

# AI Reality Therapy

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Tom Austin  
VP and Gartner Fellow

Gartner, Inc

# I am *impressed* by

## 1. The science of AI

- A profusion of results from the big 12 vendors, 100's of graduate programs, 1000's of startups

## 2. AI economics (*IT is to AI as the Iron Age is to the Steel Age*)

- Eric Brynjolfsson on AI, **General Purpose Technology** & Solow's Productivity Paradox
- Carlotta Perez on Technological Revolutions and Financial Capital (2002)
- Geoffrey Moore's *Crossing the Chasm* and Jackie Fenn's *Hype Cycle*
- Andrew Ng's call for **more applications**

## 3. The business of innovation

- Incubators and capital
- The creativity and **shameless audacity** of marketing executives the world over

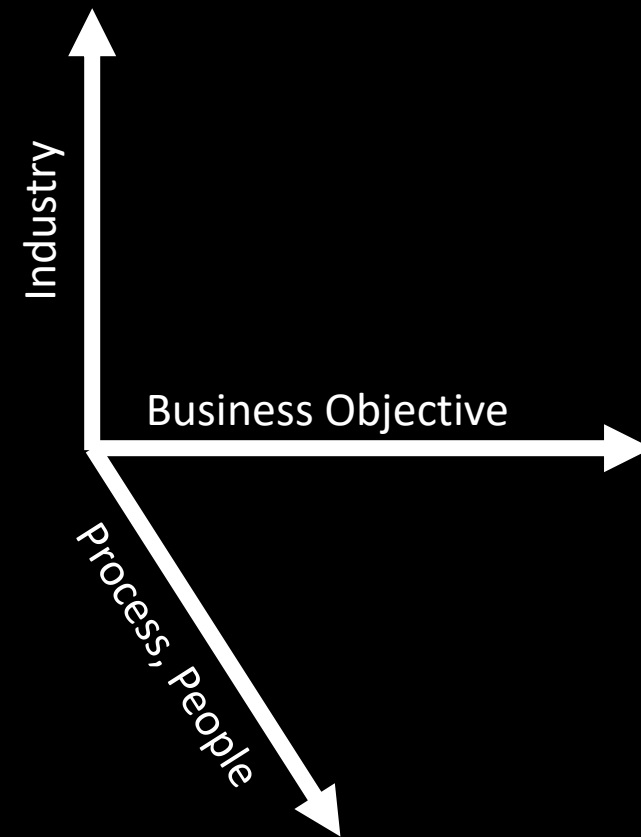
## 4. People

- The growing ranks of analysts diving into the AI pool
- Everyone here in the audience today...

# Phenomenal Science Progress – The Explosion of DNNs

Outputs	5. Video		Video Synthesis			Video Filtering Video Enhancement
	4. Image		Image Search Synthetic animation Image Synthesis		Visual Search Image Filtering Super Resolution	
	3. Audio		Speech Synthesis	Real-Time Translation Speech Imitation	Visual Q&A	
	2. Text	Natural-Language Generation Chatbots Speak	Text Creation Machine Translation Proofreading	Speech Recognition	Image Captioning Optical Character Recognition Intelligent Character Recognition	Lip Reading
	1. Tabular/ Structured	Classical Data Science Business Analytics	Document Classification Text Analytics Information Extraction	Speech User-Interfaces Audio Identification Music Recognition	Object Identification Image Analysis Face Recognition	Video Segmentation Scene Classification
		A. Tabular	B. Text	C. Audio	D. Image	E. Video
		Inputs				

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# Turbulence

*“[They] were sure that computers would not be able to drive cars ... concluded that driving would remain a human task for the foreseeable future.”*

Levy and Murnane, The New Division of Labor (2004) as cited by Brynjolfsson and McAfee (2014)

# Not Maturity

*Matthew  
20:16*

So the last shall be first, and the first last:  
for many be called, but few chosen. (King James Bible.)

*Bob Dylan  
The Times They Are A-Changin'*

And the first one now  
Will later be last  
For the times they are a-changin'.

# The future isn't here now, not yet

- Five or more generations of AI-enriched applications to see the future. Don't wait.
- Follow Fast. There are a lot of powerful 'tactical victories' to seek.
- Buy. Too much focus on *build* today, too much angst over skill shortages.

# Long Term Economic View

*“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”*

(Roy Amara, Institute for the Future)

## General Purpose Technologies

Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages. (Perez, 2002)

# The Steam Age – A General Purpose Technology

(Late 18<sup>th</sup> Century Onward)





# General Purpose Technologies

## Characteristics

- Single, recognizable generic technology
- Much initial room for improvement
- Extremely long phases and many generations
- Eventually widely used in many different uses, **spawning complementary innovations, many spillover effects**

## Slow start to benefits (a la Roy Amara and Robert Solow)

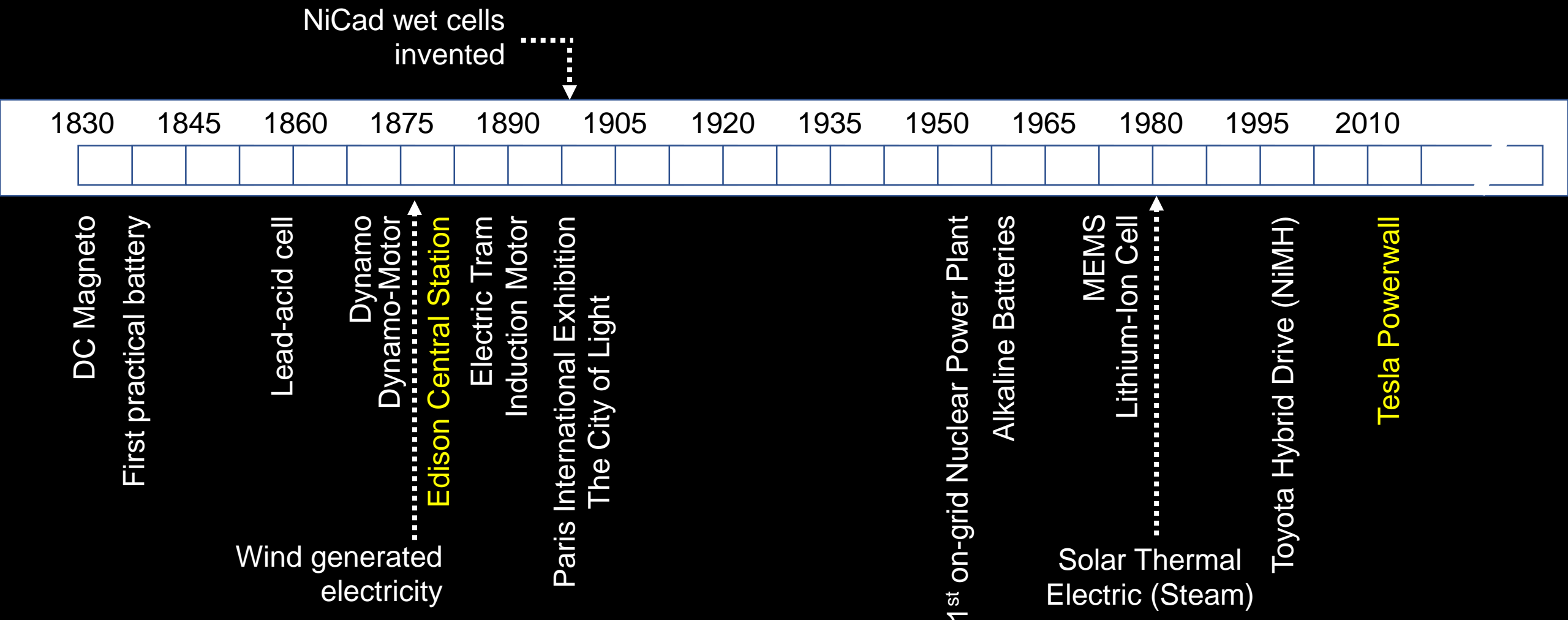
- Institutional resistance
- Requires infrastructure and ecosystem investment (time and money)
- Obsoletes old technologies and skills
- Raises learning costs
- Social dislocation, disruption

# General Purpose Technologies

GPT	Spillover effects	Date
Iron Steamship	Global agricultural trade, International tourism, Dreadnoughts	Mid 19th Century
Internal Combustion	Automobile, Airplane, Oil industry, Mobile warfare	Late 19th Century
<b>Electricity</b>	Centralized generation, Factory electrification, Telegraphic comms	Late 19th Century
Automobile	Suburbs, Commuting, Shopping centers, Long-distance tourism	20th Century
Airplane	International tourism and sports leagues, Mobile warfare	20th Century
Mass Production	Consumerism, Growth of US economy	20th Century
<b>Computer</b>	Digital Revolution	20th Century
Lean Production	Growth of Japanese economy	20th Century
Internet	Electronic business, Crowdsourcing, Social networking, Info warfare	20th Century
Biotechnology	Genetically modified food, Bioengineering, Gene therapy	20th Century
Business Virtualization	Paperless office, Telecommuting, Software agents	21st Century
Nano-technology	Nanomaterials, Nanomedicine, Quantum dot solar cell, Targeted cancer therapy	21st Century
<b>Artificial Intelligence</b>	Autonomous car, Inventory robot, Industrial robot	21st Century

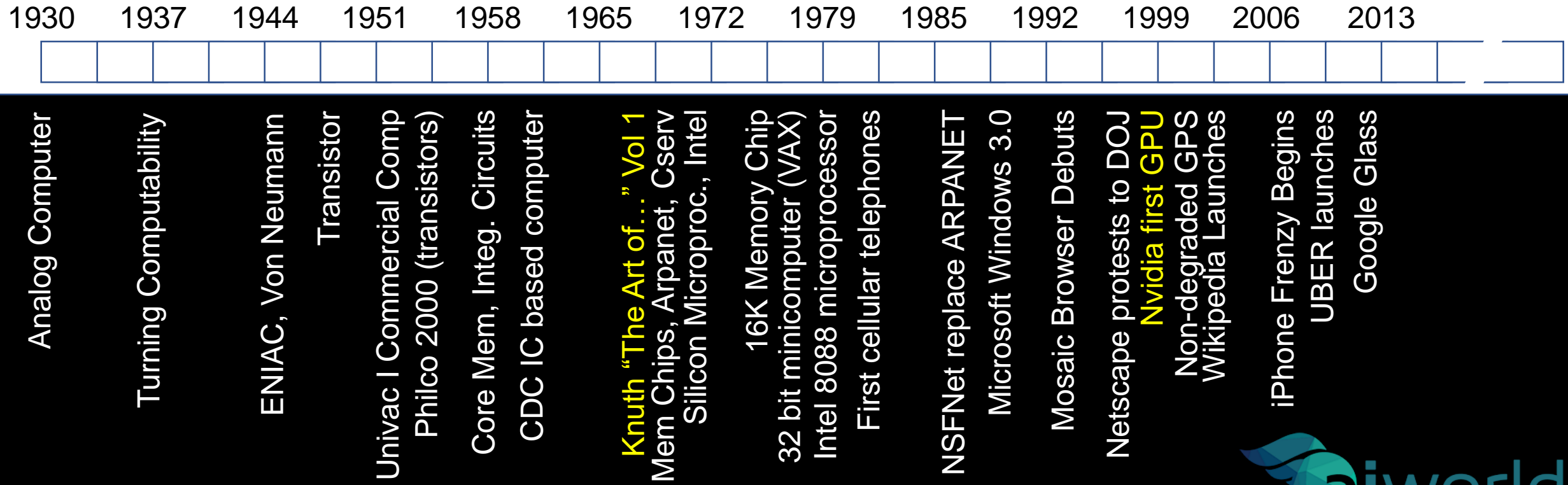
# General Purpose Technologies

Electricity (generation, storage, consumption, applications...)

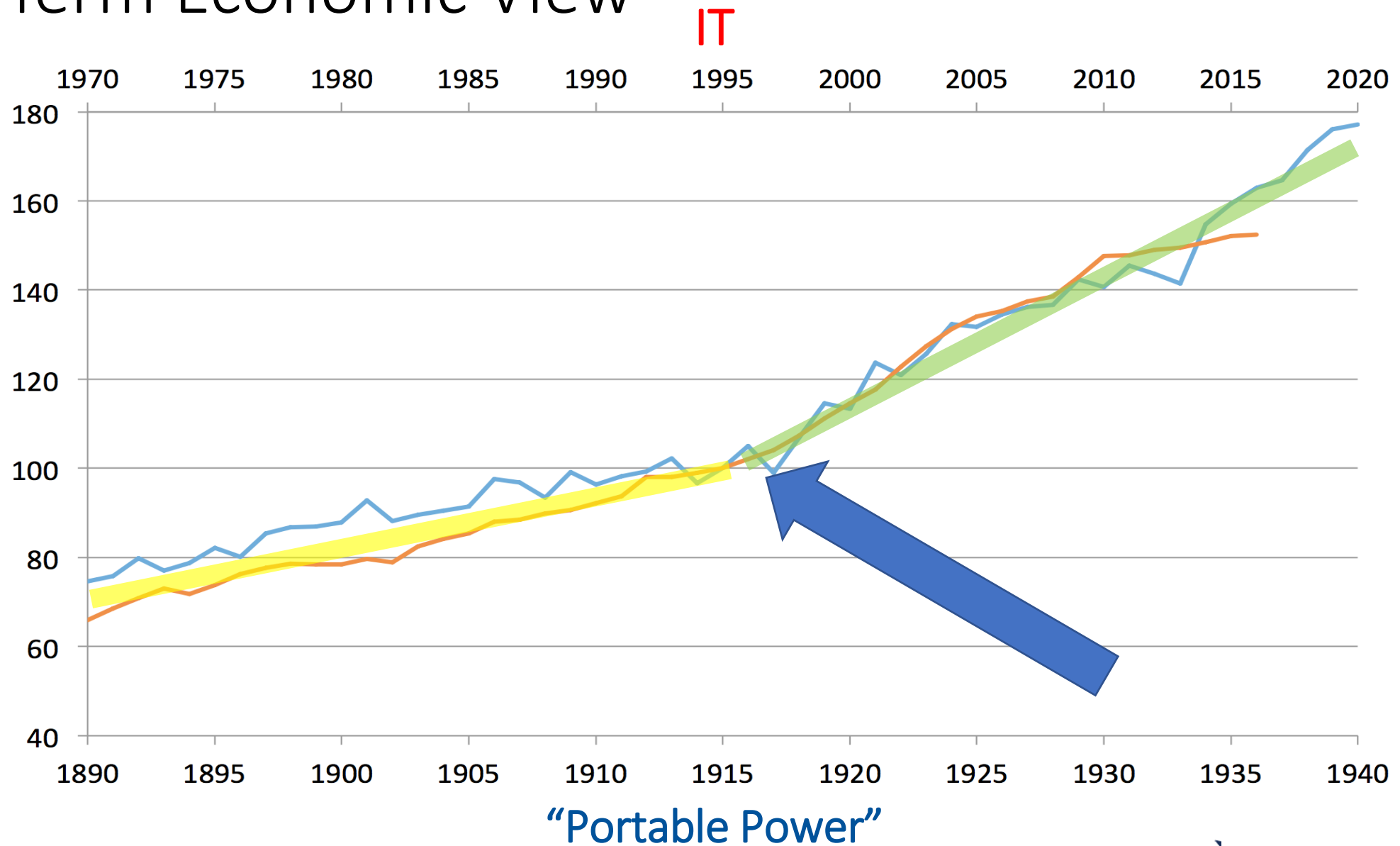


# General Purpose Technologies

# Computers (ICT)



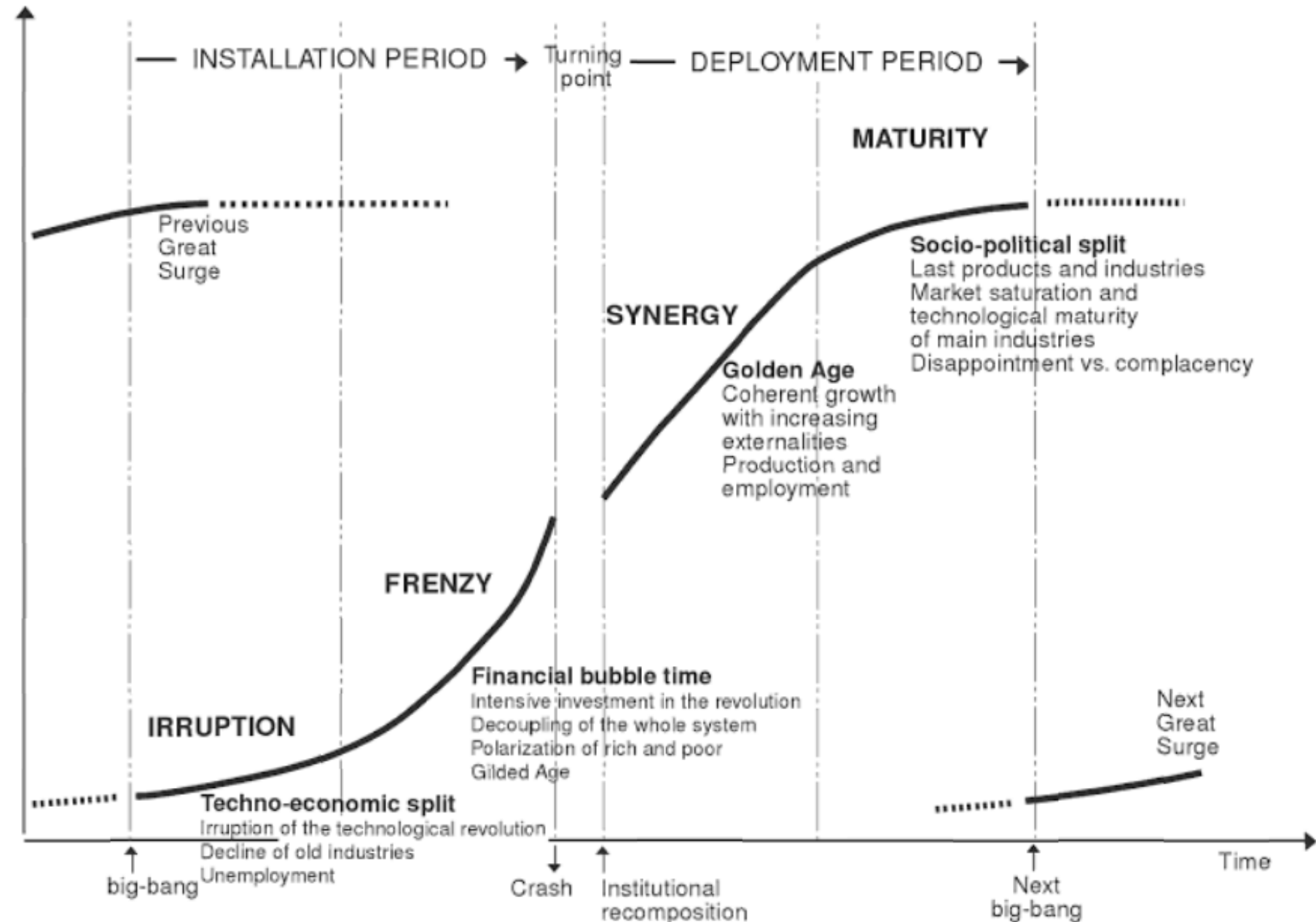
# Long Term Economic View



# Carlotta Perez

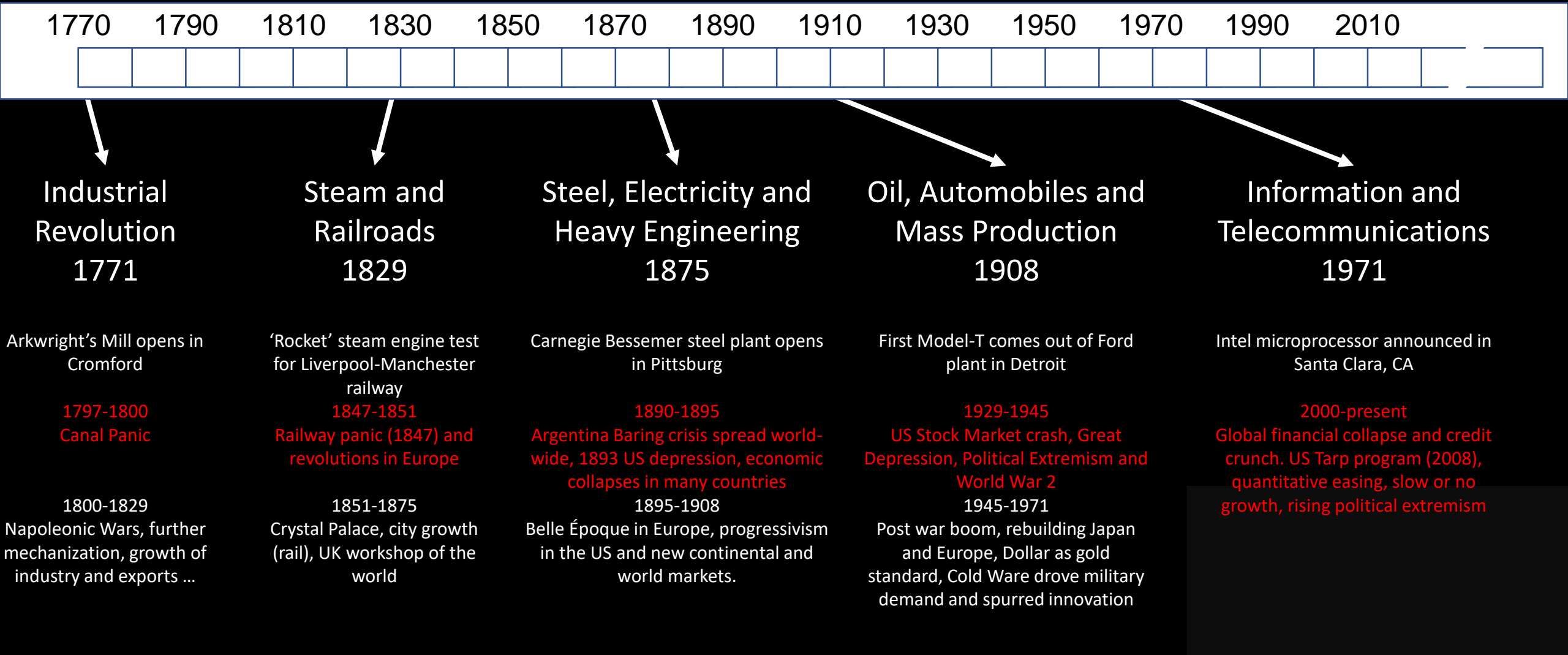
(Technological  
Revolutions and Financial  
Capital: The Dynamics of  
Bubbles and Golden  
Ages, 2002)

*Recurring phases of each great surge in the core countries*



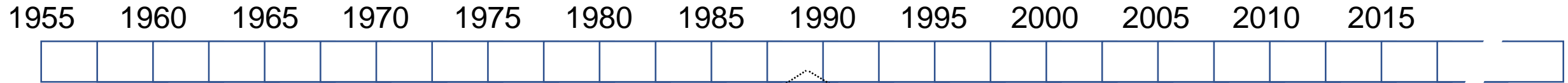
# Carlotta Perez: Five Technology Revolutions

- Aggregated General Purpose Technologies



# General Purpose Technologies

## Artificial Intelligence (ICT doing what we thought ICT couldn't do)



Dartmouth Research Project

Perceptrons

ARPA funds MIT, CMU, Stanf'd

Defunding of translation work

2001: A Space Odyssey  
Connectionism abandoned

Lighthill Report: AI Winter 1

Expert Systems

R1: 1<sup>st</sup> Commercial Expert Sys  
MITI 5<sup>th</sup> Generation Project

Backprop popularize & reinvented

Collapse of LISP Market  
Q-Learning (Reinforcement)  
Birth of Modern Robotics

D LSTM and modern RNNs born  
Deep Blue II beats Kasparov  
Intelligent agent paradigm

iRobot's Roomba Debut

DARPA Grand Challenge  
Boston Dynamics BigDog

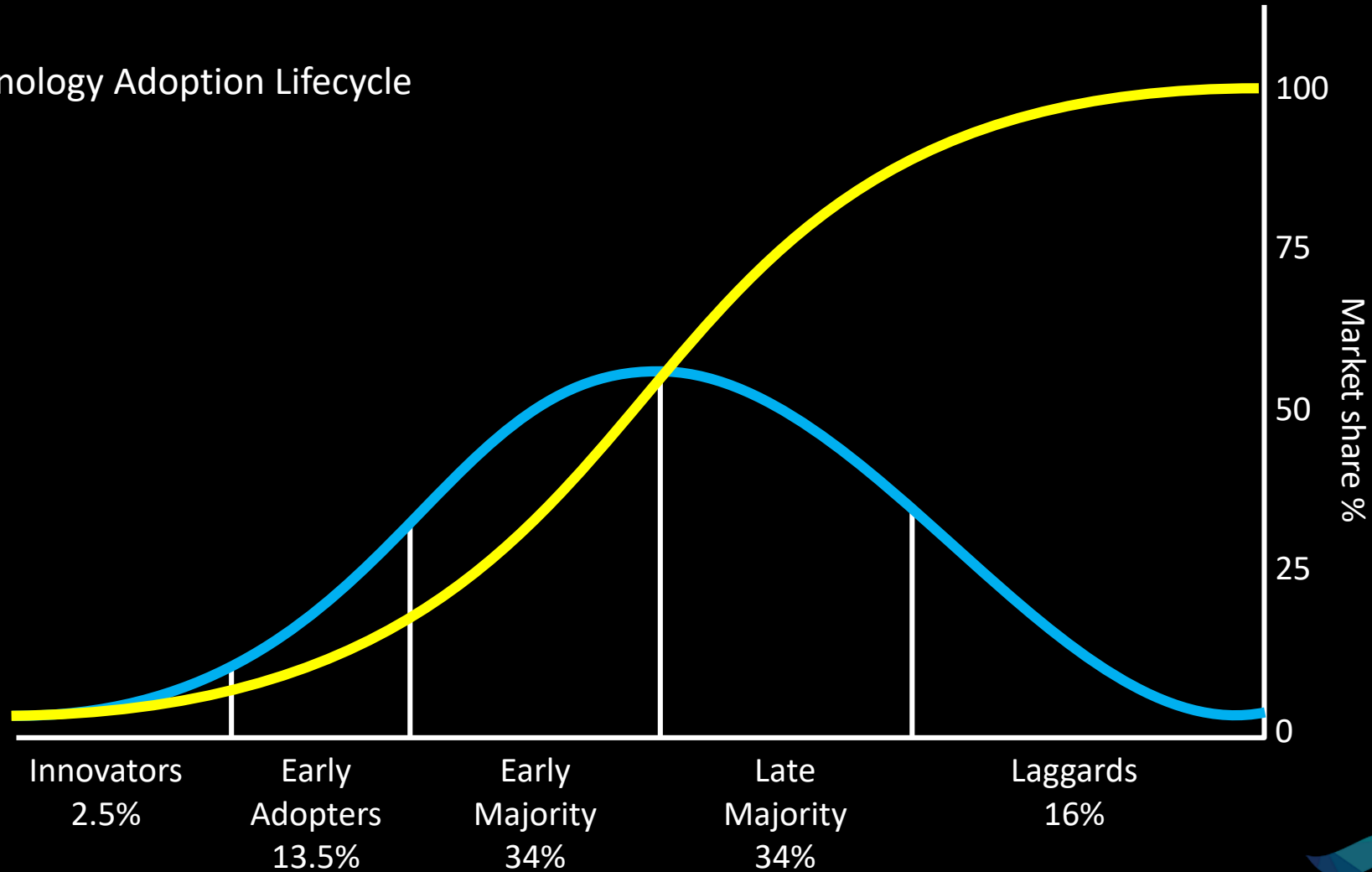
GOOG Speech->Txt on iPhone

Watson on Jeopardy  
Kreshevski and ImageNet  
End-to-end speech recognition

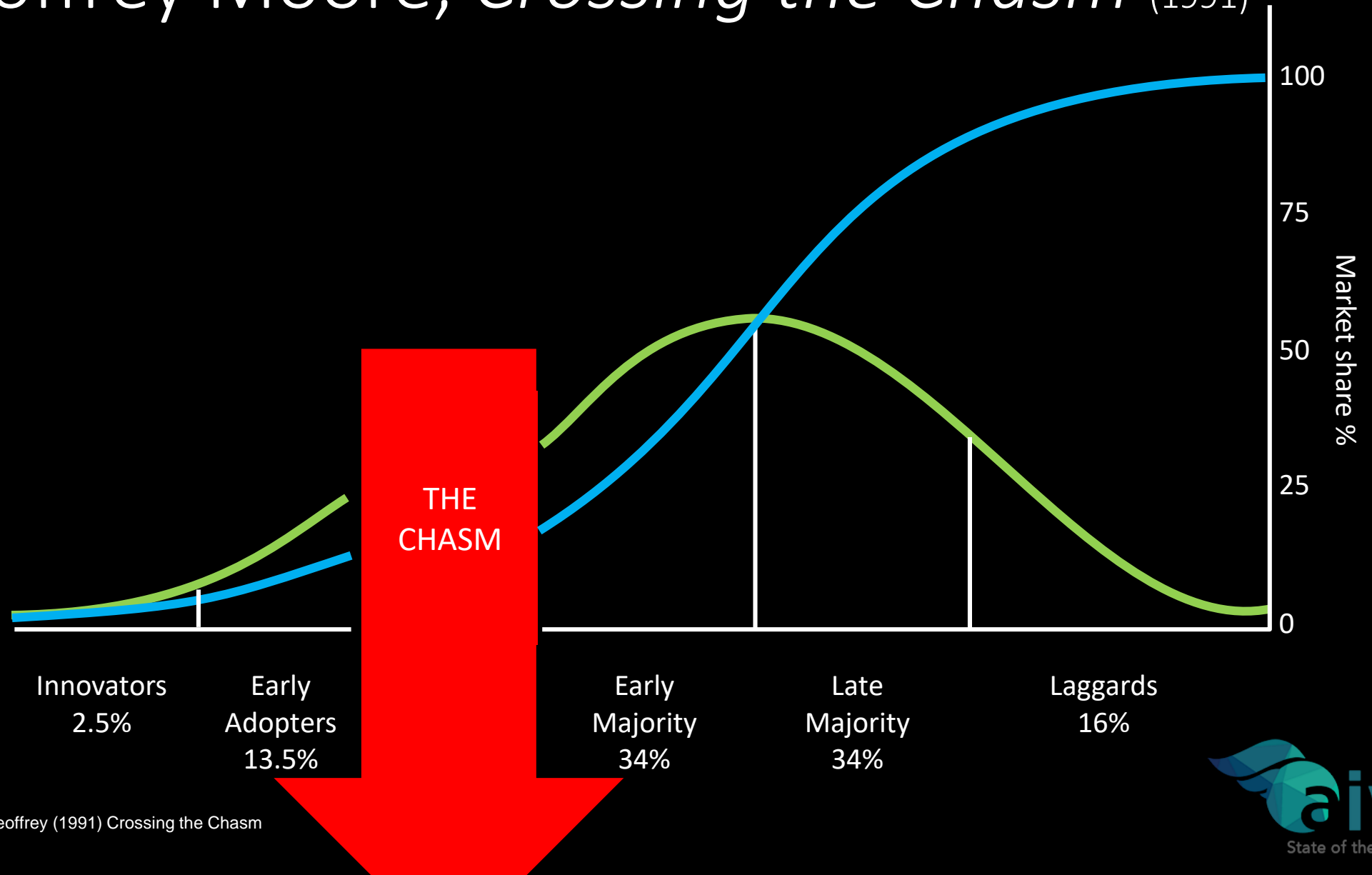


# Rogers, *Diffusion of Innovations* (1962)

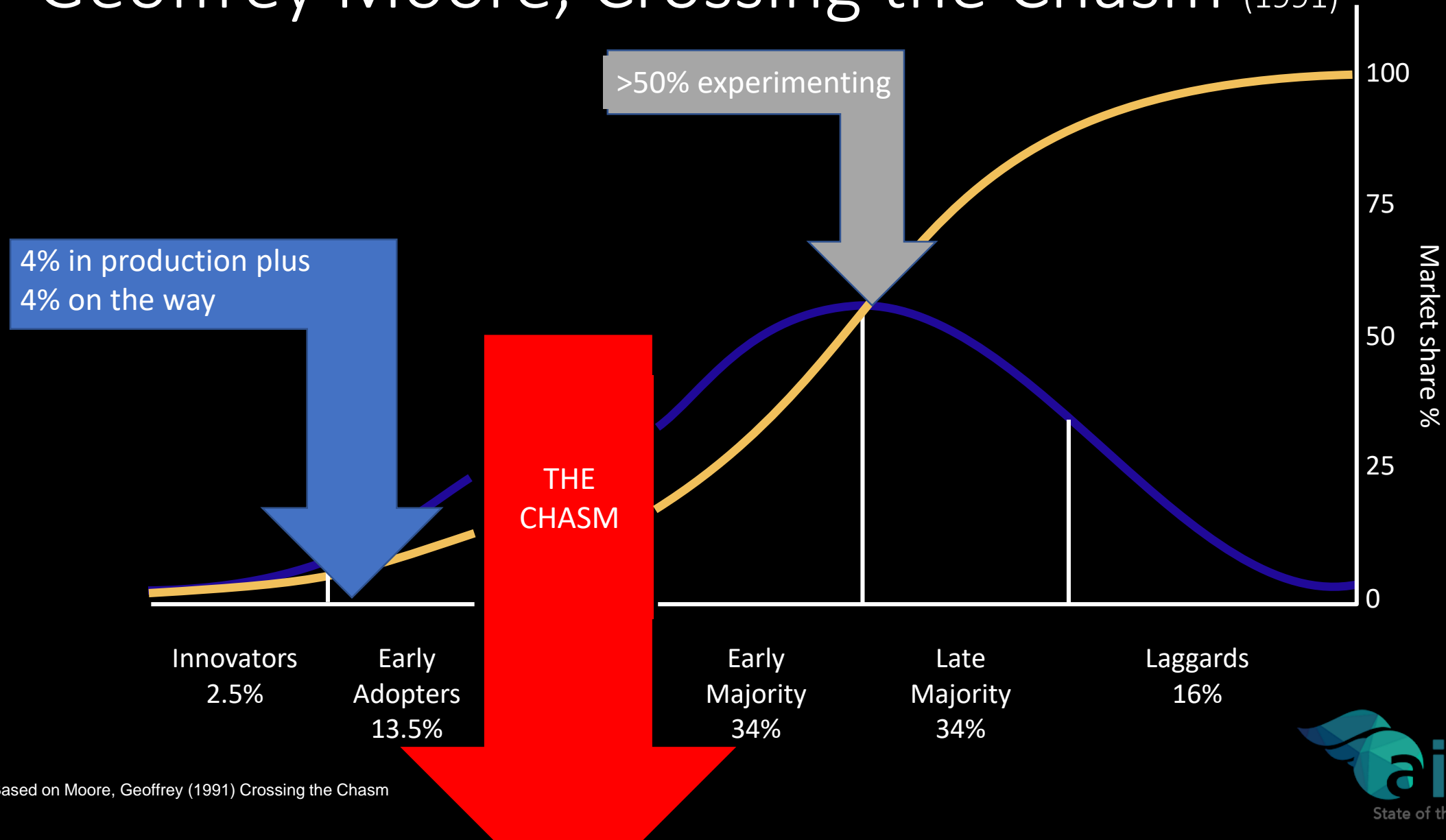
Technology Adoption Lifecycle



# Geoffrey Moore, *Crossing the Chasm* (1991)



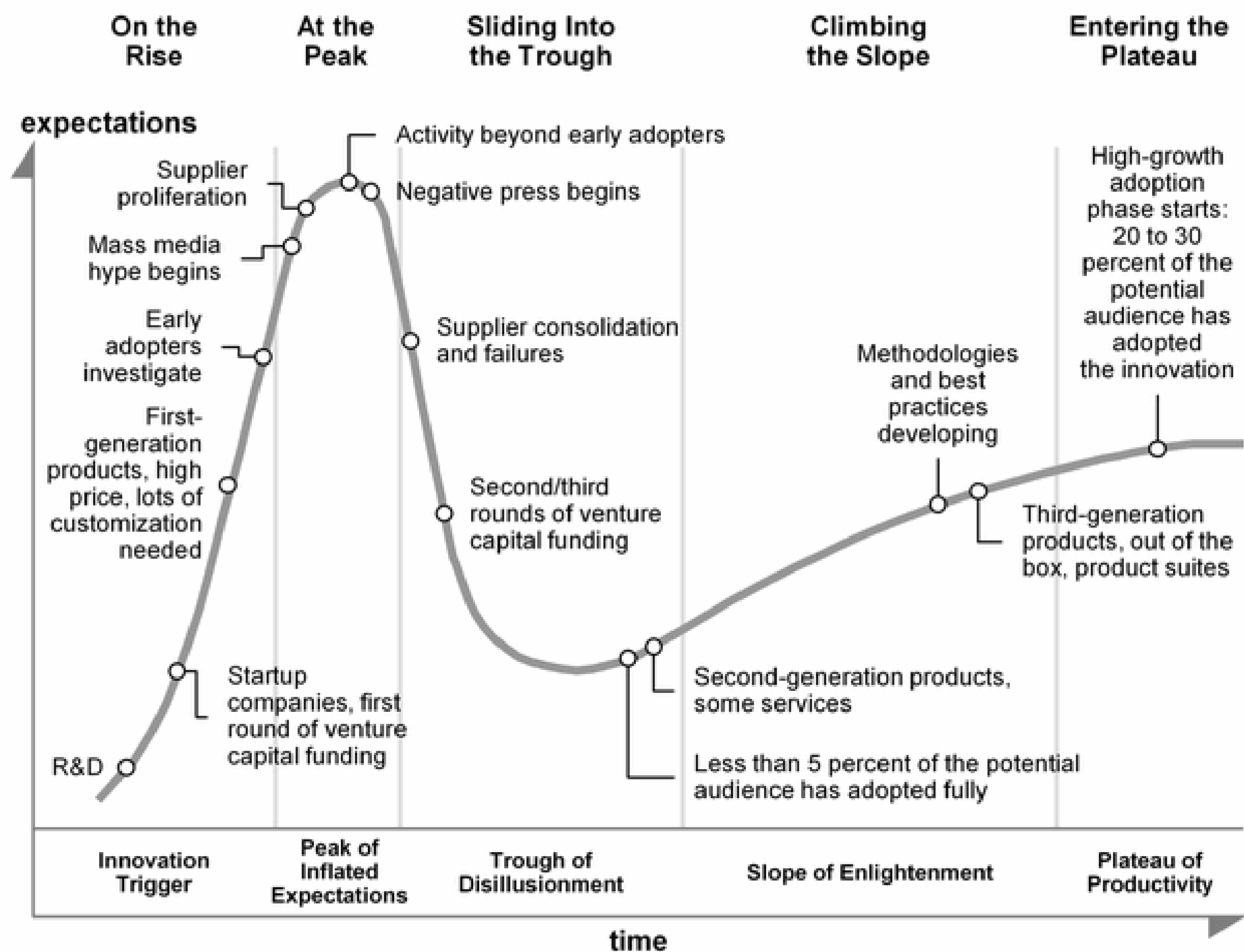
# Geoffrey Moore, Crossing the Chasm (1991)



# The Gartner Hype Cycle

(1995)

- Depicts innovation and technology patterns
- Tracks maturity and potential
- Covers more than 90 topical areas



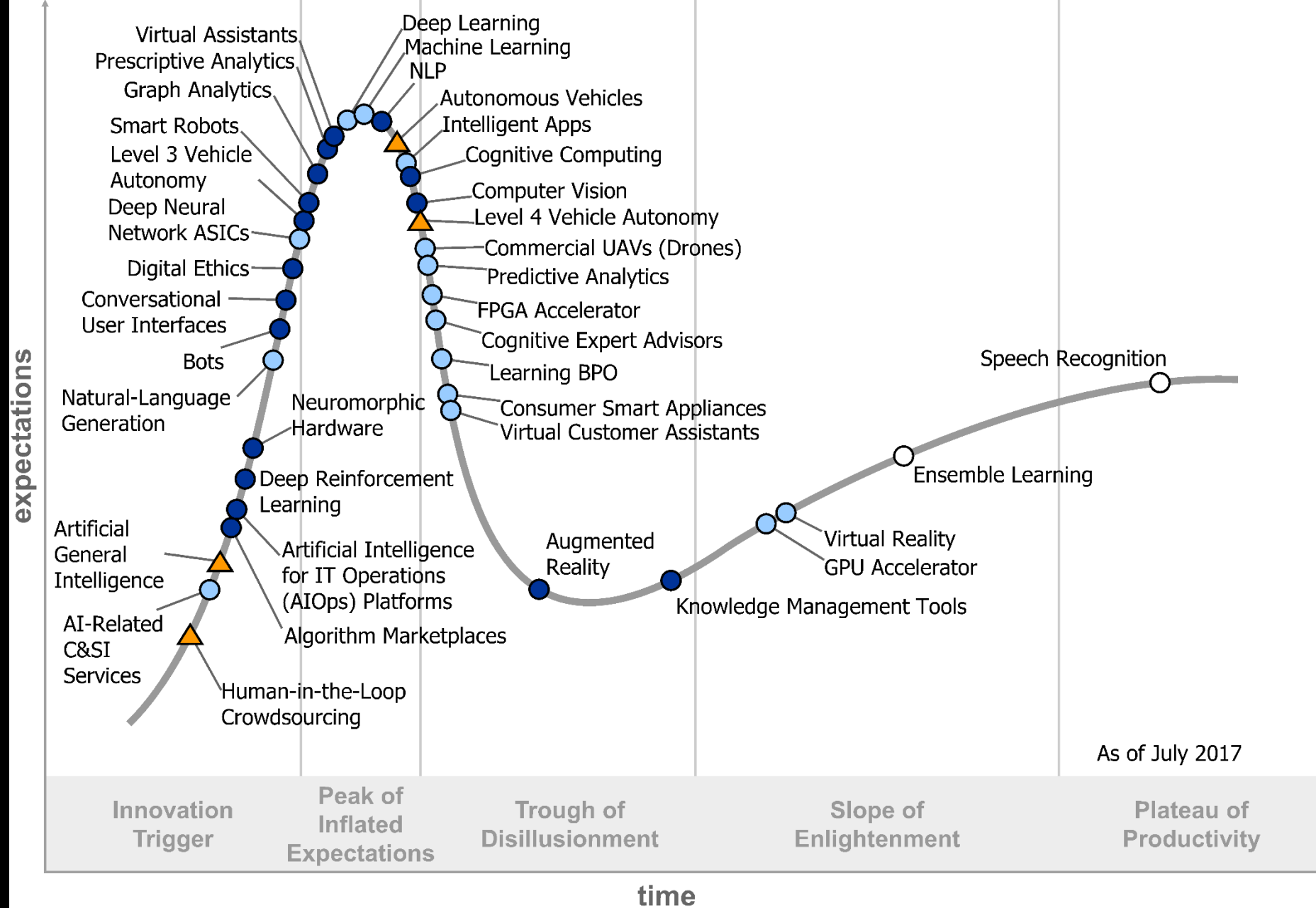
# The Gartner AI Hype Cycle

Very early maturity levels

- **86%** of tech profiles (dots) headed to the bottom of **Trough of Disillusionment**
- **54%** not expected to plateau and deliver reliable productivity for mainstream buyers until 2022 or later

Huge Potential

- **41%** offer transformational benefits
- **44%** offer high benefits



Plateau will be reached:

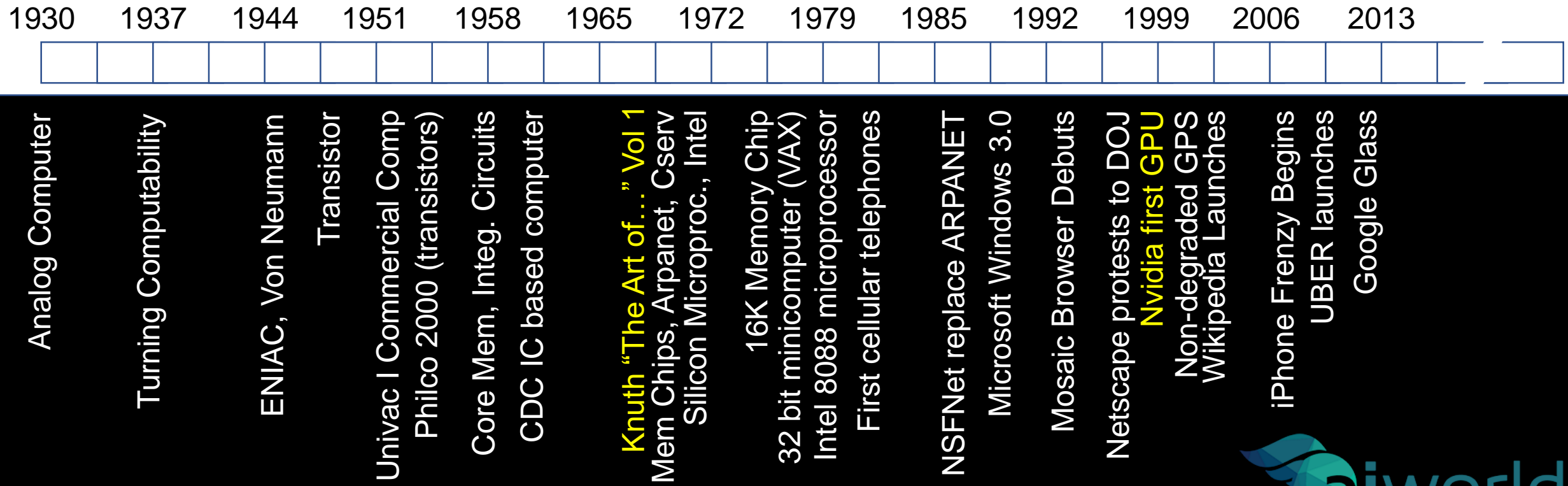
- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ✗ obsolete before plateau

# Selected Takeaways

- This is the beginning of the new age of AI which will continue to evolve, transform and expand its penetration of everything we do for the next 50+ years.
- The chasm has **not** been crossed:
  - Only **4% of enterprises<sup>1</sup>** are fully invested in production applications that exploit AI technology.
  - Eighty-six percent of AI technology profiles in the Gartner AI Hype Cycle heading to the bottom of the trough of disillusionment.

# Metaphorically, Where is AI Today?

## Relative to Computers (ICT)









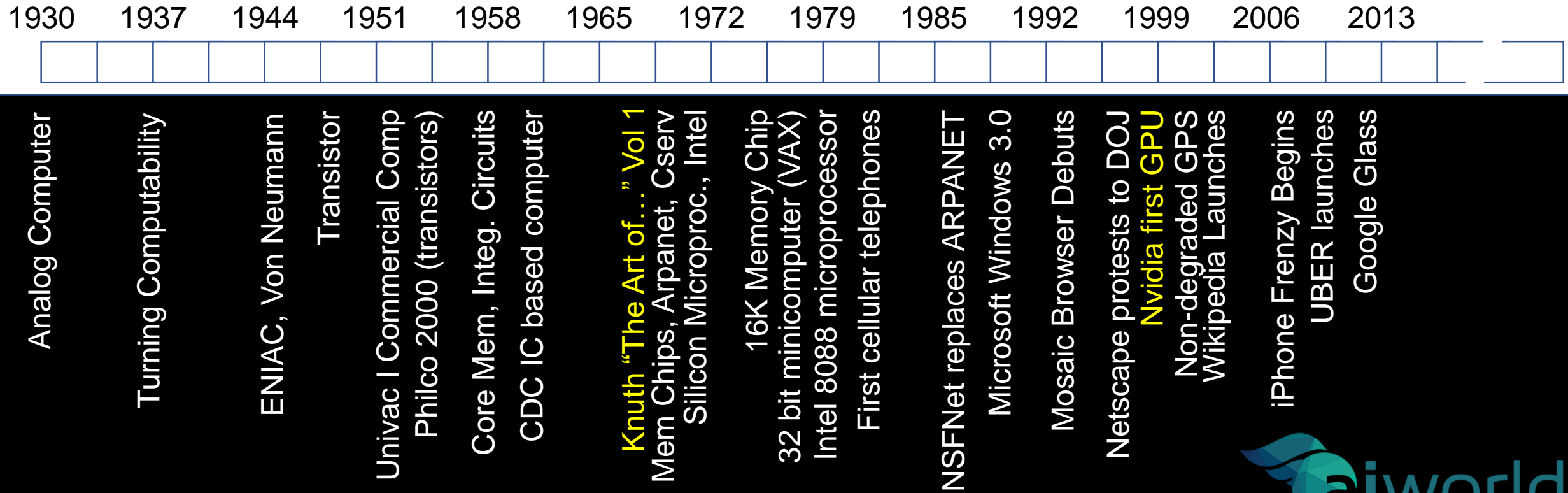
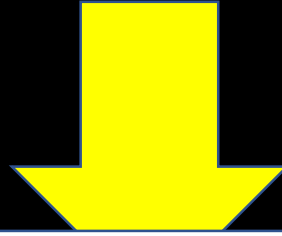
# The Year the Modern Hula hoop was invented...



By BeenAroundAWhile at en.wikipedia, CC BY-SA 3.0,  
<https://commons.wikimedia.org/w/index.php?curid=47396916>

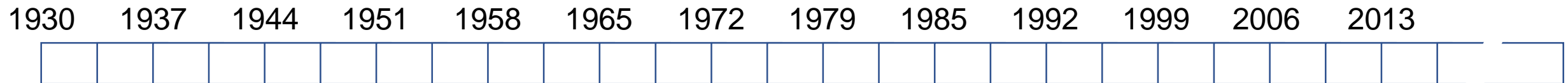
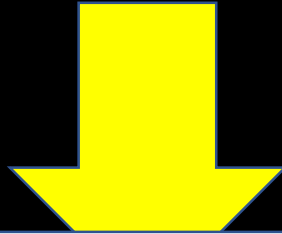
# Metaphorically, Where is AI Today?

Relative to Computers (ICT)



# Metaphorically, Where is AI Today?

## Relative to Computers (ICT)



# Why 1958?

- Write your own sort routines
- Lack of standards
- Dearth of off-the-shelf applications
- Bespoke solutions
- Few engineering cookbooks
- High risk – few if any safety systems

# Success

## Impediments

- Science: Many to-dos
- Ecosystems: Nascent
- Time: Evolution is a cumulative process
- Fixity: People, processes, policies, plans, commitments, customers and other constituencies
- Other Impediments: Existing capital investments and skills, knowledge unevenly distributed, myths are growing, conventional wisdom mistaken

## Opportunities

- Focus on CEO's business initiatives
- Short time to value
- Be a fast follower
- Demand products, not experiments
- Bias towards a larger number of small wins
- Protect your career by protecting senior executives from false expectations. There is no intelligence in AI.

# I am *impressed* by

1. The science
2. The economics
  - *IT is to AI as the Iron Age is to the Steel Age*
  - Brynjolfsson, Perez, Moore, Fenn and Ng
3. The business of innovation
4. People

Thank you!