

# The Training Technology Firehose: How to stay on the Cutting Edge in an Era of Rapid Innovation

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We live in an era in which mobile computing, the internet of things, data networks, analytics, AI, are evolving at a rapid pace.

Herring (2015) The Truly Personal Computer. *The Economist*

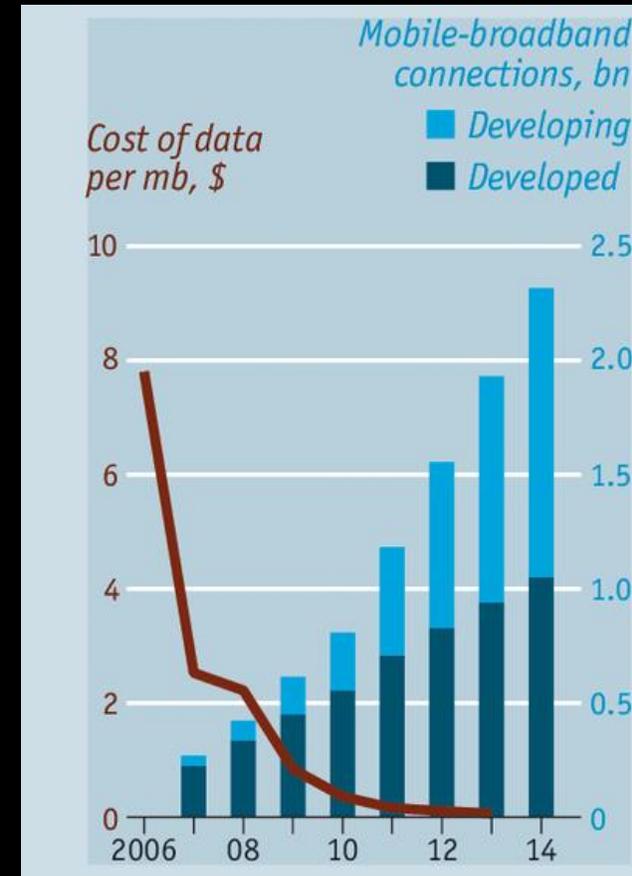


“From 2009 to 2013 the mobile industry invested \$1.8 trillion on improving infrastructure around the world.”

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In that same time, download speeds increased by a factor of 12K and data costs dropped from \$8/mb to about \$.02/mb.

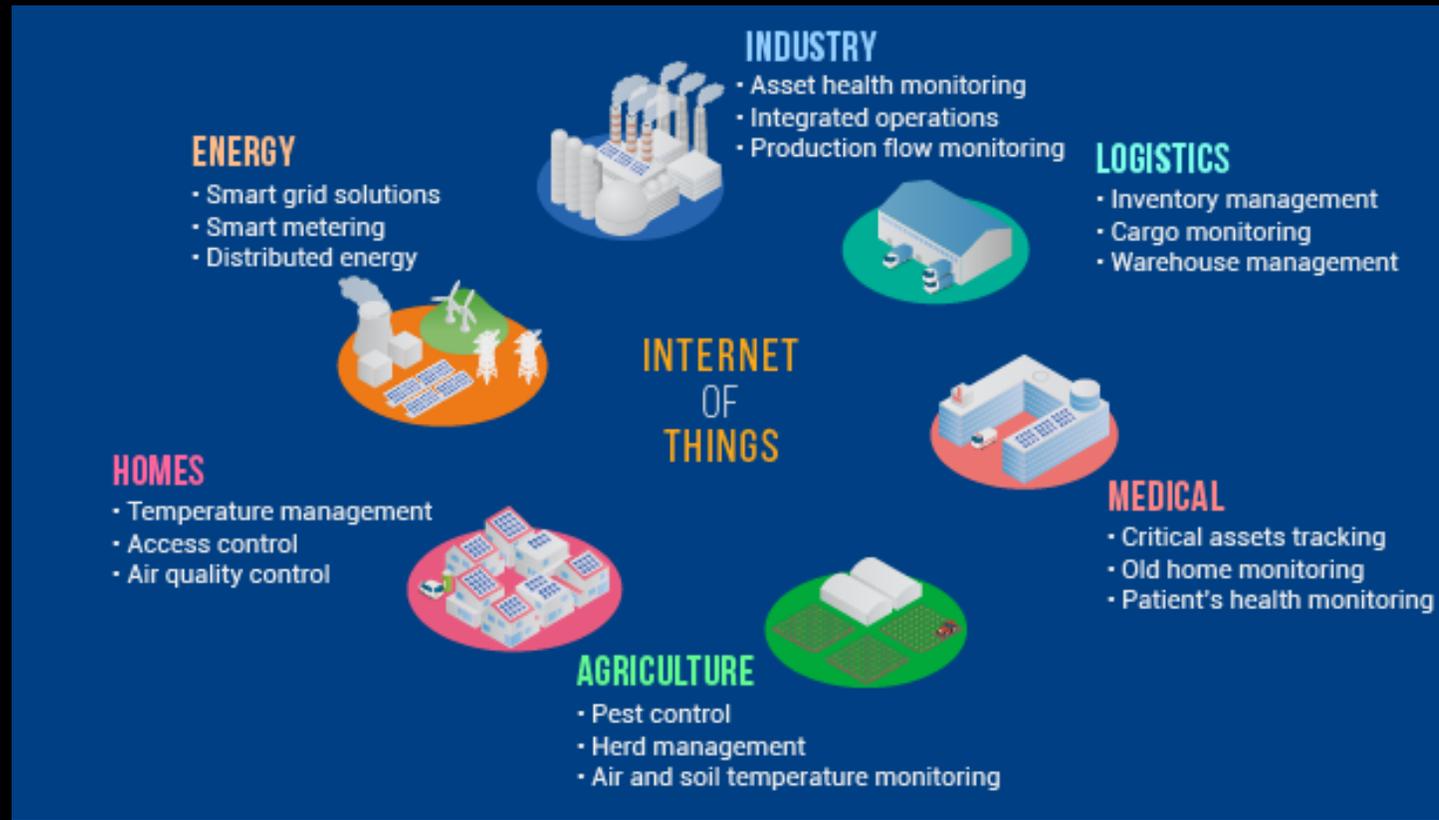


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8.4 billion “Things” are on the internet today, up by more than 30% from just one year ago.



The massive amount of data generated by the IoT will fuel analytics that will continue to revolutionize almost every industry.



How do we stay **cutting edge** with our **training technologies** in an era of such *rapid change*?

*Artificial Intelligence*

*Internet of Things*

*Edge Computing*

*Virtual Reality*

*Big Data*

*Augmented Reality*

*Cloud Computing*

*Virtual Humans*

*Intelligent Tutoring*

Opportunity favors the prepared.



# How can we prepare?

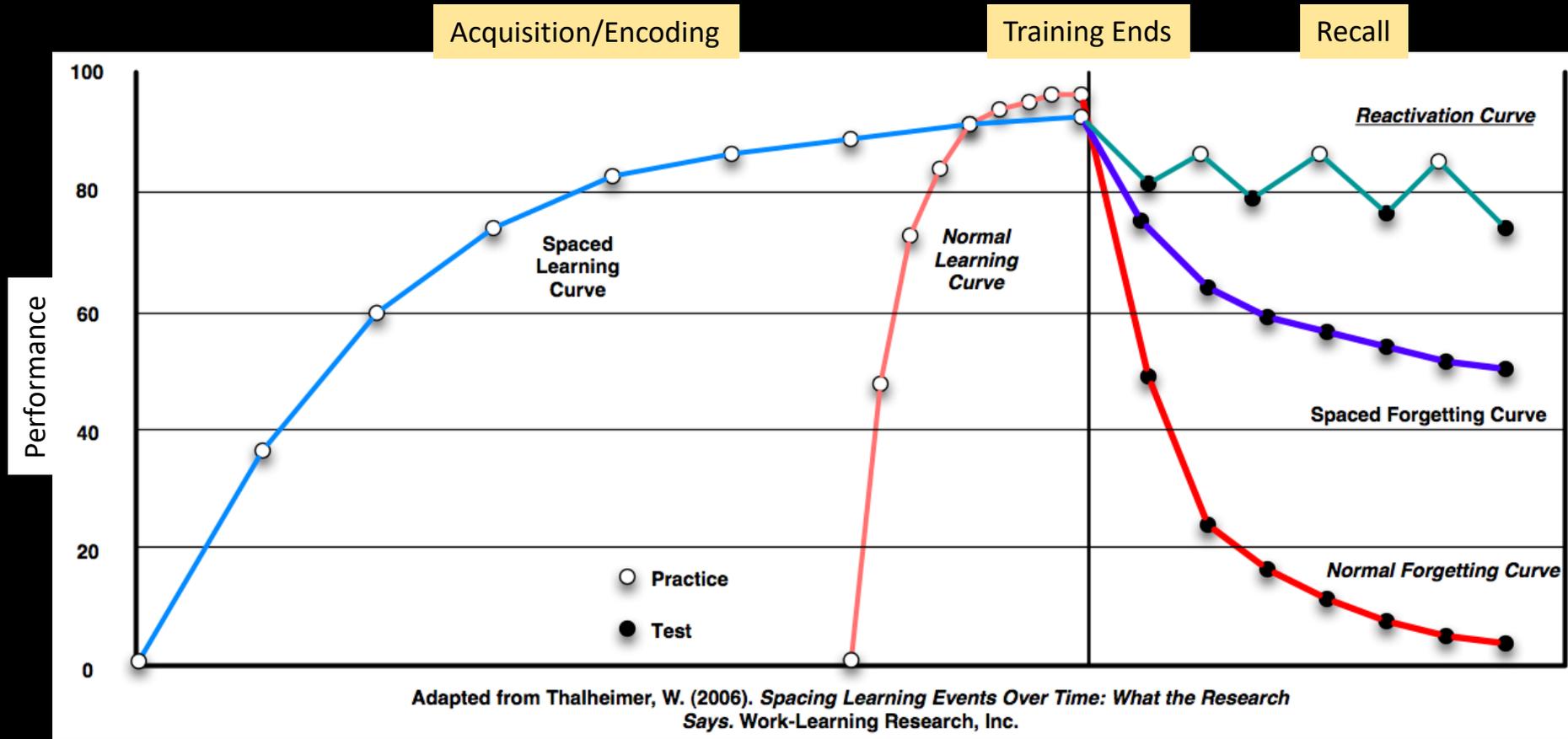
- What kinds of technologies could accelerate learning?
- How could technology accelerate learning?
- How do people learn?

# How can we prepare?

- What kinds of technologies could accelerate learning?
- How could technology accelerate learning?
- How do people learn?



# Spaced vs Compressed Learning



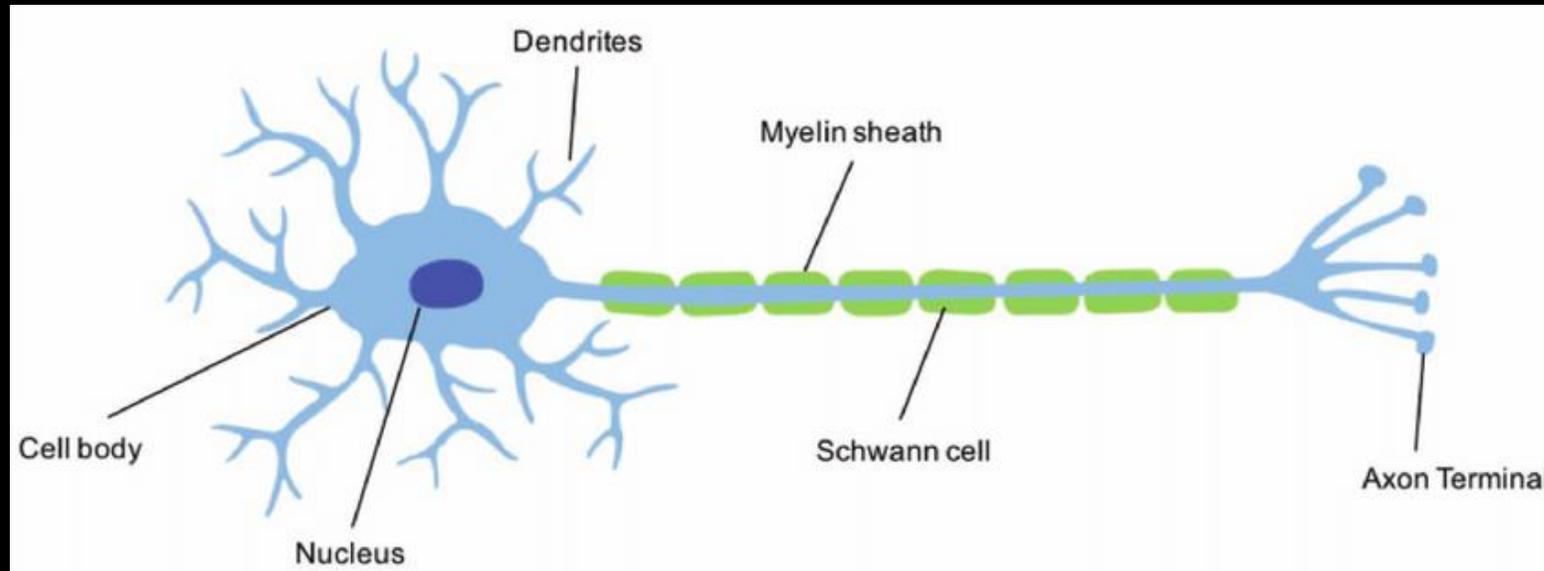
Hermann Ebbinghaus (ca. 1880)

# What are Neuronal Changes that Underlie Learning?

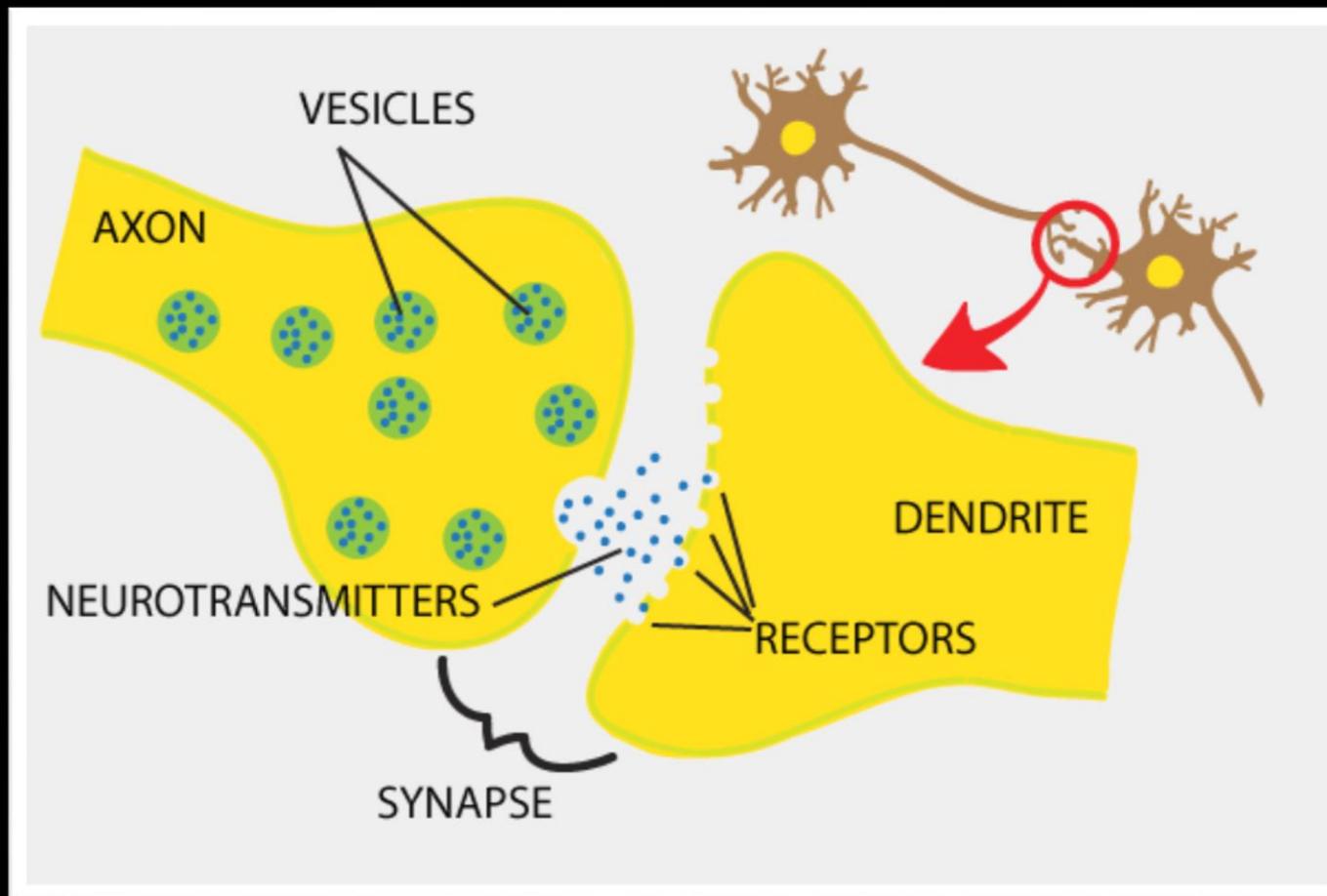
Immediate Changes – temporary, functional

Long-Term Changes – durable, structural

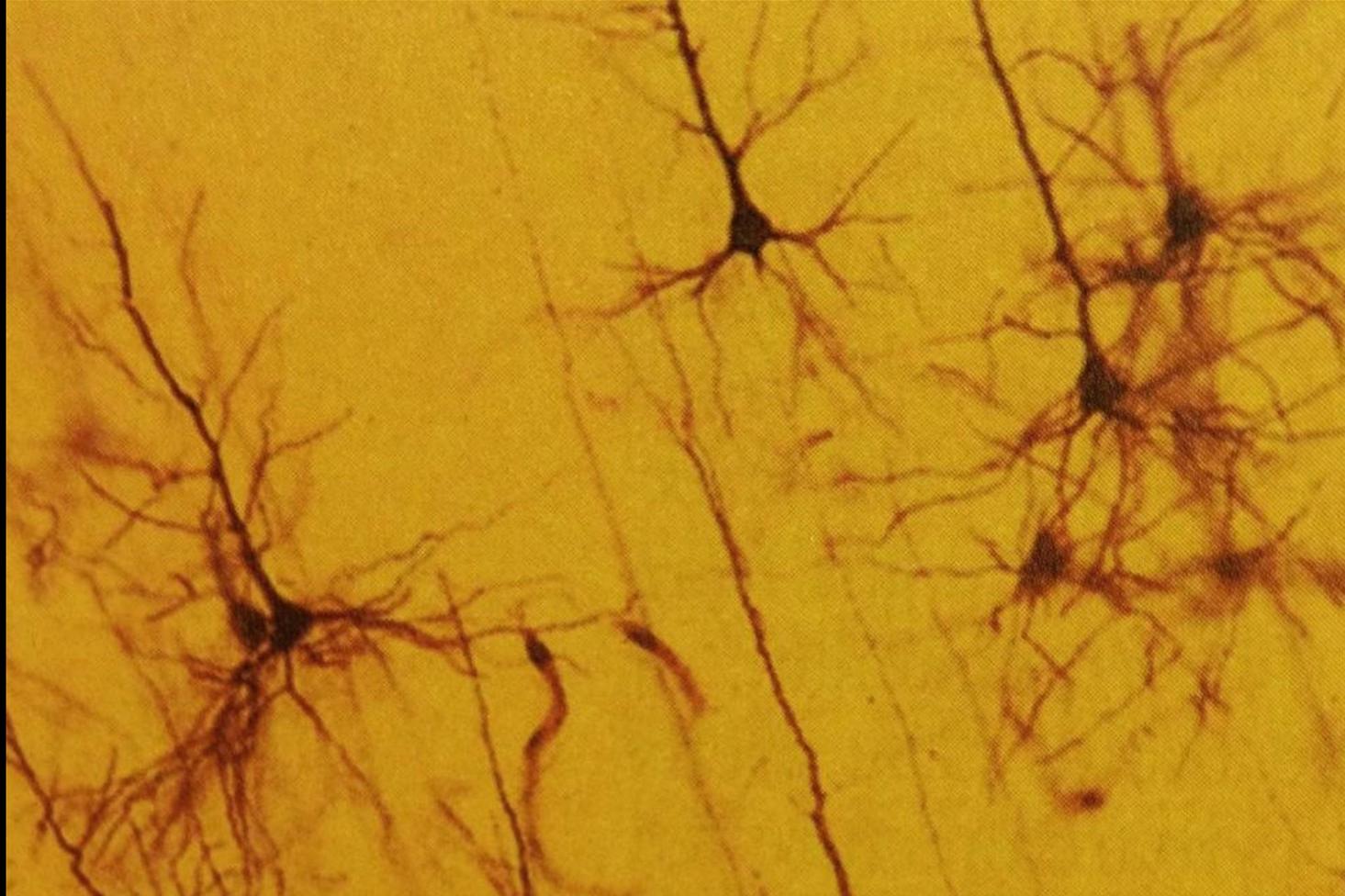
# Neuron Structure



# Synaptic Structure



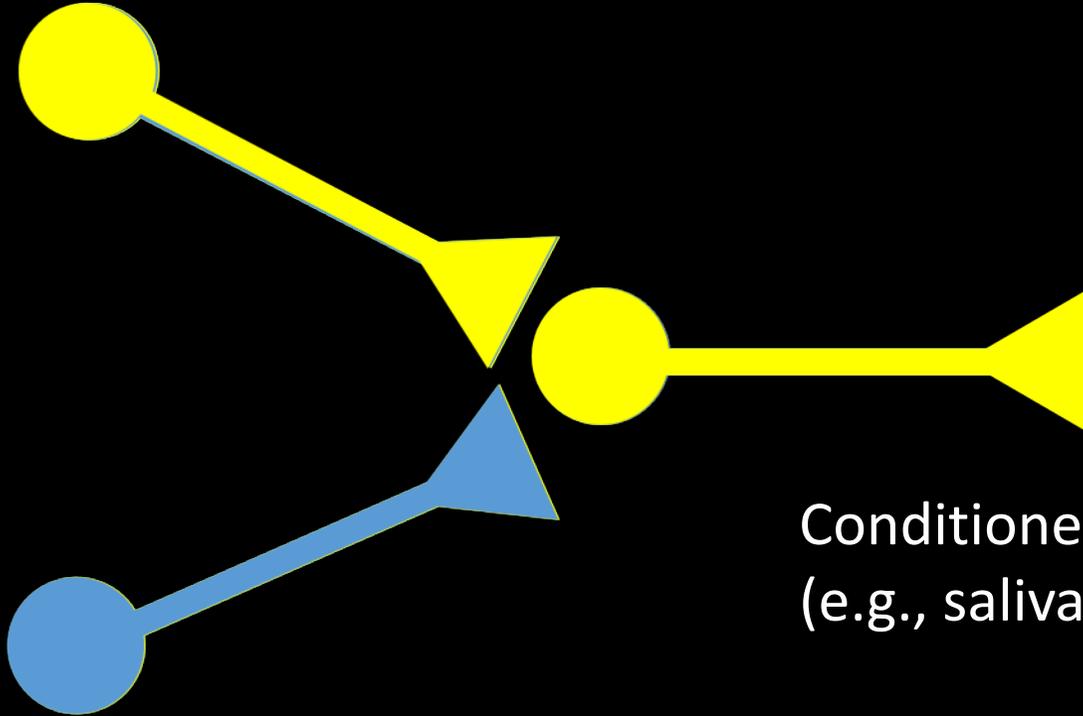
# Neuron Structure



Golgi Stain of cortical pyramidal cells

# Hebb Circuit

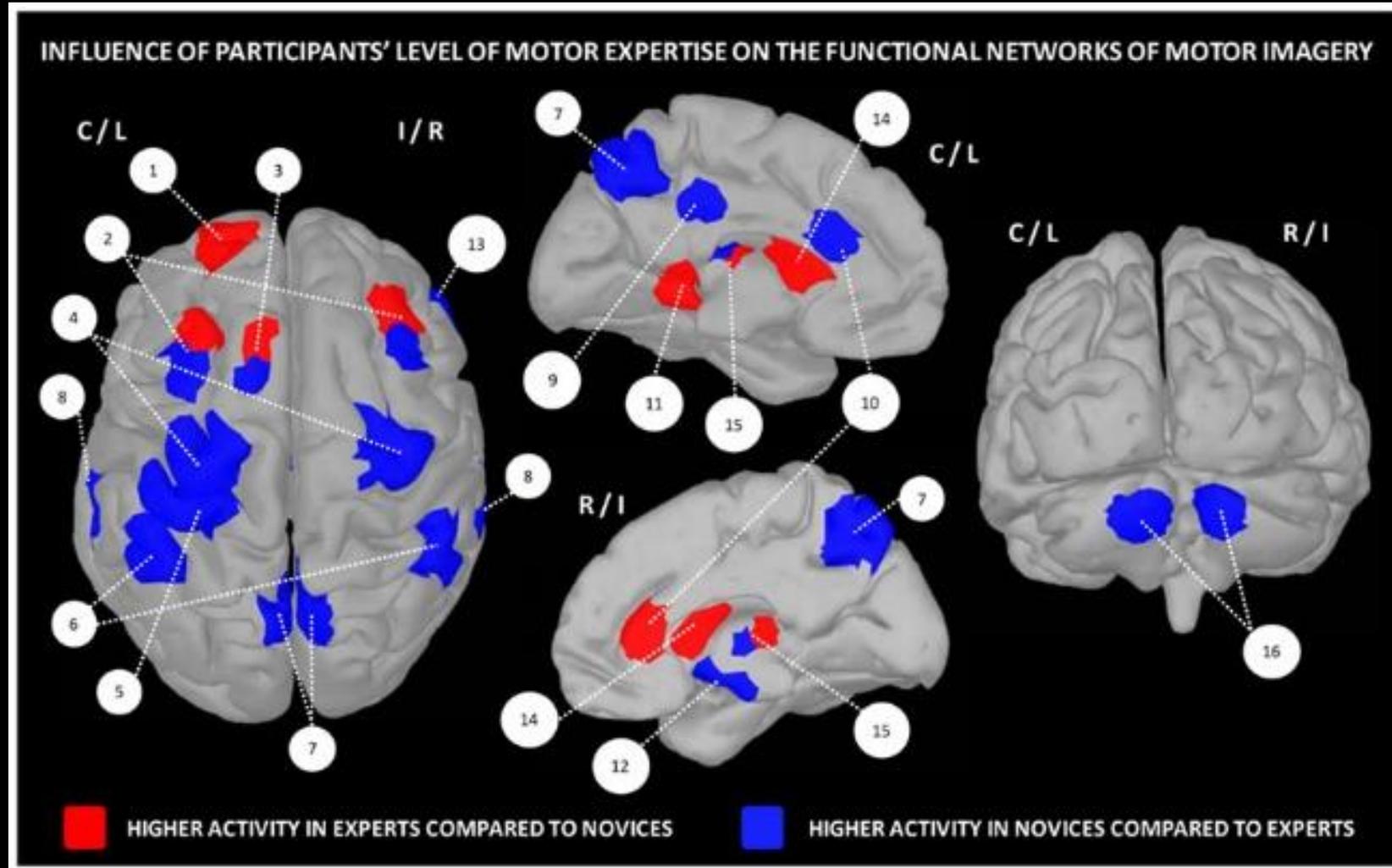
Conditioned Stimulus  
(e.g., bell)



Conditioned Response  
(e.g., salivation)

Unconditioned Stimulus  
(e.g., food powder)

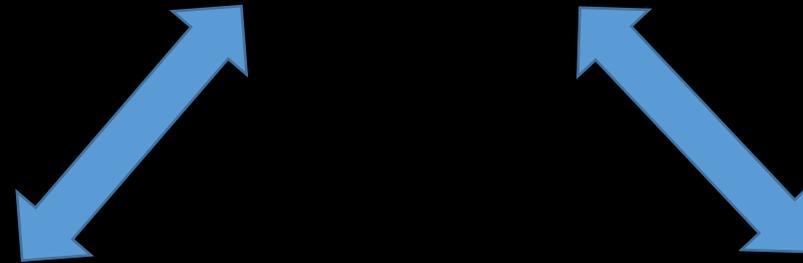
# The Expert Brain is More Efficient



# Learning Trade Space

## Time

- Initial training duration
- Retraining duration



## Cost

- Facilities
- Personnel
- Devices



## Performance (Readiness)

- Skill Level
- Decay Resistance

# How Could Technology Accelerate Learning?

- Eliminate the need for learning
  - Automation/AI
- Facilitate Acquisition
  - Intelligent training systems
- Facilitate Recall
  - Provide cueing, prompting
- Support training process:
  - Tools to automate planning, preparation, execution and assessment
- WHAT ARE THE RISKS/TRADEFOFFS?

# 1. Eliminate or reduce the need for training

Automation – make complex tasks simpler



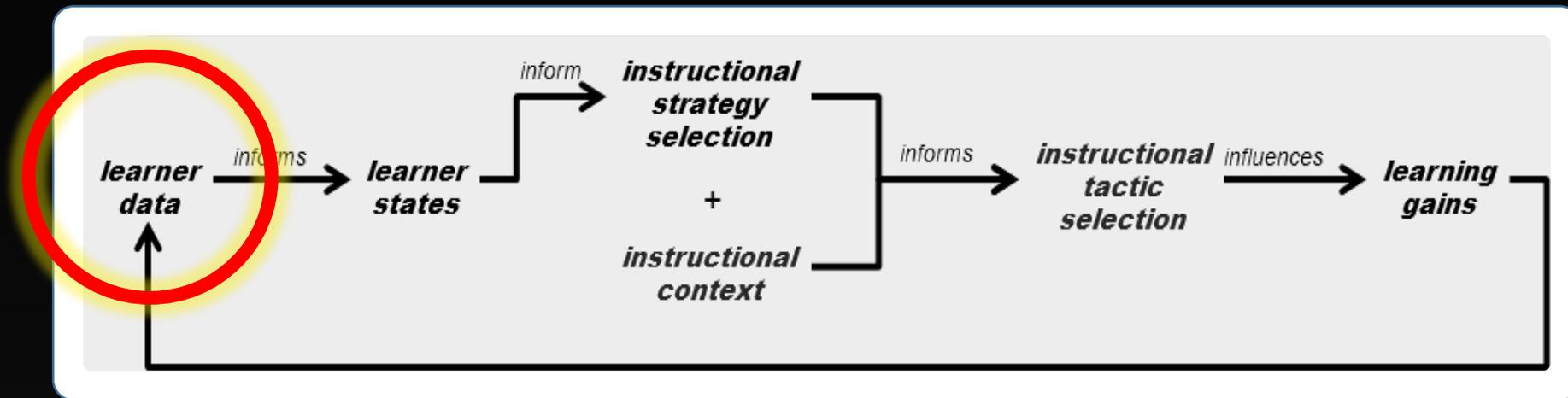
MARKSMANSHIP  
SMART RIFLE



AUTONOMOUS  
VEHICLES

## 2. Facilitate Acquisition

Intelligent Tutoring – Adapt training to the needs of the individual or unit



Big Data Analytics  
Machine Learning

# 3. Facilitate Acquisition and Recall

## Augmented Reality: Cueing, Prompting procedures

### Maintenance/Repair



### Medical



### Operations

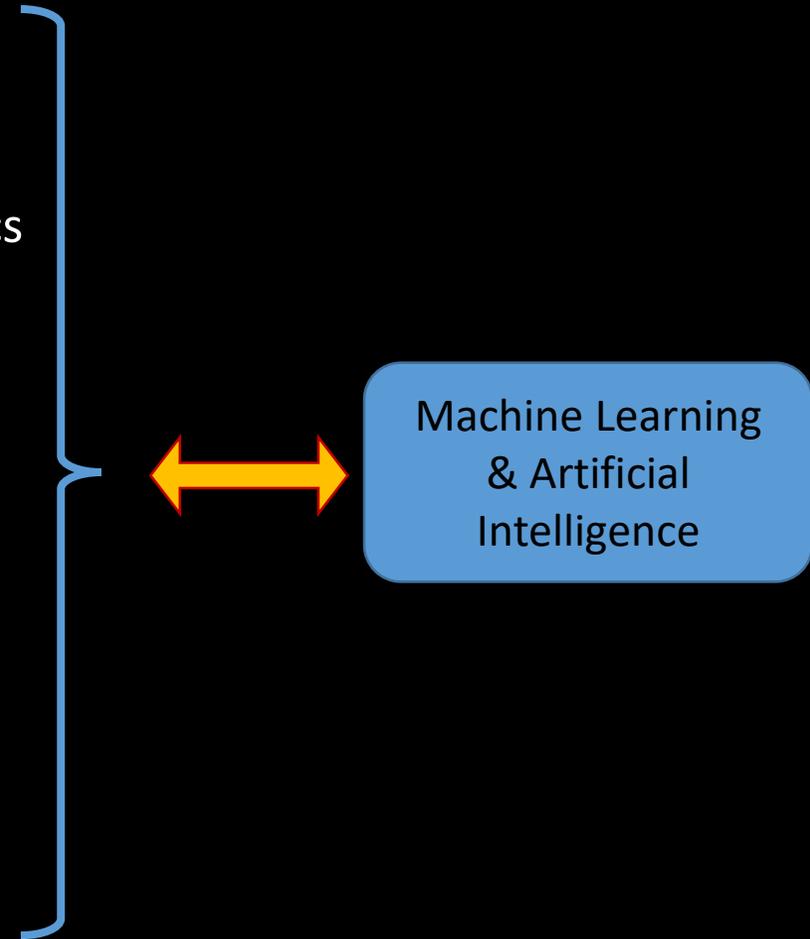
### Mission Planning



# 4. Support Training Enterprise

Automation, Automation, Automation...

- Plan
  - Identify training needs
  - Create training scenarios
  - Identify and create performance metrics
- Prepare
  - Scheduling of resources
  - Validation of scenarios and metrics
- Execute
  - Monitoring of performance
  - Adaptation of scenarios/scripts
- Assess
  - Training status by unit and objective
  - Recommend follow on training



# Risk/Benefit Tradeoffs

- Automation
  - Reduced training cost/need vs. dependence on automation
- Facilitate Encoding
  - More efficient training vs. risk of easy access to individual training records
- Facilitate Recall
  - Reduced need for refresher training vs. dependence on AR/HUDs to provide cueing, prompting
- Support training process:
  - Reduced training overhead costs vs. trust in automated processes and pushing more responsibility to the unit to conduct its own training.

# Wrap Up

- How humans learn and develop expertise determines the kinds of outcomes we can expect when we try to accelerate learning
  - *Think Learning Trade Space*
- Four ways to accelerate learning with Technology:
  - Reduce need
  - Facilitate Acquisition
  - Facilitate Recall
  - Automate training support.
- Risks and Benefits are associated with all solutions