Computer Architecture Lecture 6: Basics of I/O and Storage Systems

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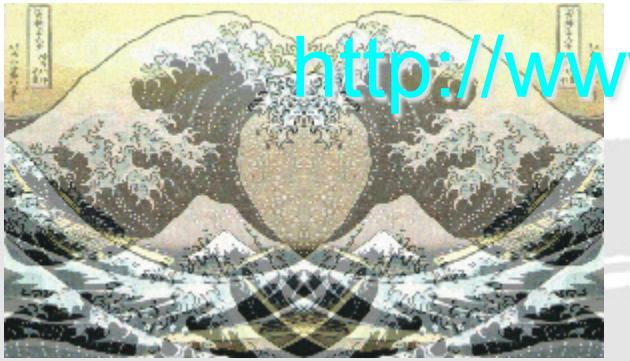

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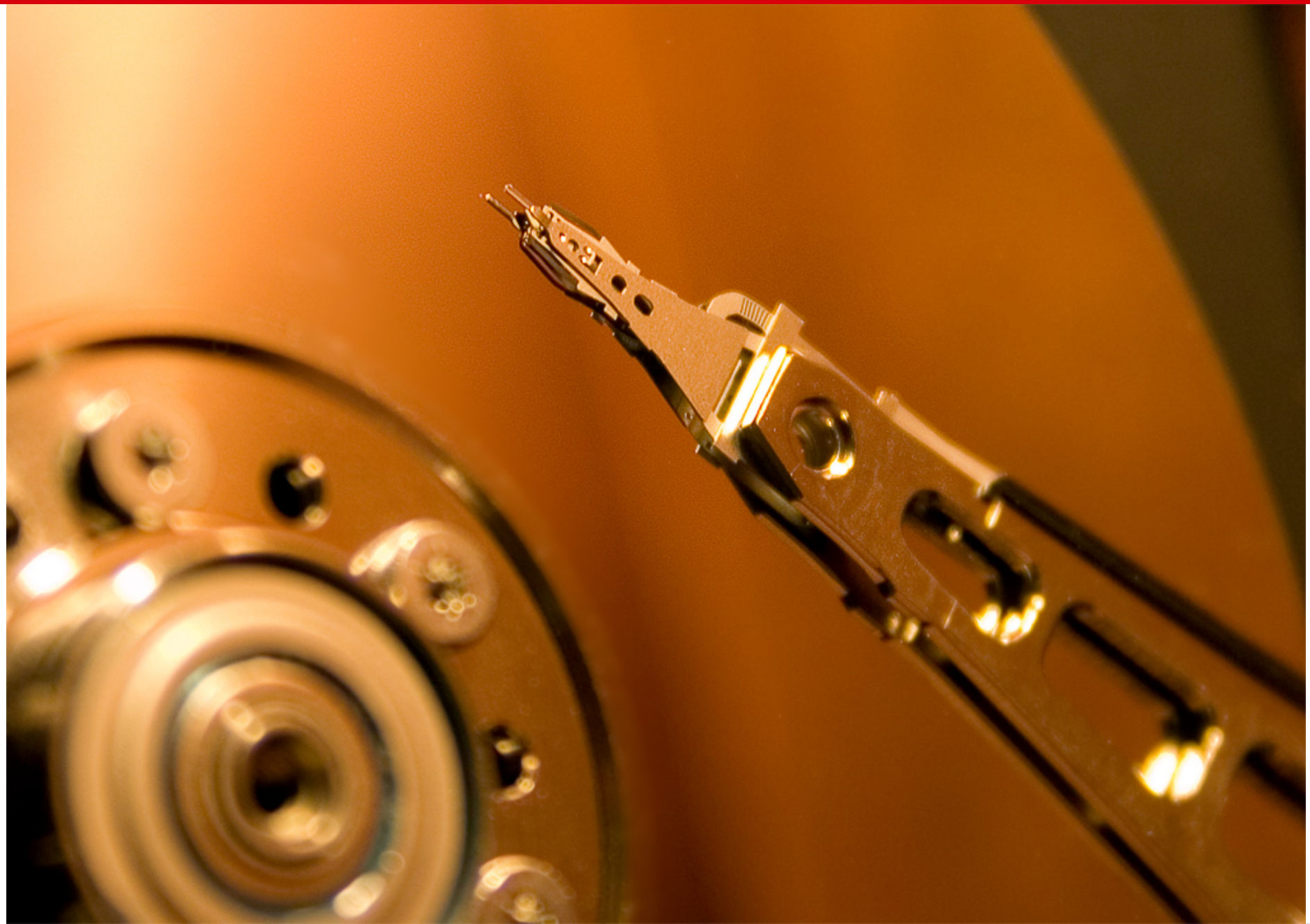
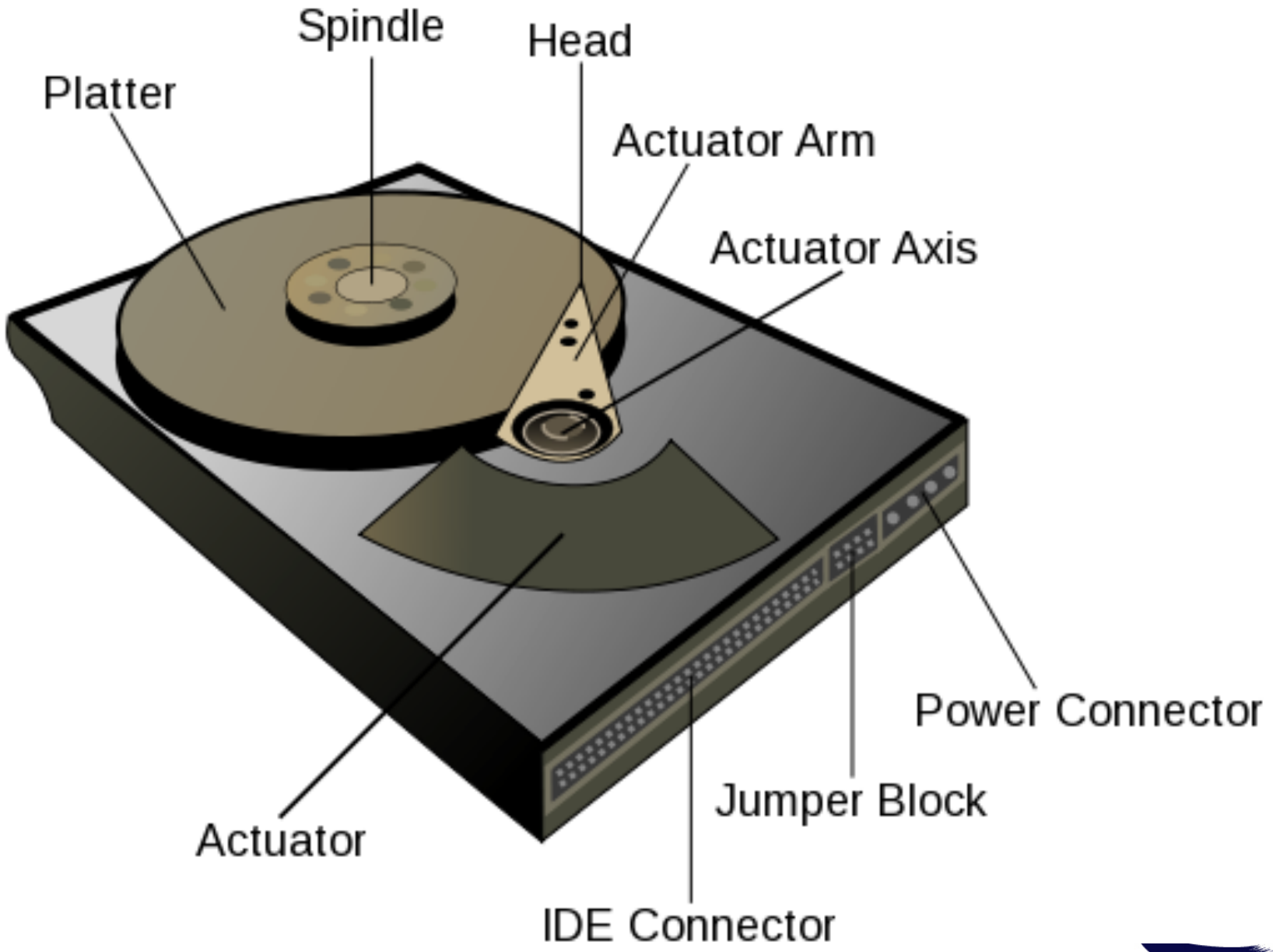
Platter, Spindle, Arm, and Head



Outline

- What's a Disk Drive?
- The Importance of a Disk Drive
- The Insides of a Disk Drive
- The Access Time Gap
- Disk Drive Trends
- A Little History
- The Basics of a Bus
- Homework

What's a Disk Drive?

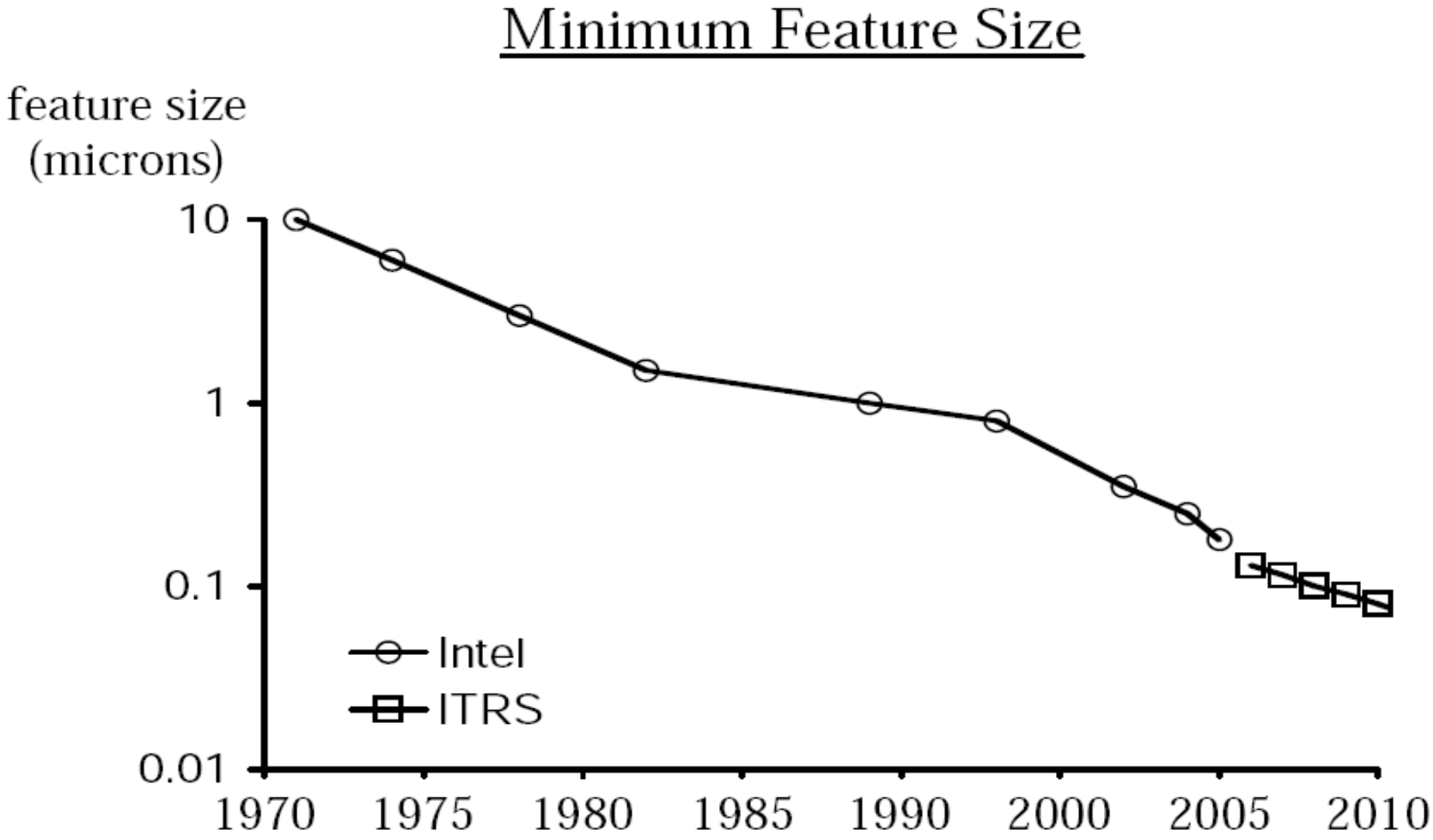


What's Important About a Disk Drive?

- Expensive
- Consume lots of power
- Performance bottleneck
- Fragile

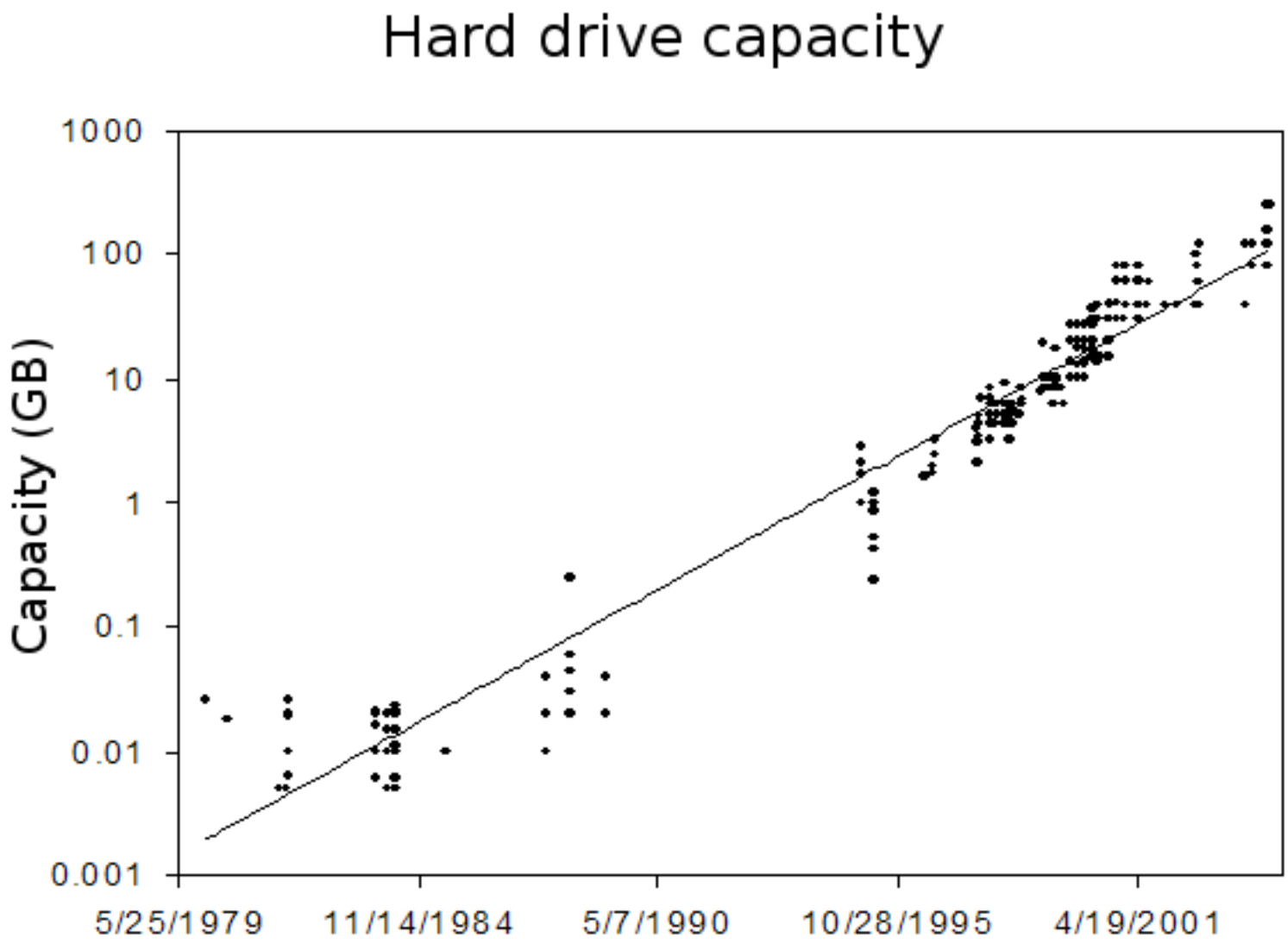
But they hold your data without power (they are *nonvolatile*), for a long time! Lots and lots of data!

Moore's Law



The decreasing minimum feature size of transistor components is shown for both Intel products and data reported by the International Technology Roadmap for Semiconductors (ITRS).

Growth of Capacity Over Two Decades



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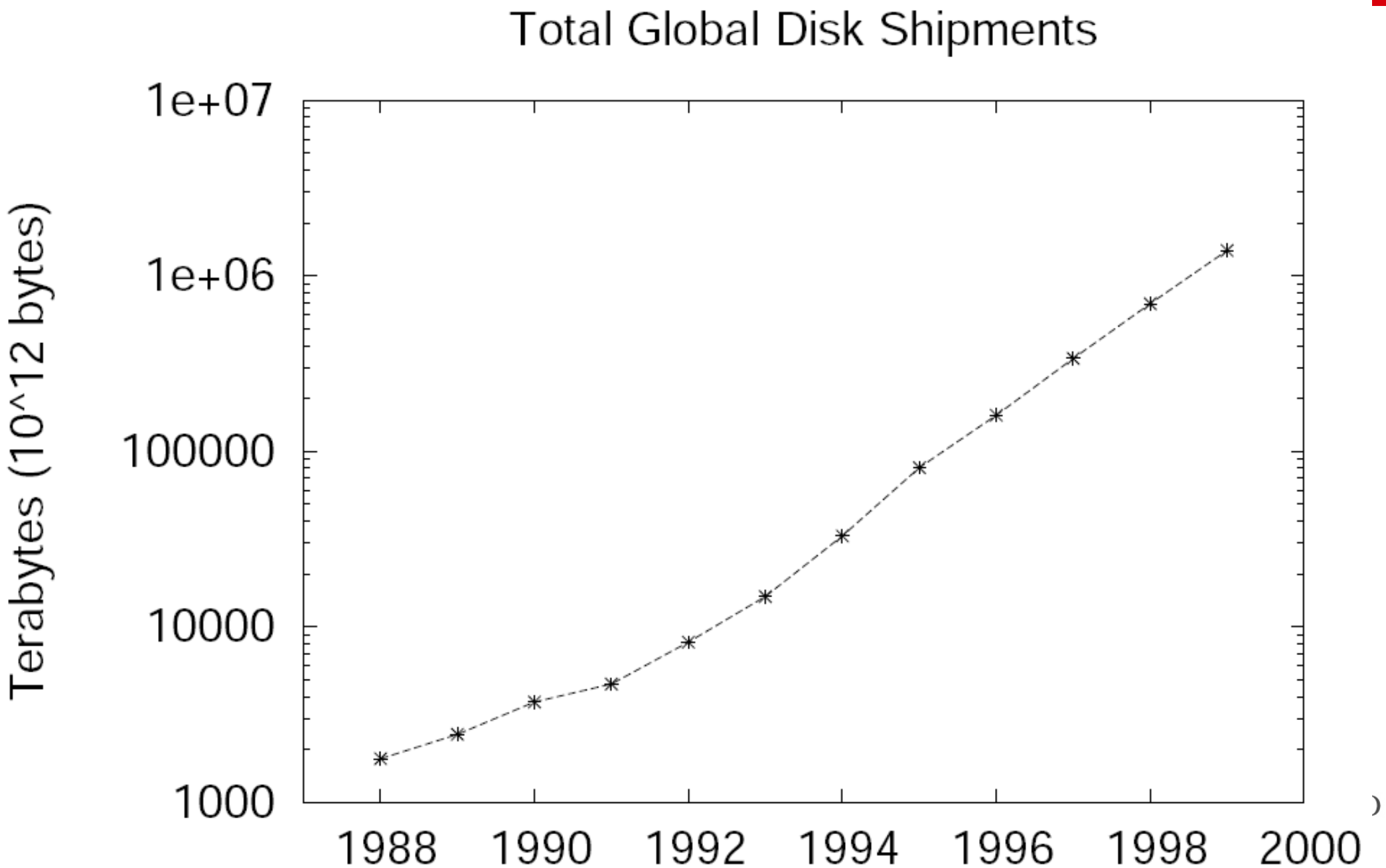
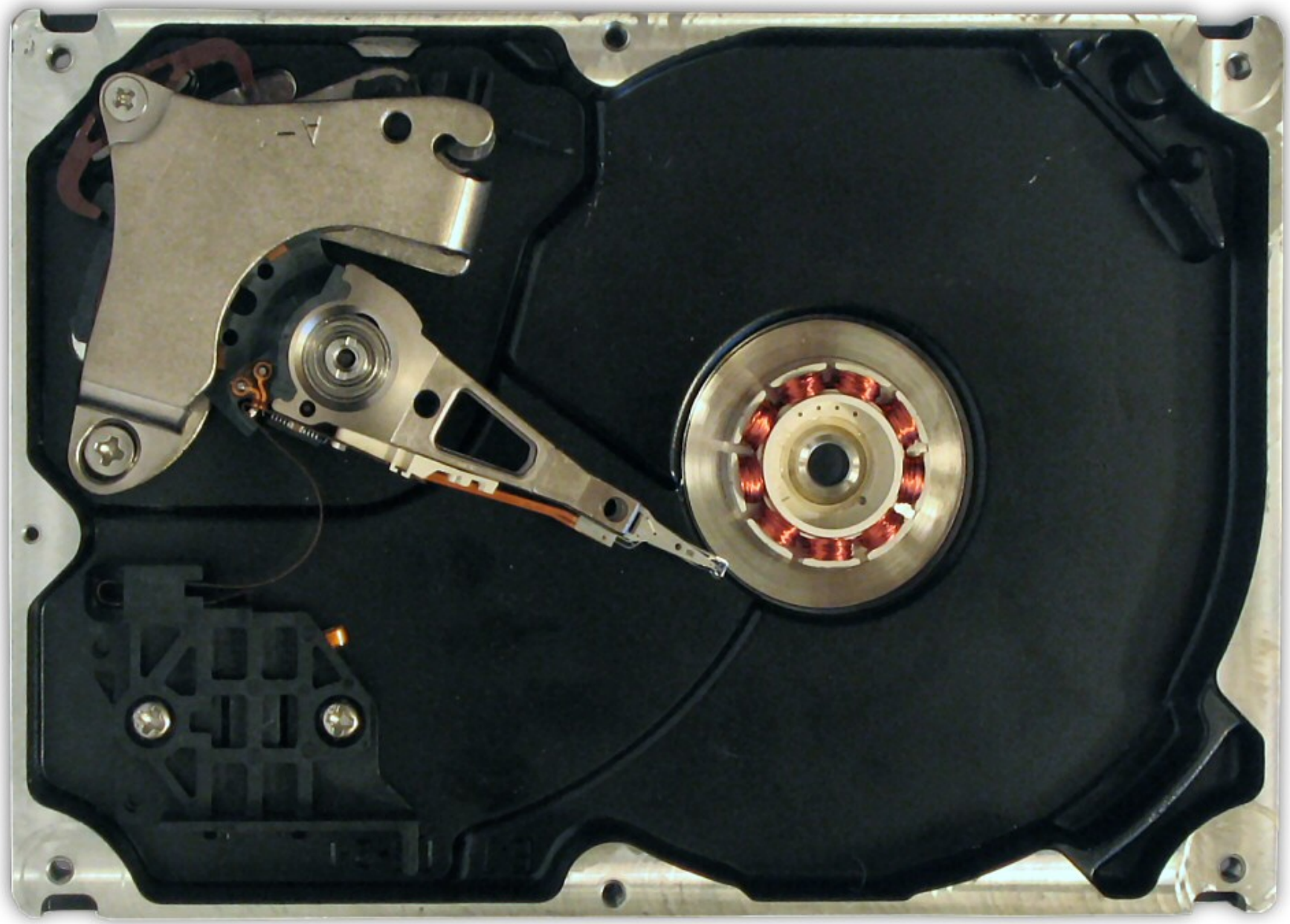
Global Disk Shipments (in TB)



What's a Disk Drive?



Anatomy of a Hard Drive

The Platter(s)

The Platters: 3 Disks, 6 Arms & Heads

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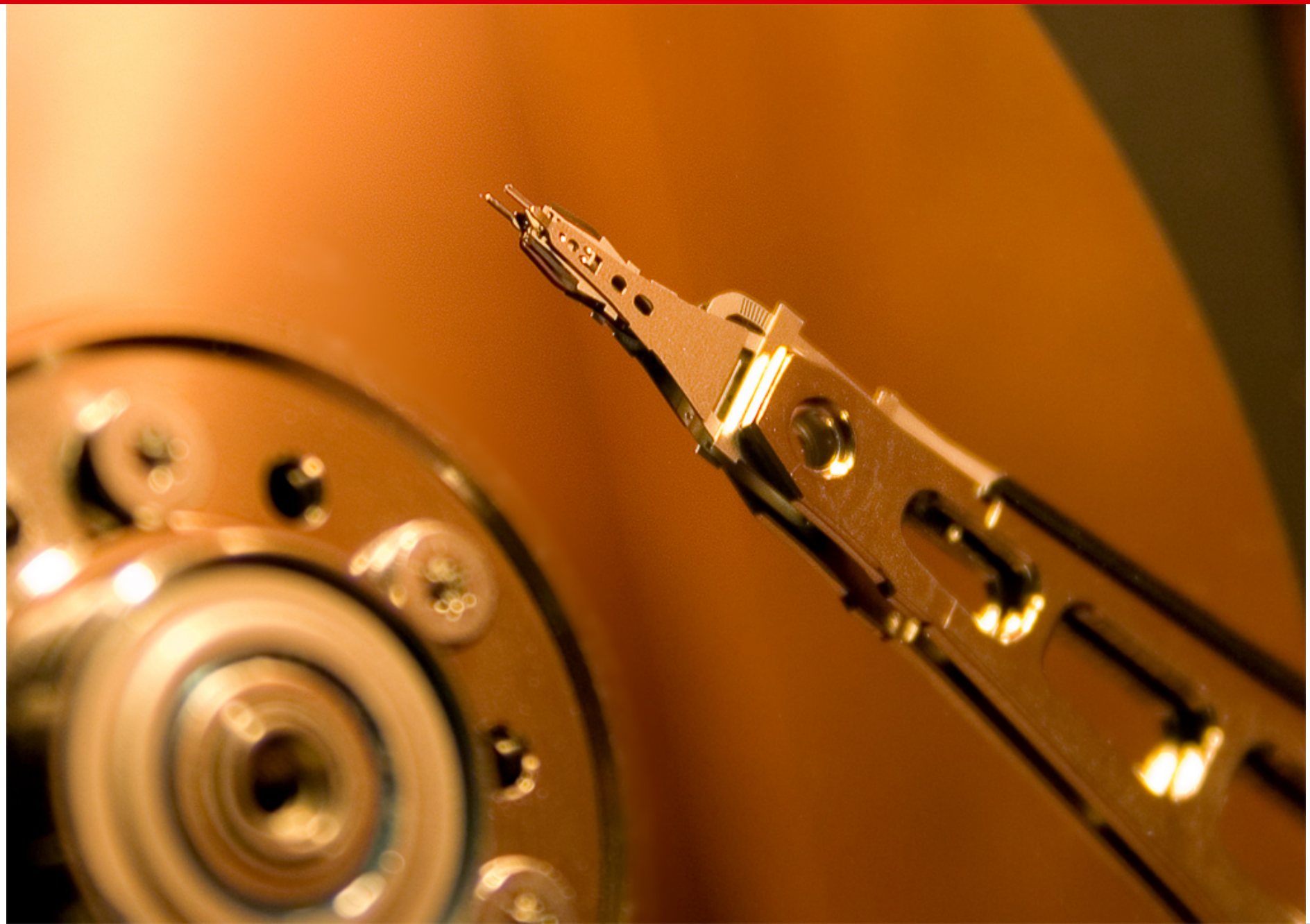
Platter, Spindle, Arm, and Head



Arm, Slider & Read/Write Head

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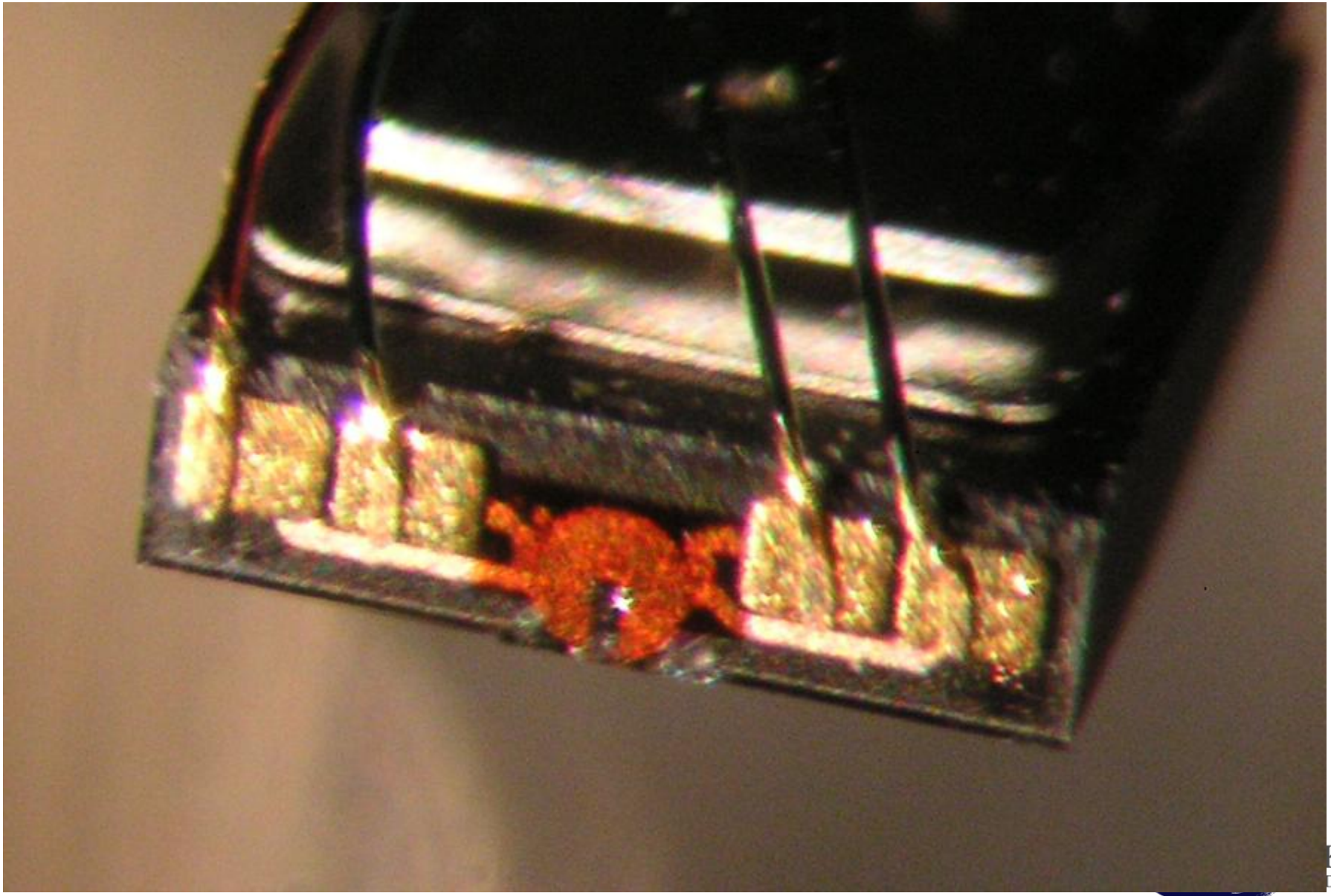
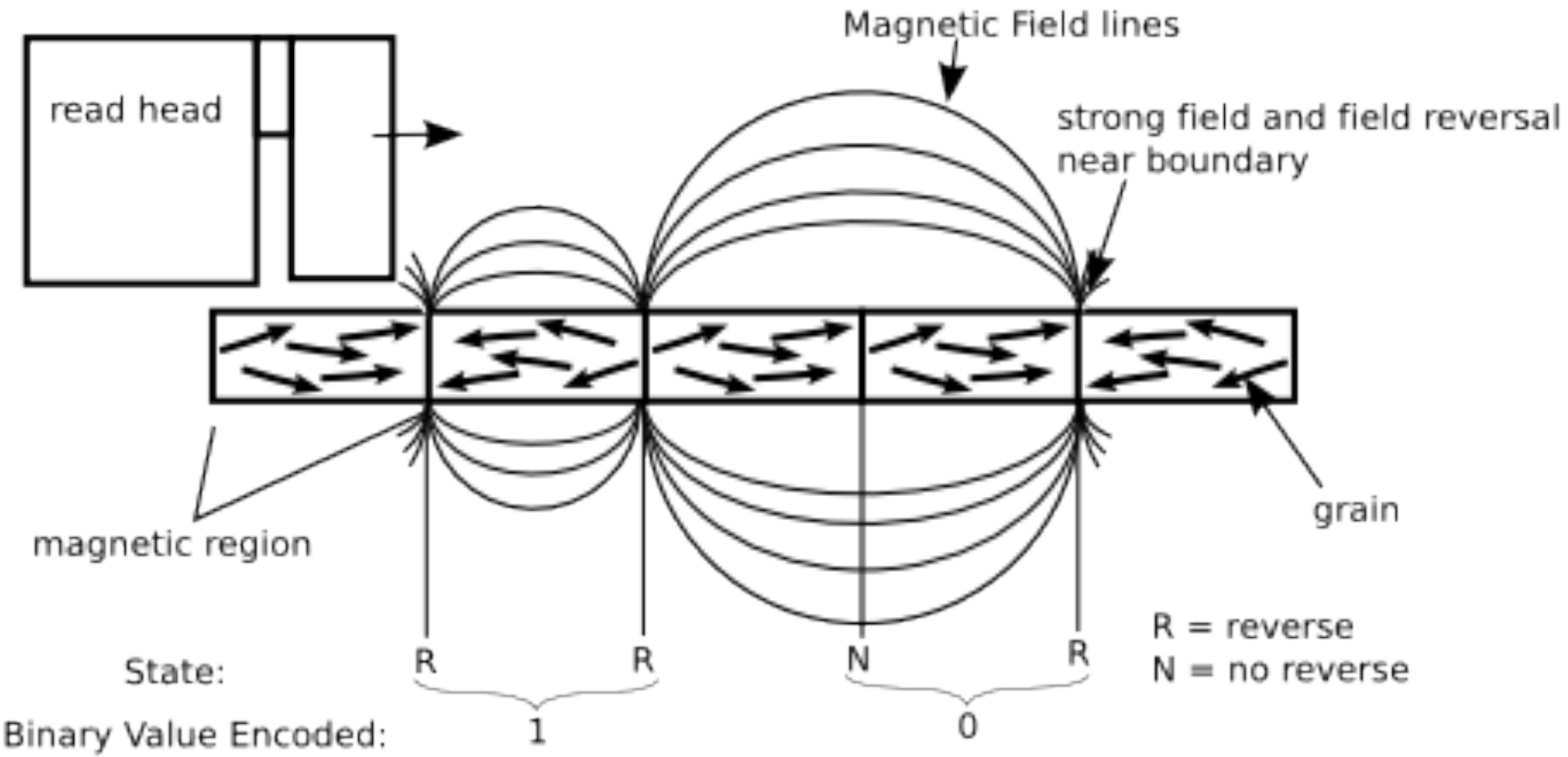
The Head on the Slider



Magnetic Media & R/W Head



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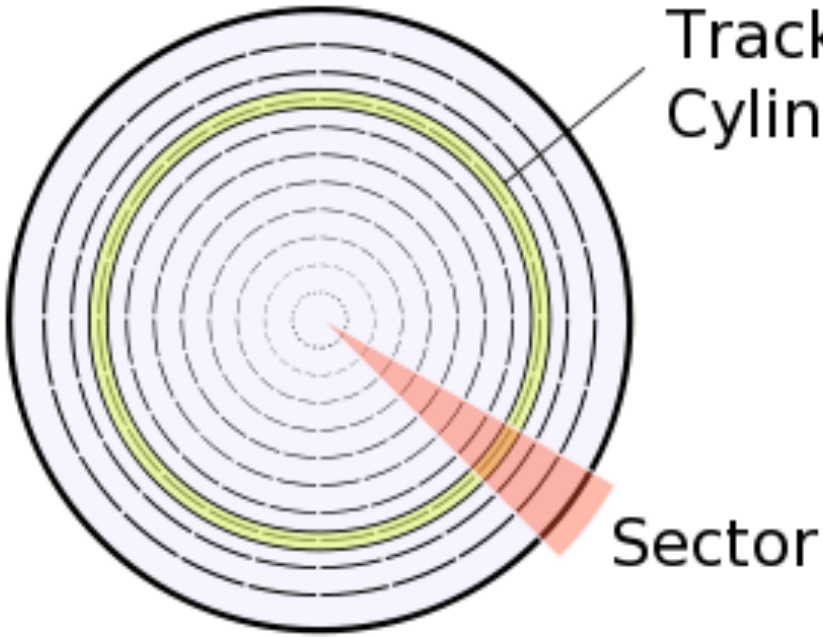
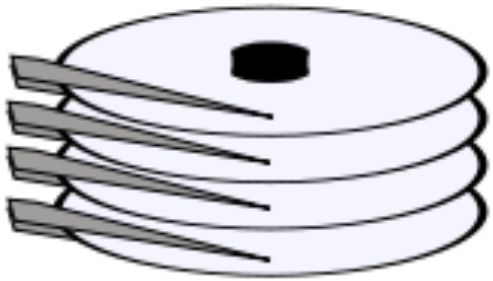
Cyclinder, Head, Sector (CHS)





Heads

8 Heads,
4 Platters

Video: Arm Moving

Video courtesy of Jun Takei, Intel

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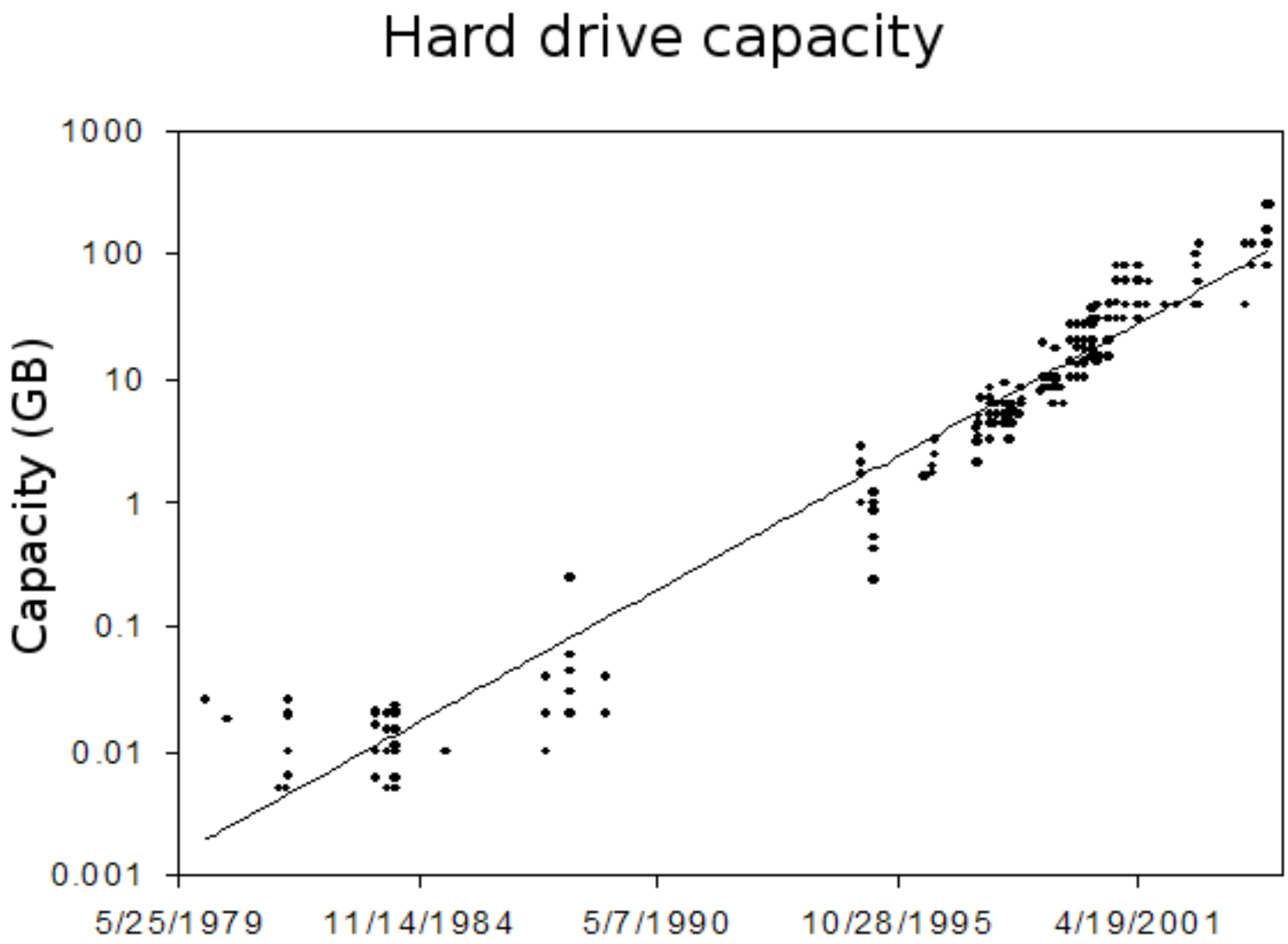
Video: Arm Moving (2)

Video courtesy of Jun Takei, Intel

Growth of Capacity Over Two Decades



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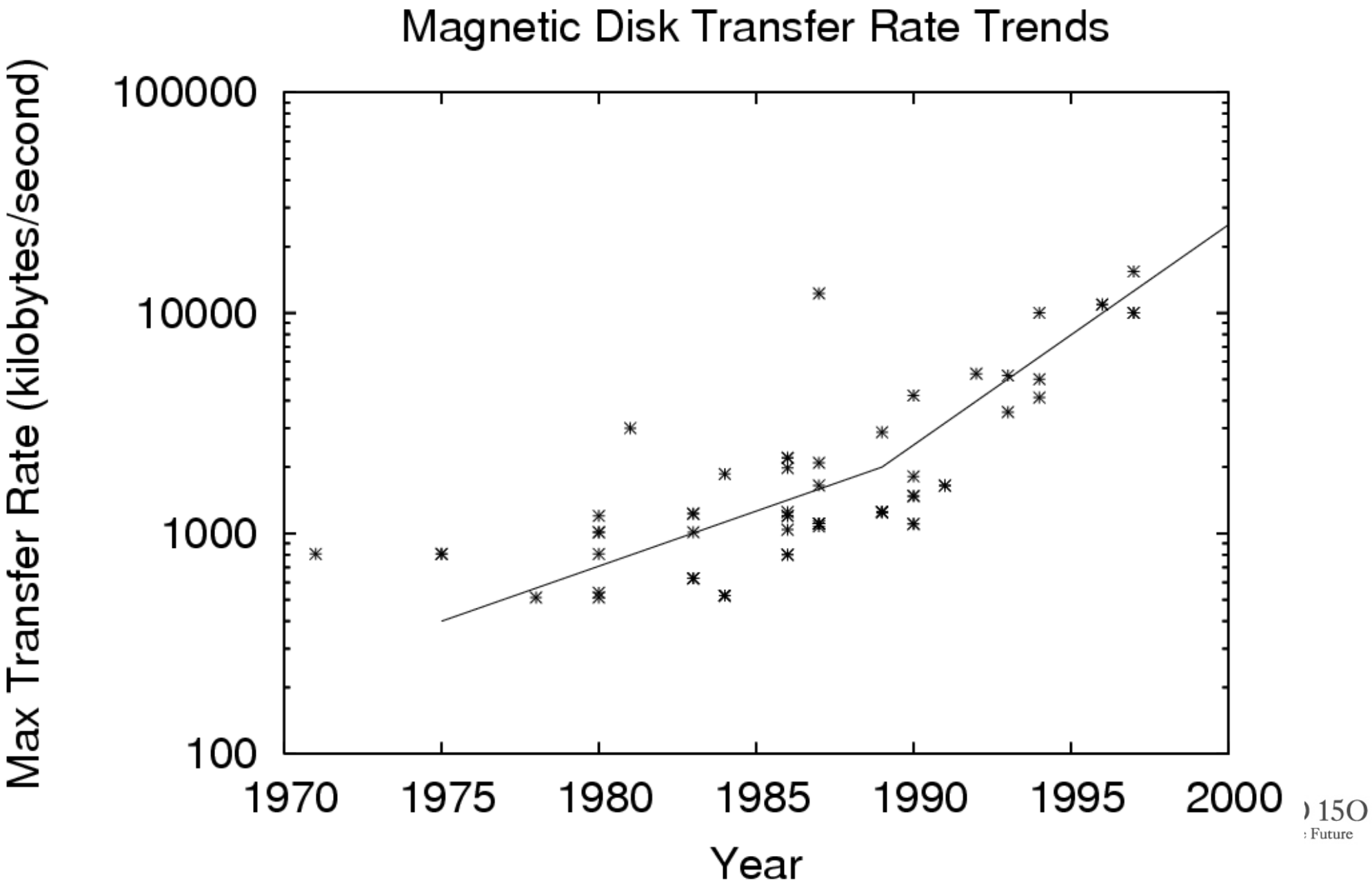
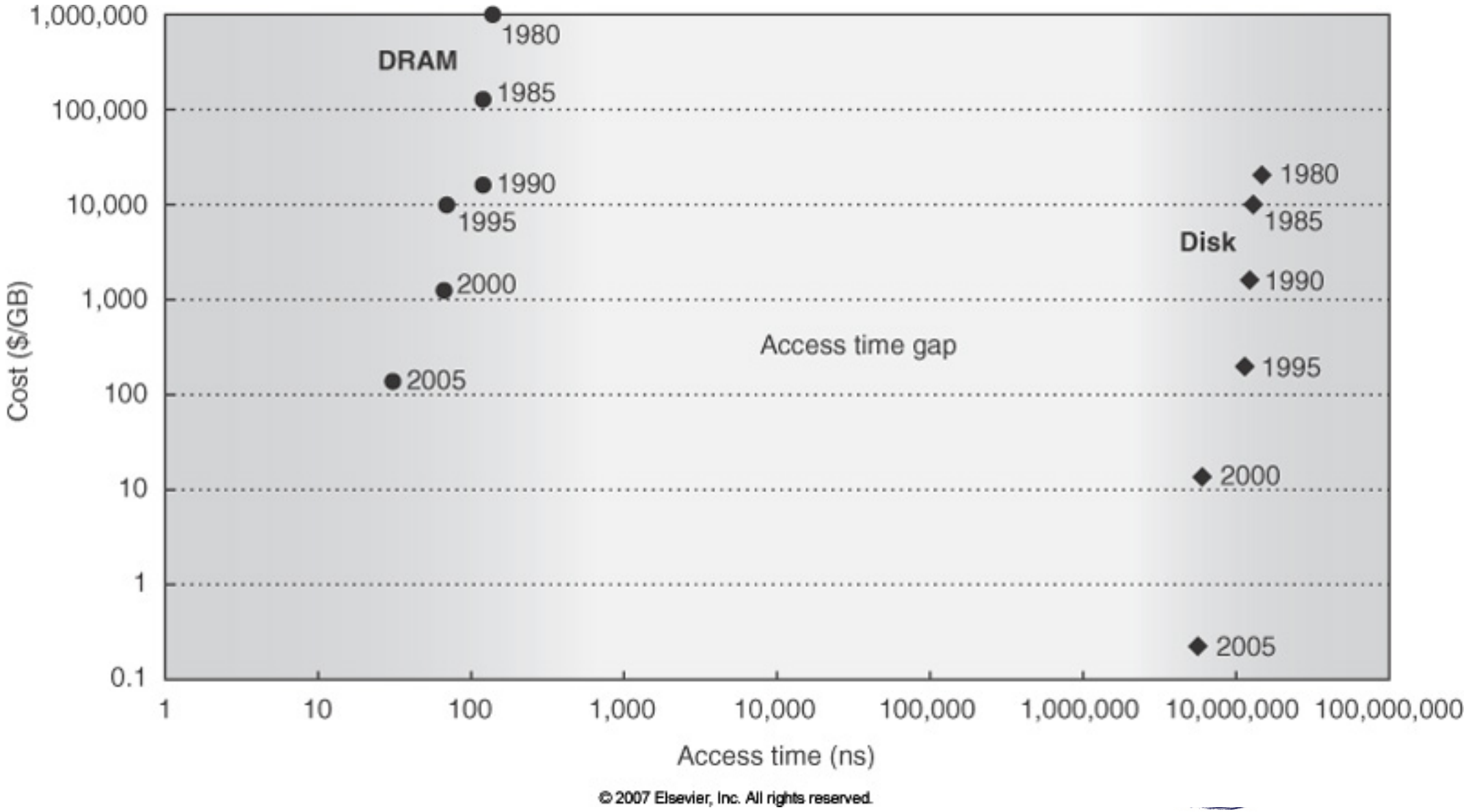
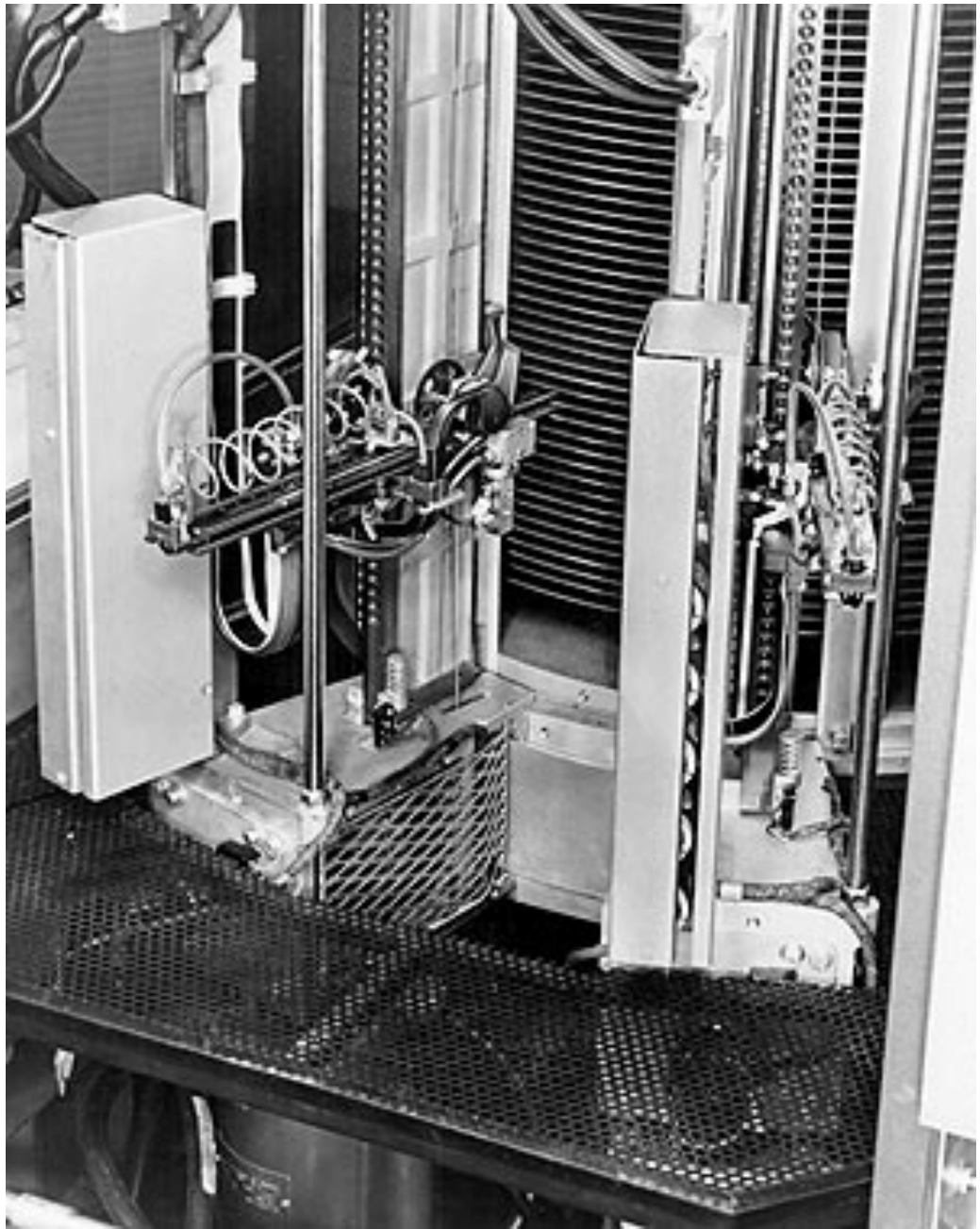
Transfer Rate



Access Time Gap



A Little History: The RAMAC



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A Little History: The RAMAC

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RAMAC Delivery!

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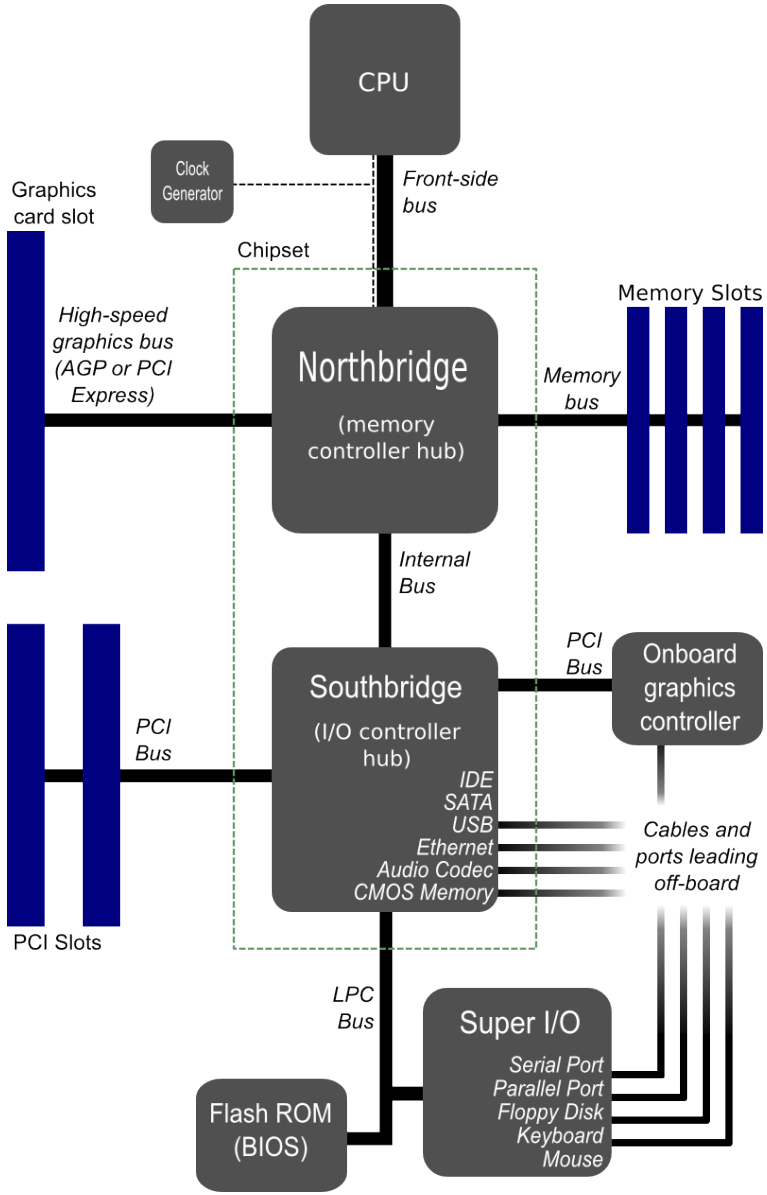
Bus

- Shared bandwidth
- Requires addressing
- Transactions
- Arbitration: priority, fairness
- Limitations: width, length (capacitance, 電気容量)
- Types: memory, peripheral
- Standardization

Buses: System Diagram



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Buses: System Diagram

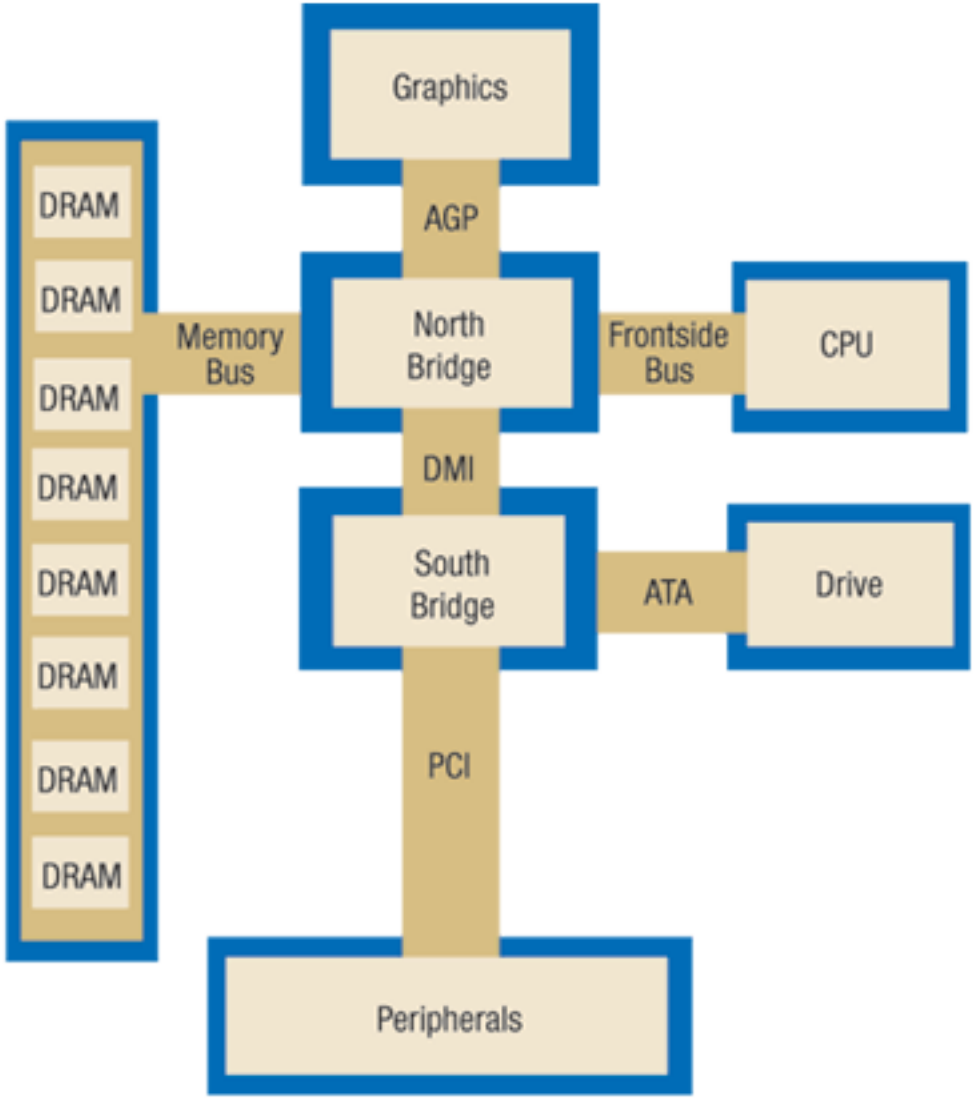

Figure 1 Major semiconductor content of standard motherboard.

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