Neuro-Inspired Computational Elements NICE 2019

March 26-29, 2019

Albany CNSE Campus

Albany, NY

IBM intel APPLIED MATERIALS make possible TEL TOKYO ELECTRON SUNY POLYTECHNIC INSTITUTE

Thanks to our host and sponsors

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- Mike Davies (Intel)
- Winfried Wilcke (IBM)
- Hemanth Jagannathan (IBM)
- Brad Aimone (Sandia National Labs)
- Steve Furber (Univ. of Manchester)
- Johannes Schemmel (Univ. of Heidelberg)
- Murat Okandan (NICE Workshop Found.)

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- Nicolas Breil (AMAT)
- Nathaniel Cady (SUNY Polytechnic Institute
- Cindy Goldberg (IBM)
- Hemanth Jagannathan (IBM)
- Gert Leusink (TEL)
- Melissa Renzi (SUNY Polytechnic Institute)
- Joshua Rubin (IBM)
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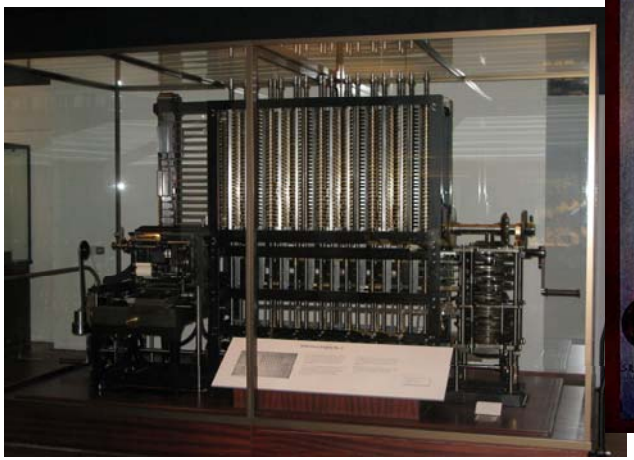
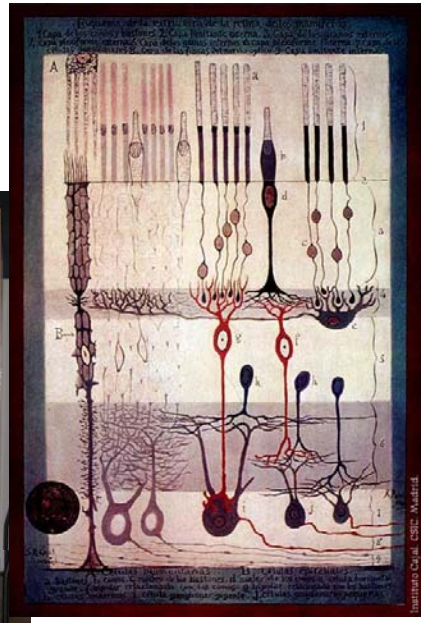
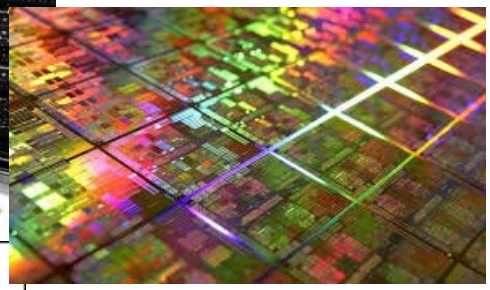
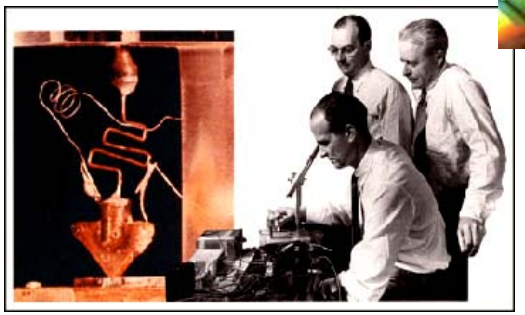
Convergence – long burn

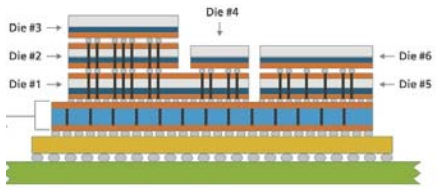
- Neuroscience
- Computational Theory/Algorithms
- Microelectronics
- Applications











Paradigm shift in computing
→ Beyond stored program architecture

Two Broad Application Areas

1. **Neuroscience and medicine** will benefit greatly from new tools, methods and insights provided by neuromorphic/neuro-inspired systems, algorithms and platforms

2. **Next generation data analysis, prediction and control systems** will be built using new computing approaches based on and developed with neuromorphic/neuro-inspired systems

Artificial Intelligence with -

1. **Software**
2. **Software + accelerators (GPU, TPU, AI hardware…)**
3. **New platforms (non-von Neumann/Turing)**

Where are we headed?

World Brain
H.G. Wells
(1936)

Catalogue all information (World Encyclopedia), use it to make optimum decisions

Electronic World Brain
Arthur C. Clarke
(1962)

Electronic World Encyclopedia
Two phases:

- World Library:
  cataloging (by 2000)
- World Brain:
  AI generates new information (by 2100)

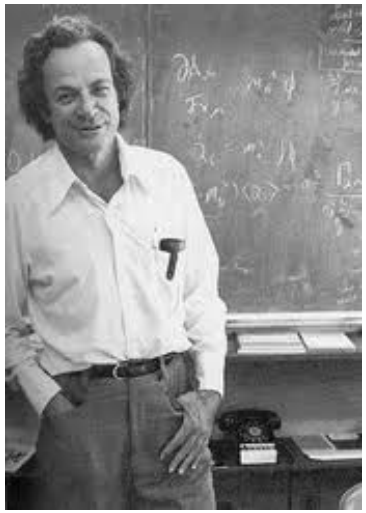
Human Strategy
Alex 'Sandy' Pentland
(2017)

Human AI:
Humans as network nodes, sampling and making decisions

Neuro-inspired/Neuromorphic, Next Generation Computing Systems

- Leveraging the convergence among neuroscience, theory/algorithms, microelectronics
- Wide range of applications and great success with machine learning, further developments in progress
- Still a larger set of challenging problems remaining
- How do we address those problems with new platforms, computing approaches and systems?

What are we going to do with it?



Feynman's answer:

"Like everything else new in our civilization, it will be used for entertainment."

Feynman's second nanotechnology talk, 1983

Dr. Ford, Arnold is still looking for you.
Are you at NICE 2019?