

# Challenges of Building Personal Robots

Steve Cousins



# Industrial Robotics

1960

2010



Personal Robotics

Industrial Robotics

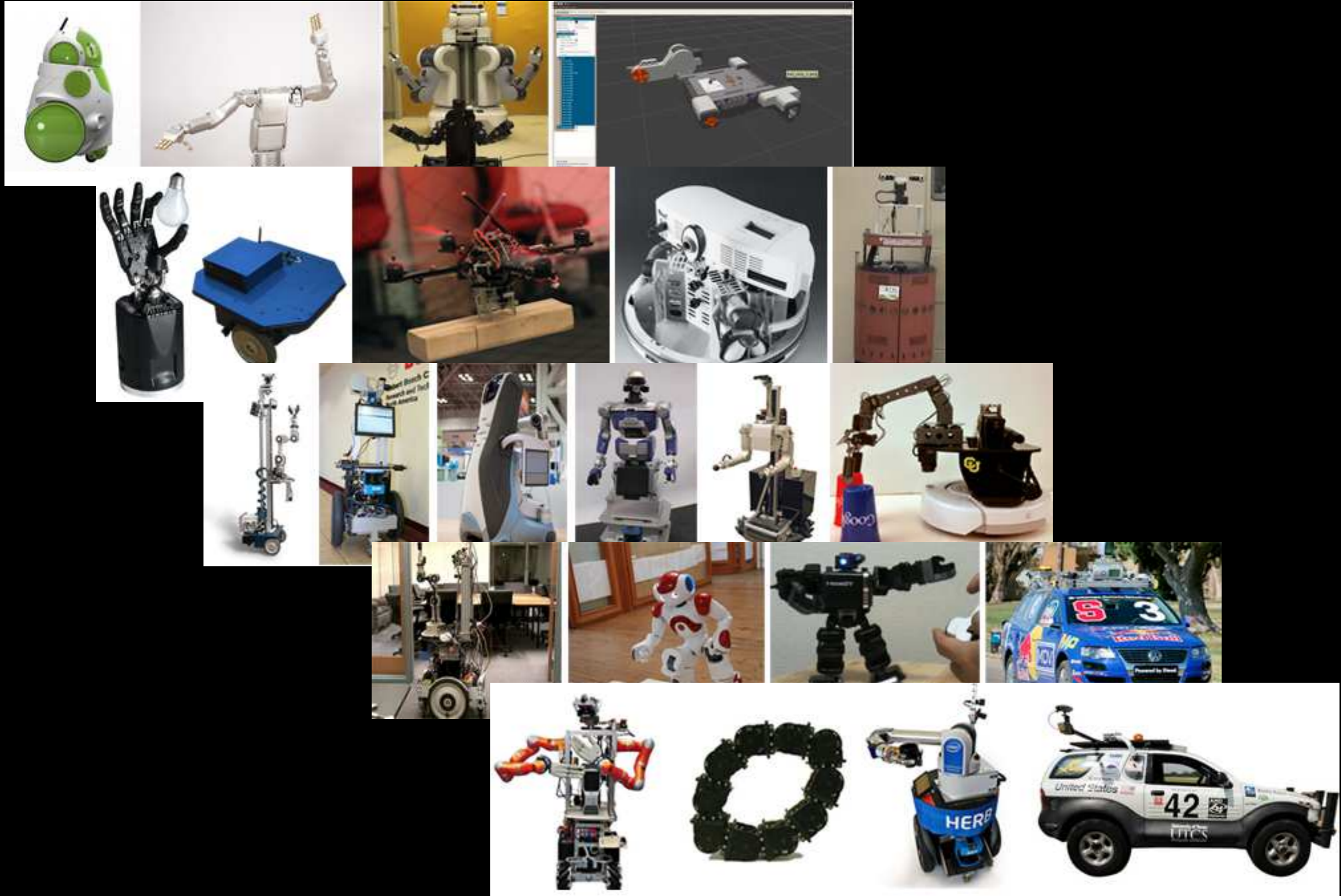
1960

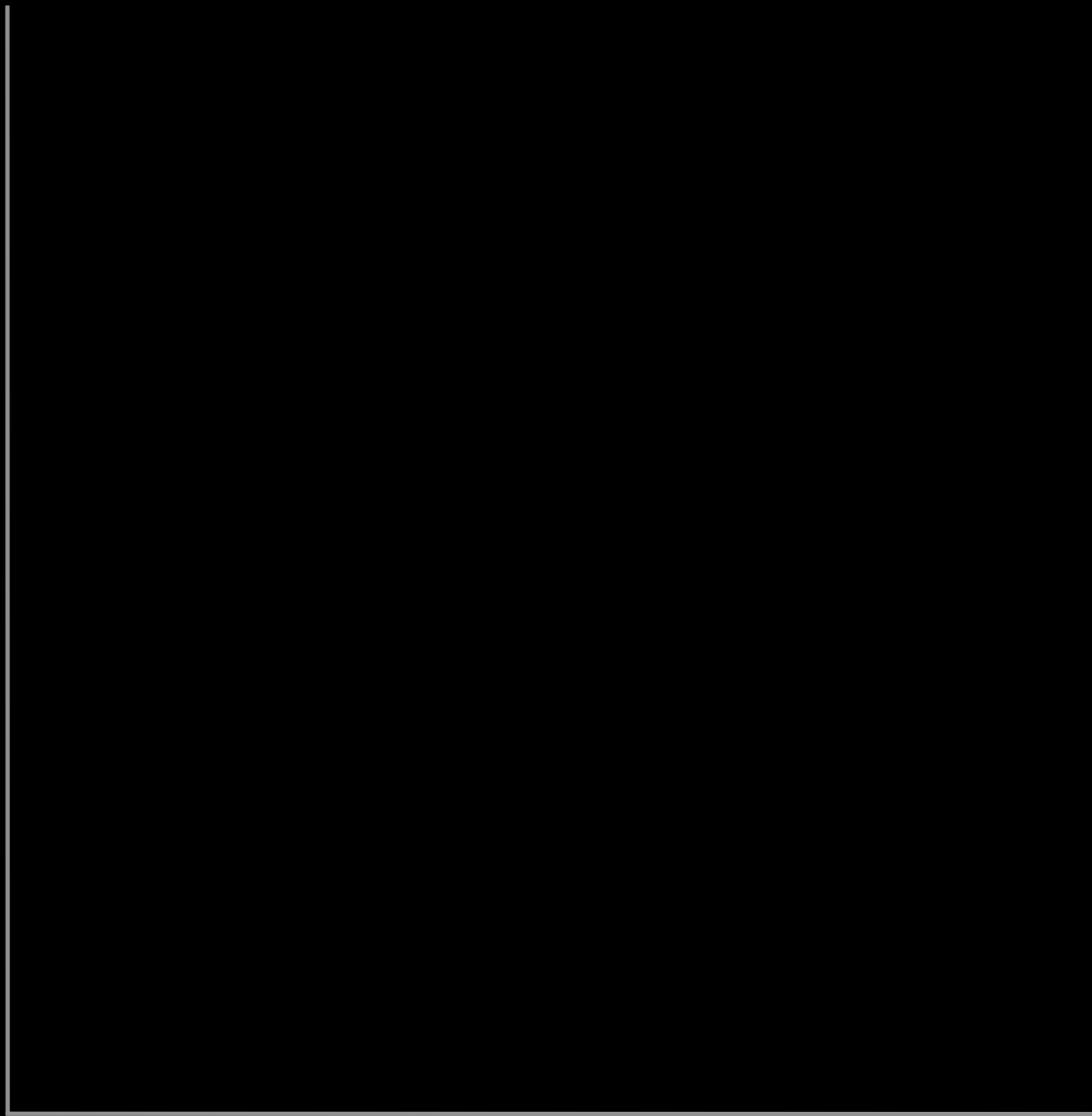
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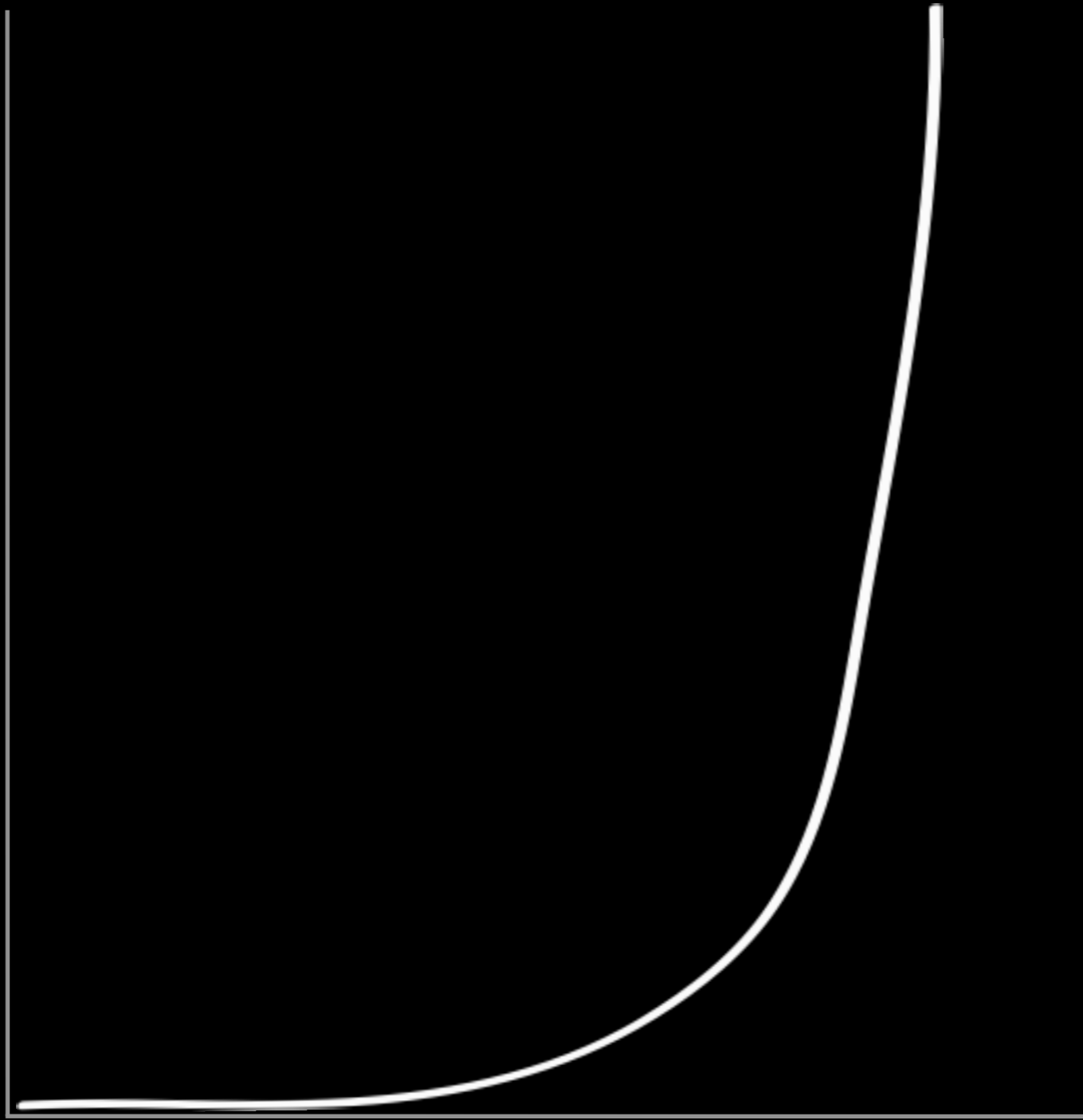
2060

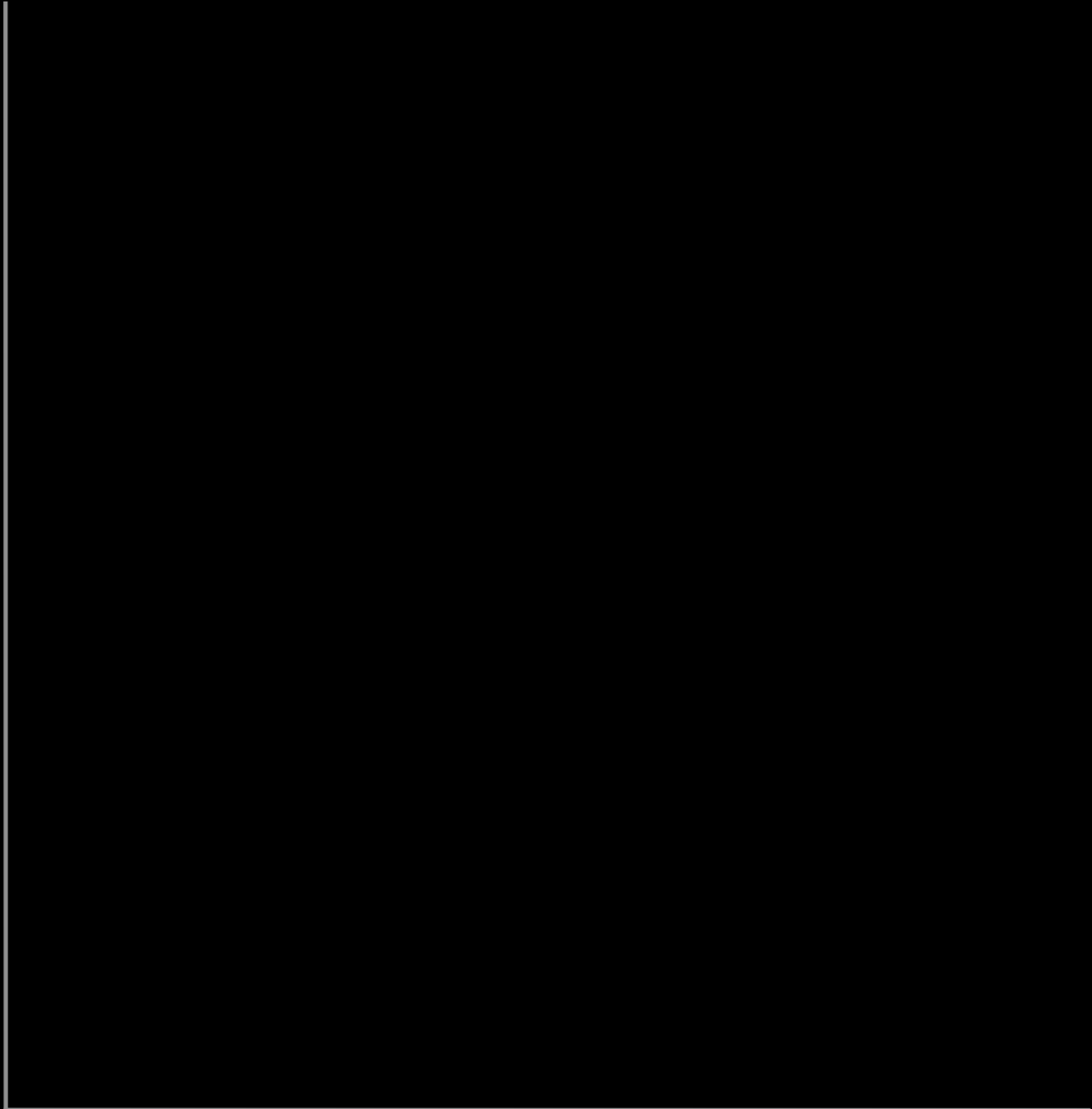




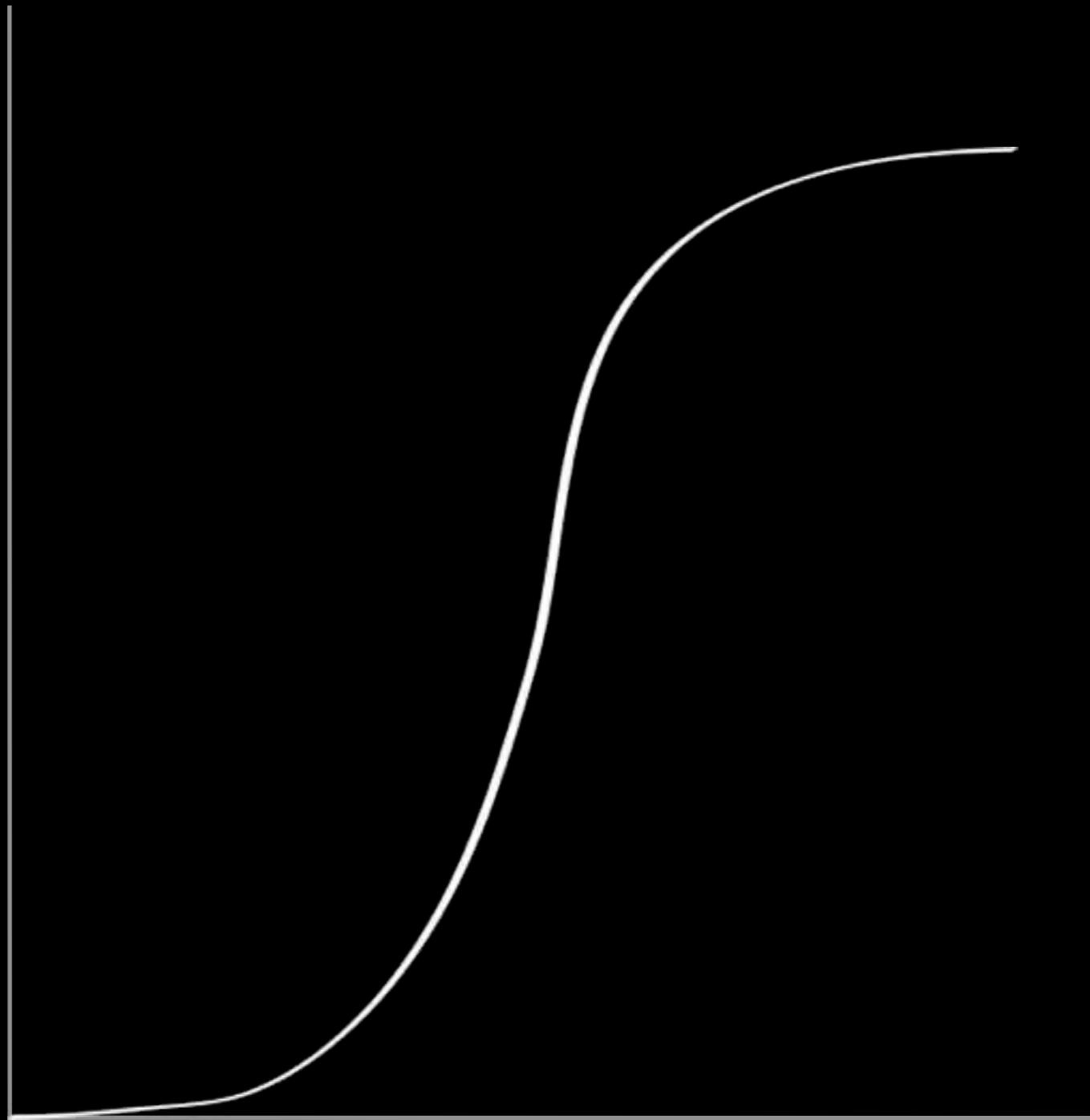


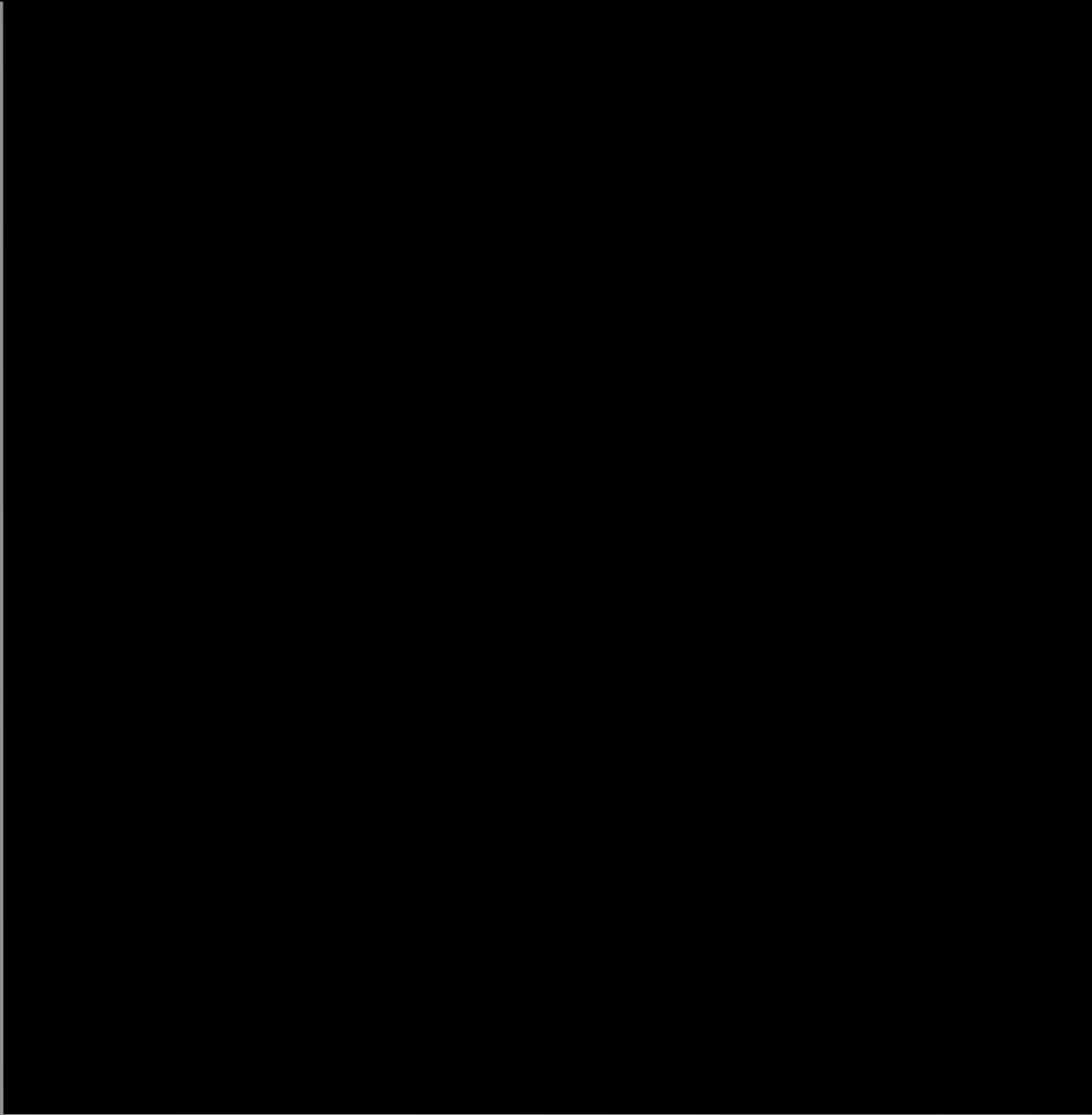


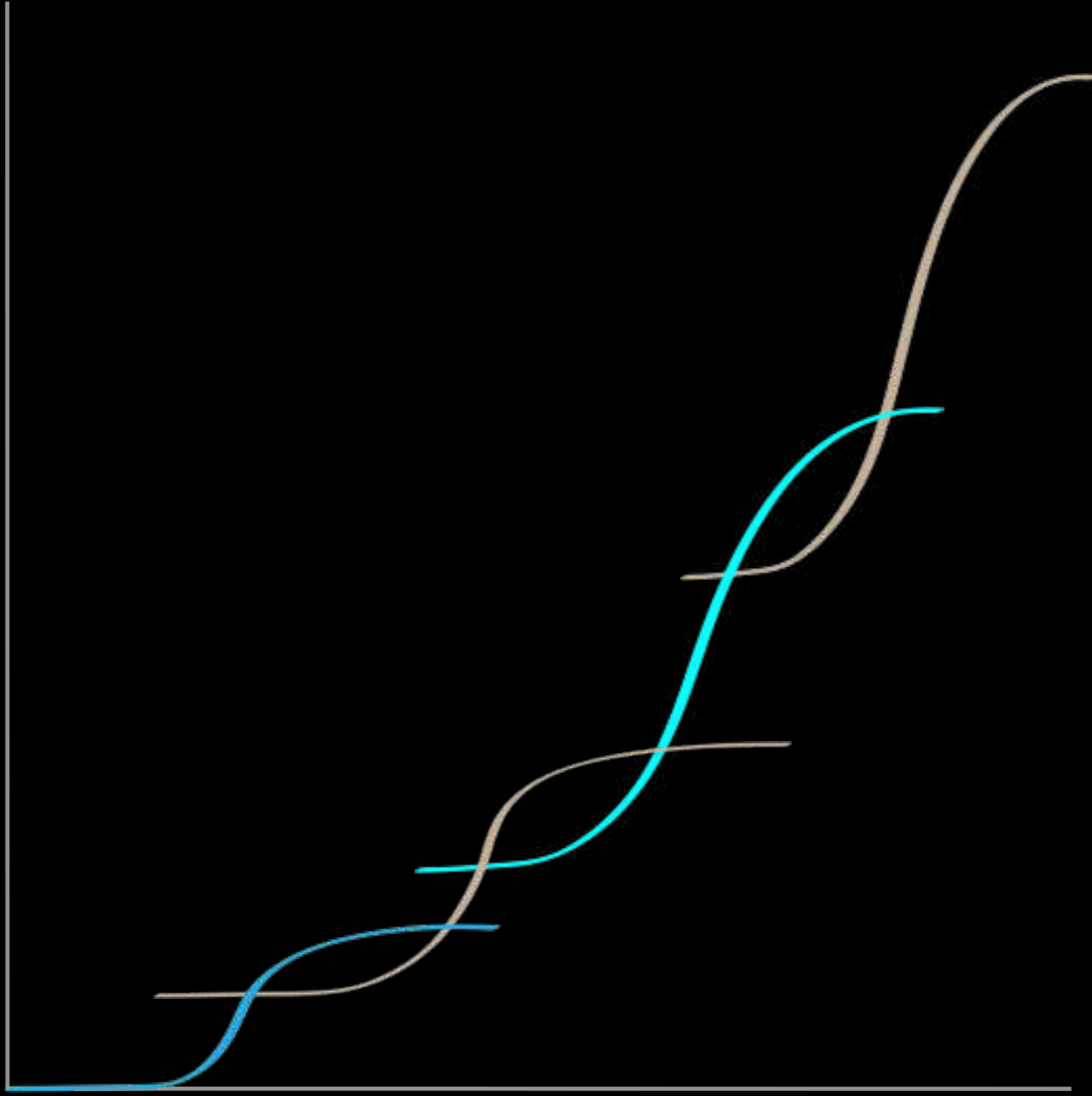


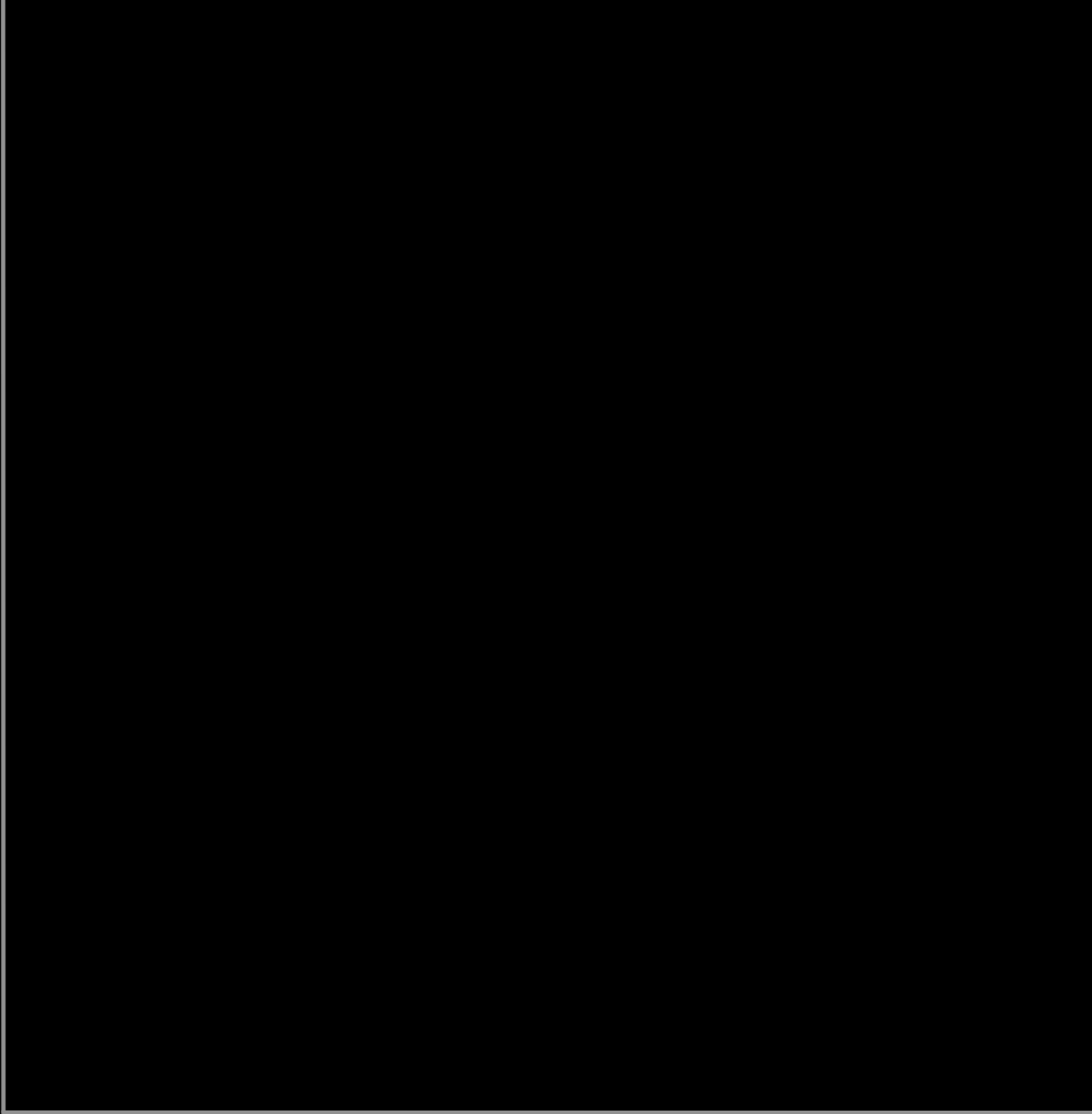












**Task-  
Centered**  
*(Roomba)*



**Task-  
Centered**  
*(Roomba)*

**Be There**  
Remote Presence

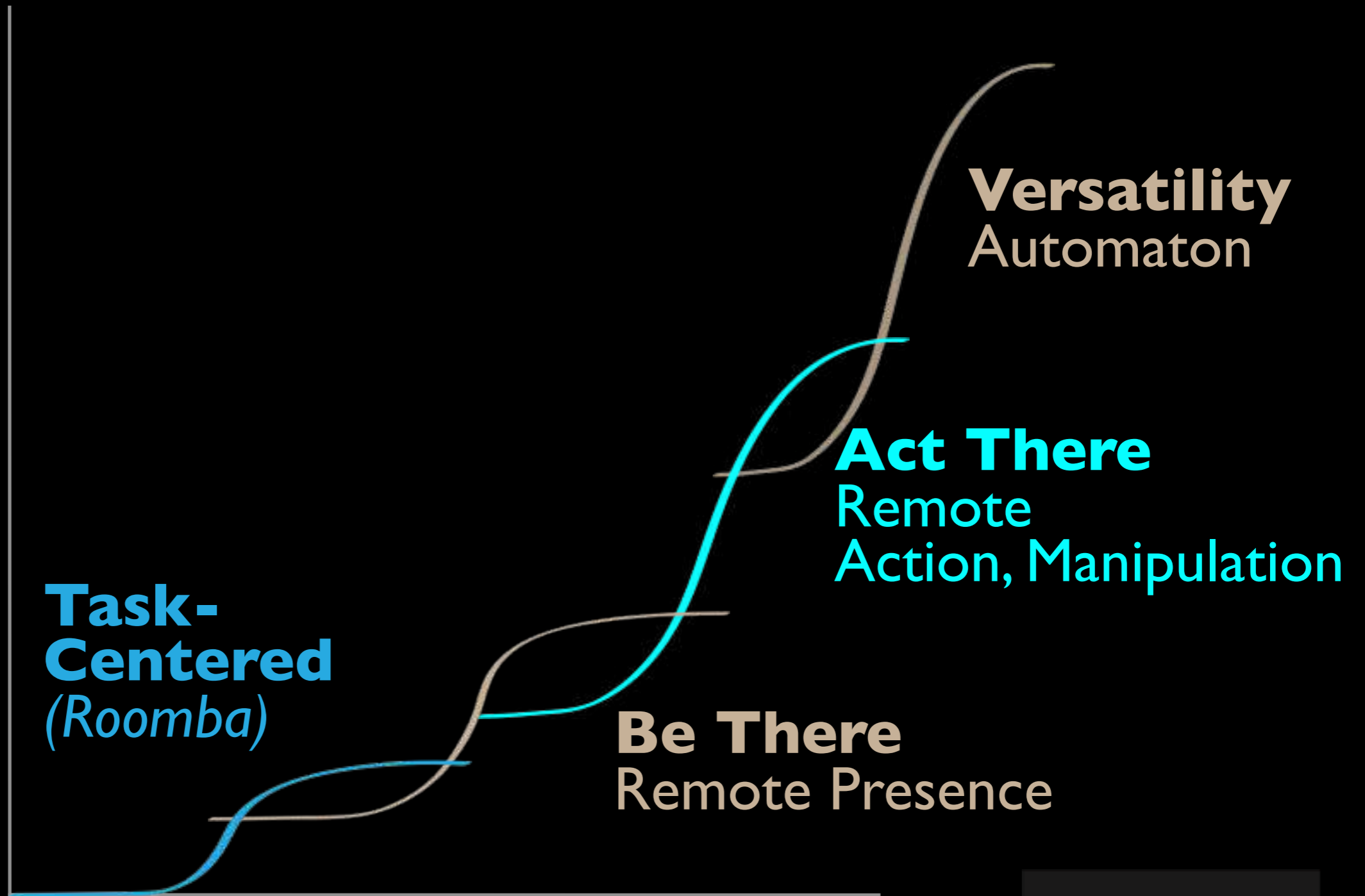


**Task-  
Centered**  
*(Roomba)*

**Be There**  
Remote Presence

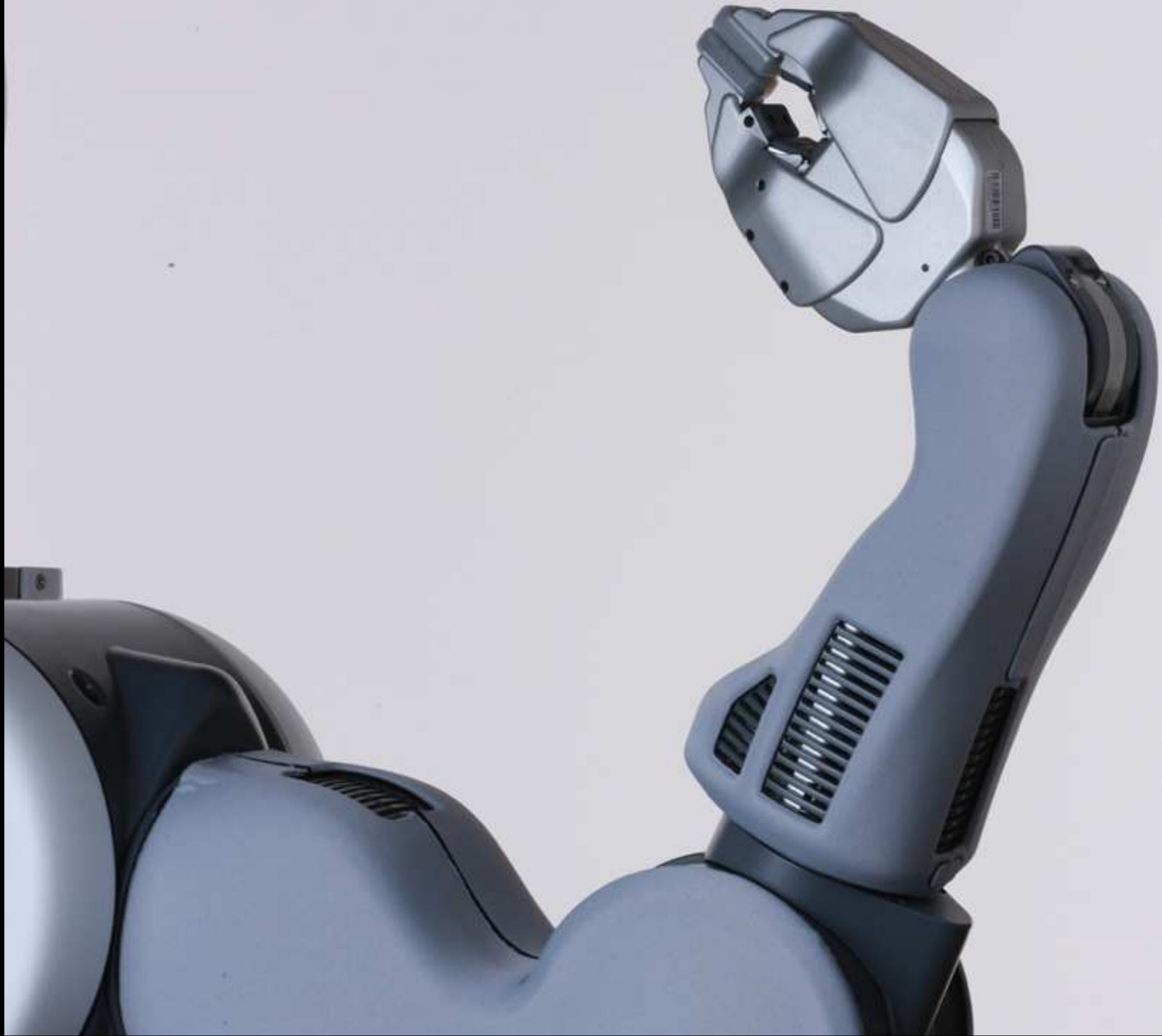
**Act There**  
Remote  
Action, Manipulation











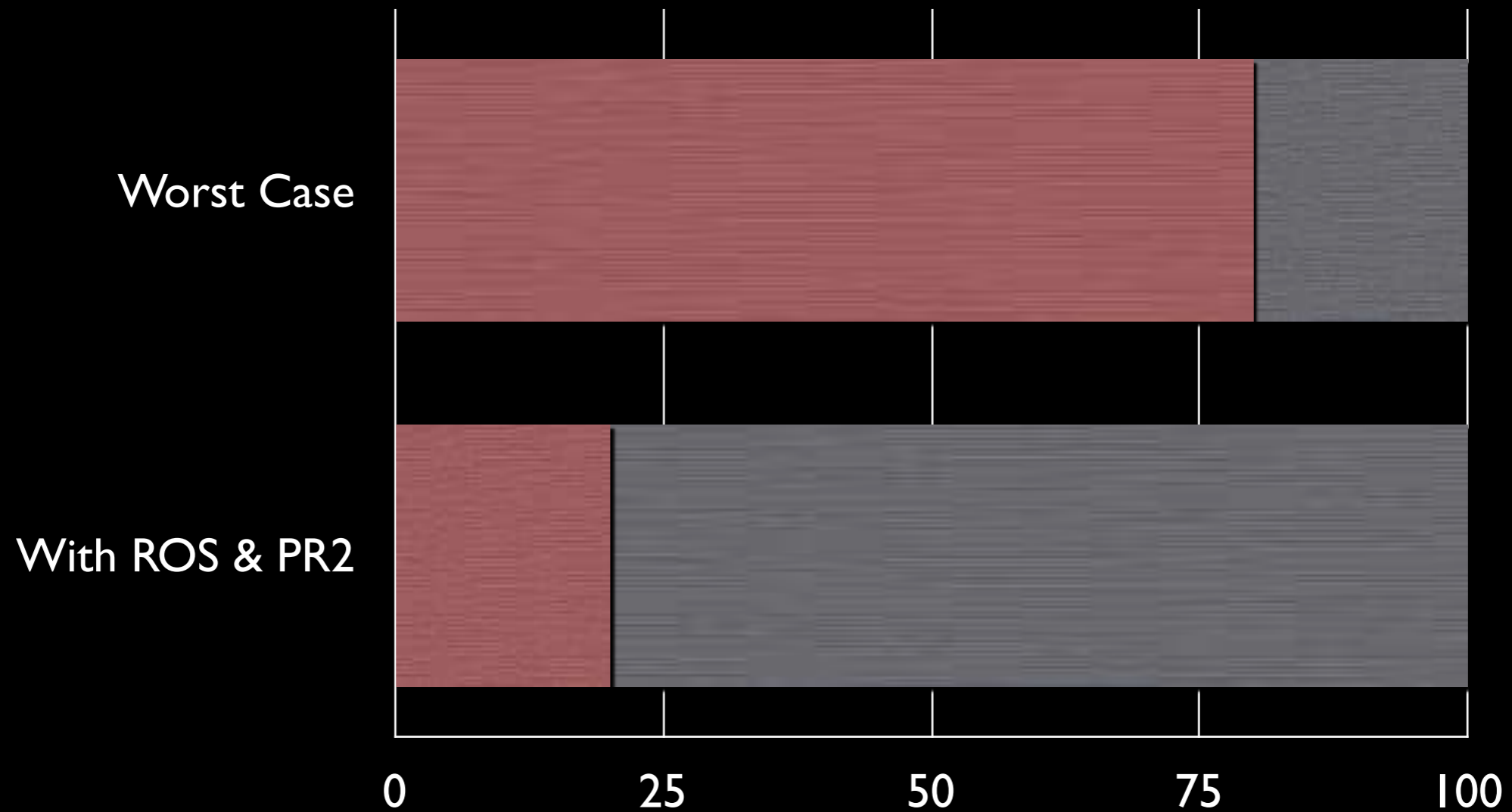




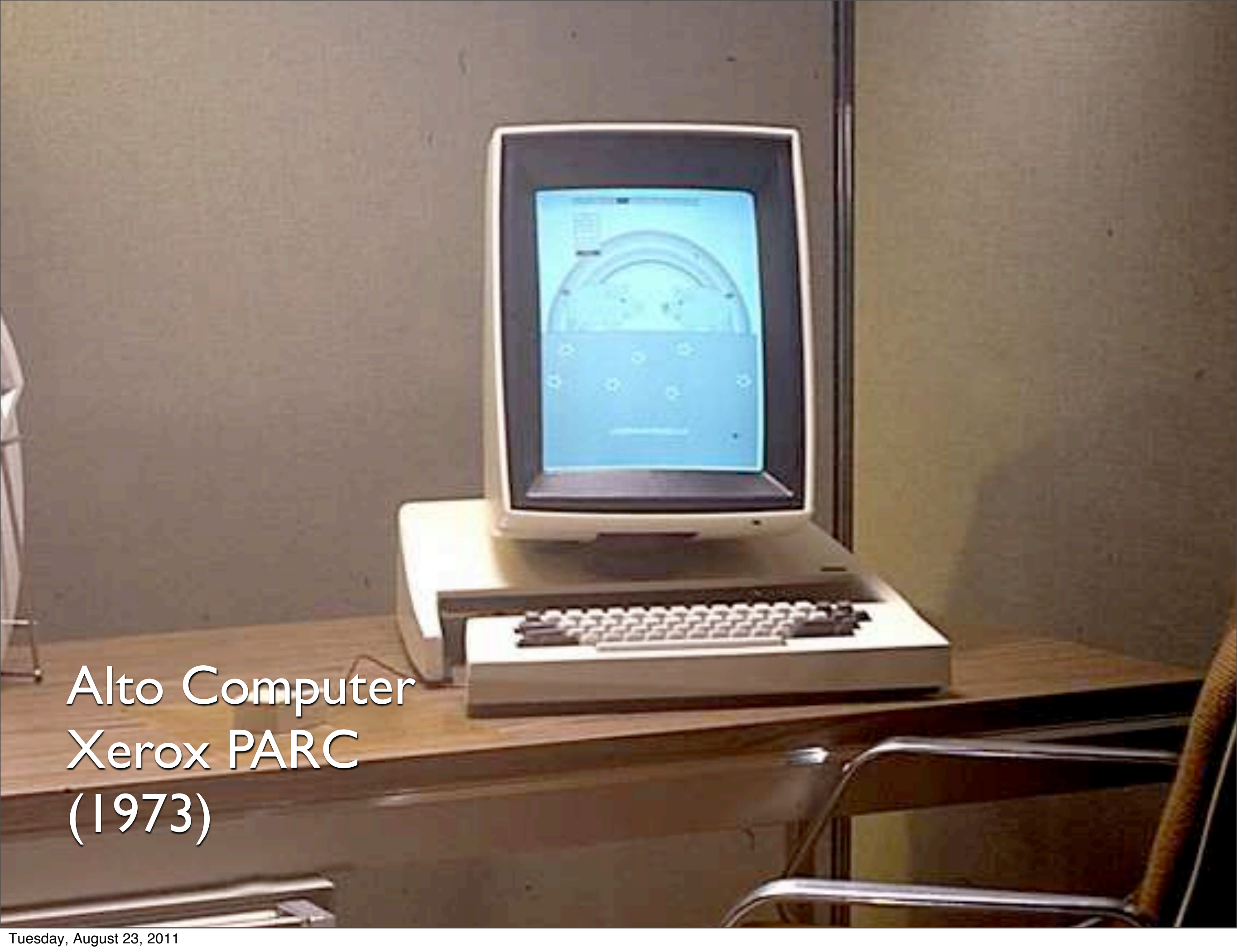
# Catalyst

Required Engineering

Core Research





A photograph of a Xerox Alto computer system. The monitor is on a stand, displaying a graphical user interface with a rainbow and several windows. The keyboard is on a separate tray in front of the monitor. The system is on a wooden desk. A chair is visible in the foreground.

Alto Computer  
Xerox PARC  
(1973)



**MITS** **ALTAIR 8800 COMPUTE**





#### A BALANCE OF FEATURES

The APPLE II SYSTEM is a fully assembled, tested & burn-in microprocessor based using the 6502 microprocessor. The board contains processor & support hardware, complete video electronics for a 40 character line, 24 line video display, on-board RAM capacity of 8K BYTES, software system monitor in PROM, and fully regulated power supplies. The Apple also directly to an ASCII encoded board and a video monitor, using the efficient entry and storage of programs in hex notation. The use of the 8K RAM chips results in high density, and can be upgraded to 16K when they become bytes on-board RAM.

A full (1 keyboard) cassette interface is available and includes a tape Apple II And Folks Basic

# Technical Challenges

- Human-robot interaction
- Mobility
- Manipulation
- Perception
- Complex real-time control



# Wish List...



# Robot Batteries Never Last Long Enough



# Huge Shared-memory Compute



# Fast Communication



# GPUs... with Ubuntu support



# Less (or no) Wires





# Hobbyist Access



# Specialized Processors



# Cool Chips



# Questions?

