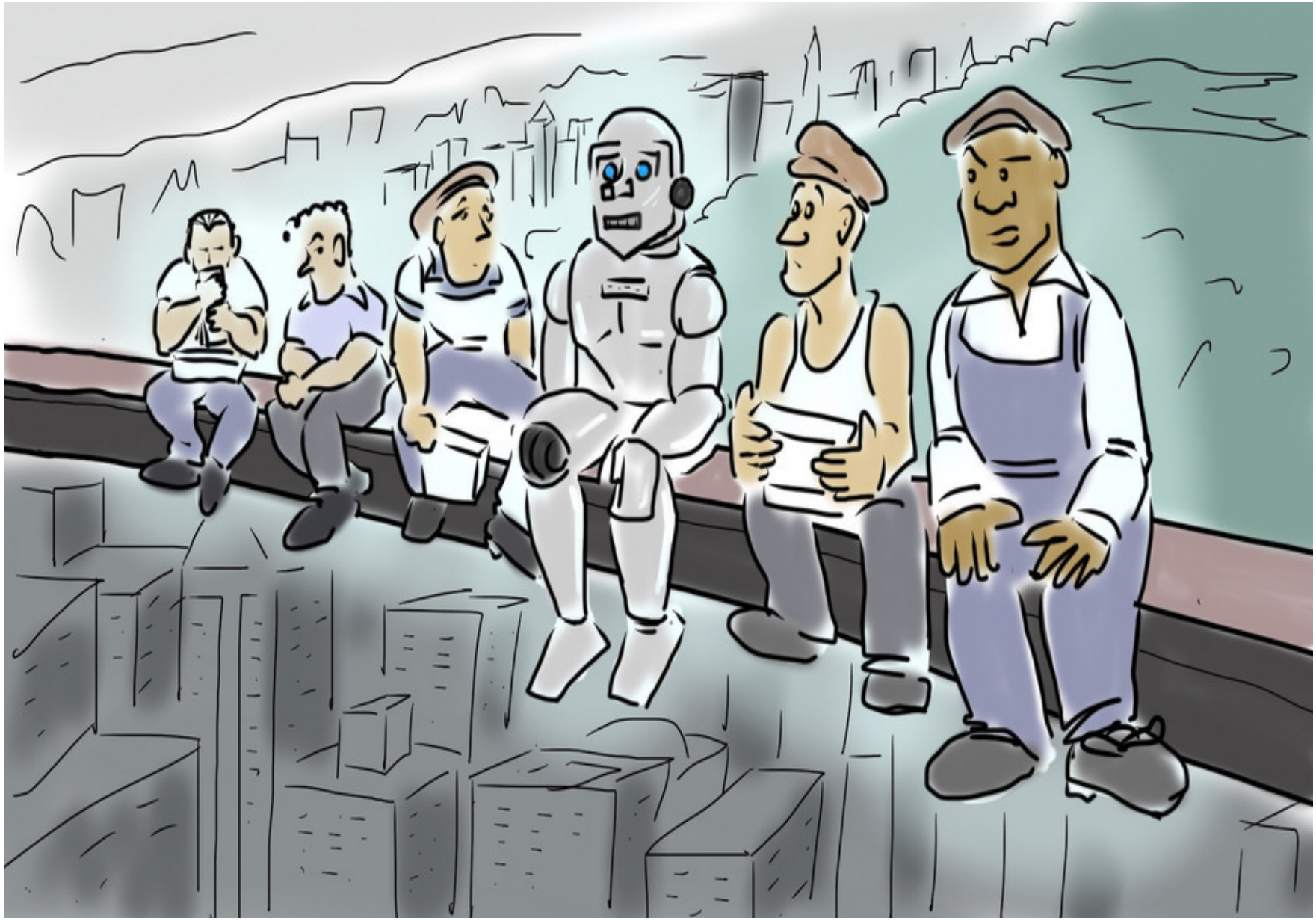
Humans & Humanoids

- an emerging partnership

Bob Bishop

ICES Foundation

Geneva, Switzerland



Isaac Asimov (1920-1992)

- Born Russia, family immigrated to Brooklyn, NYC
- Educated Columbia University
- Professor biochemistry at Boston University
- Wrote 500 books, including ***I, Robot*** and ***Foundation***
- Coined the term ***robotics***
- Coined the ***3 Laws of Robotics***

Asimov's 3 Laws of Robotics

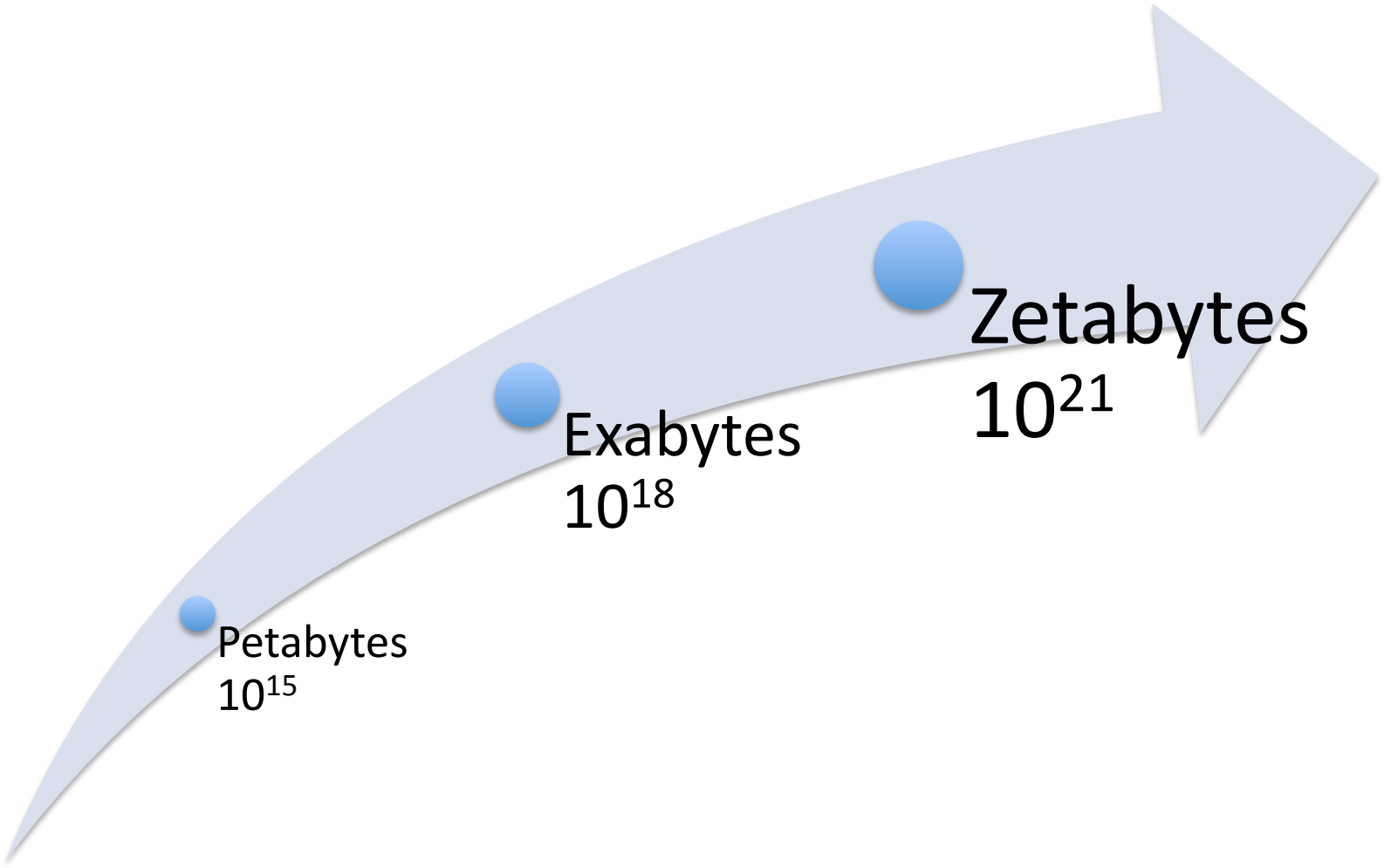
1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.

2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

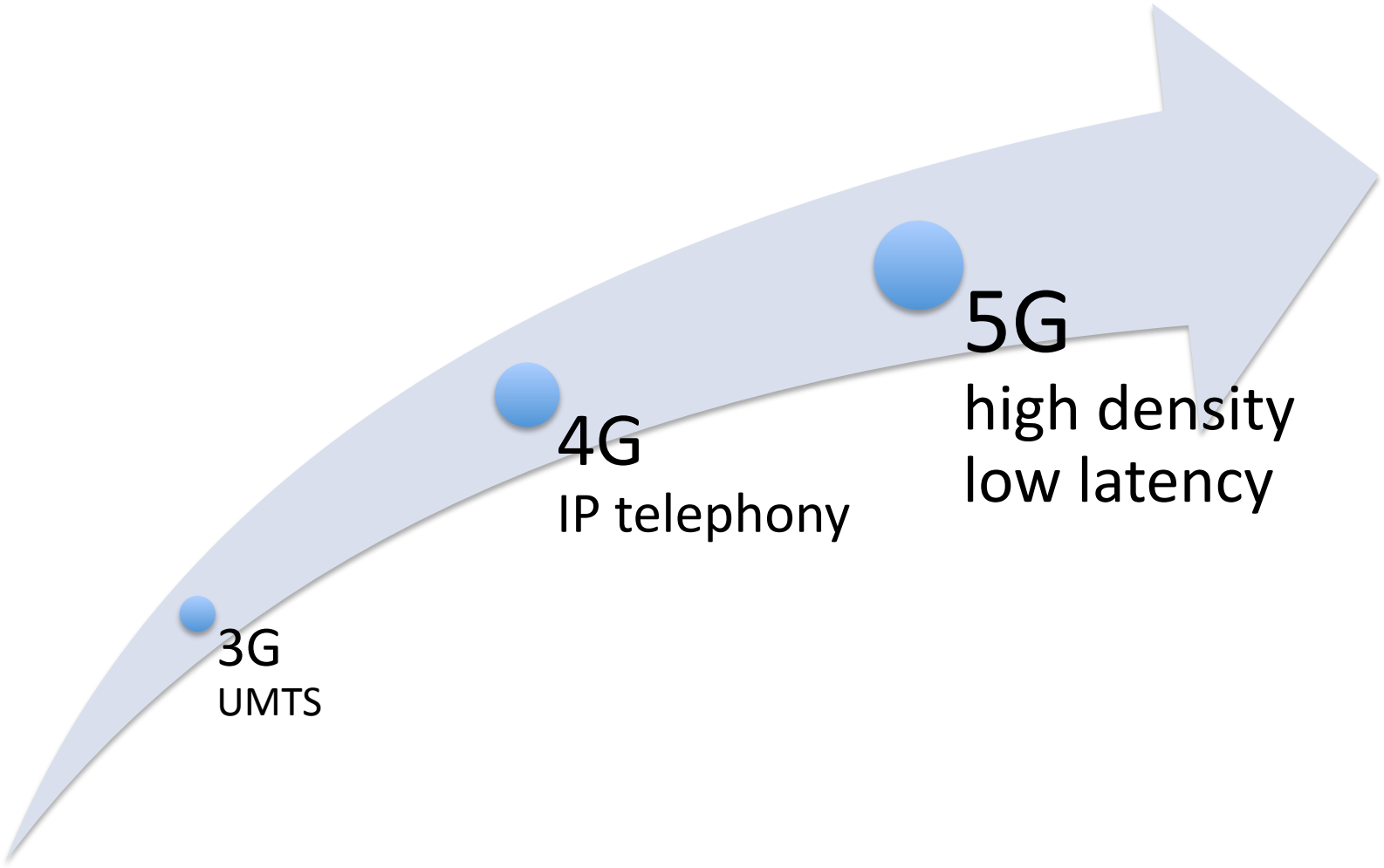
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

ASIMO
HONDA
HONDA
The Power of Dreams
asimo.honda.com

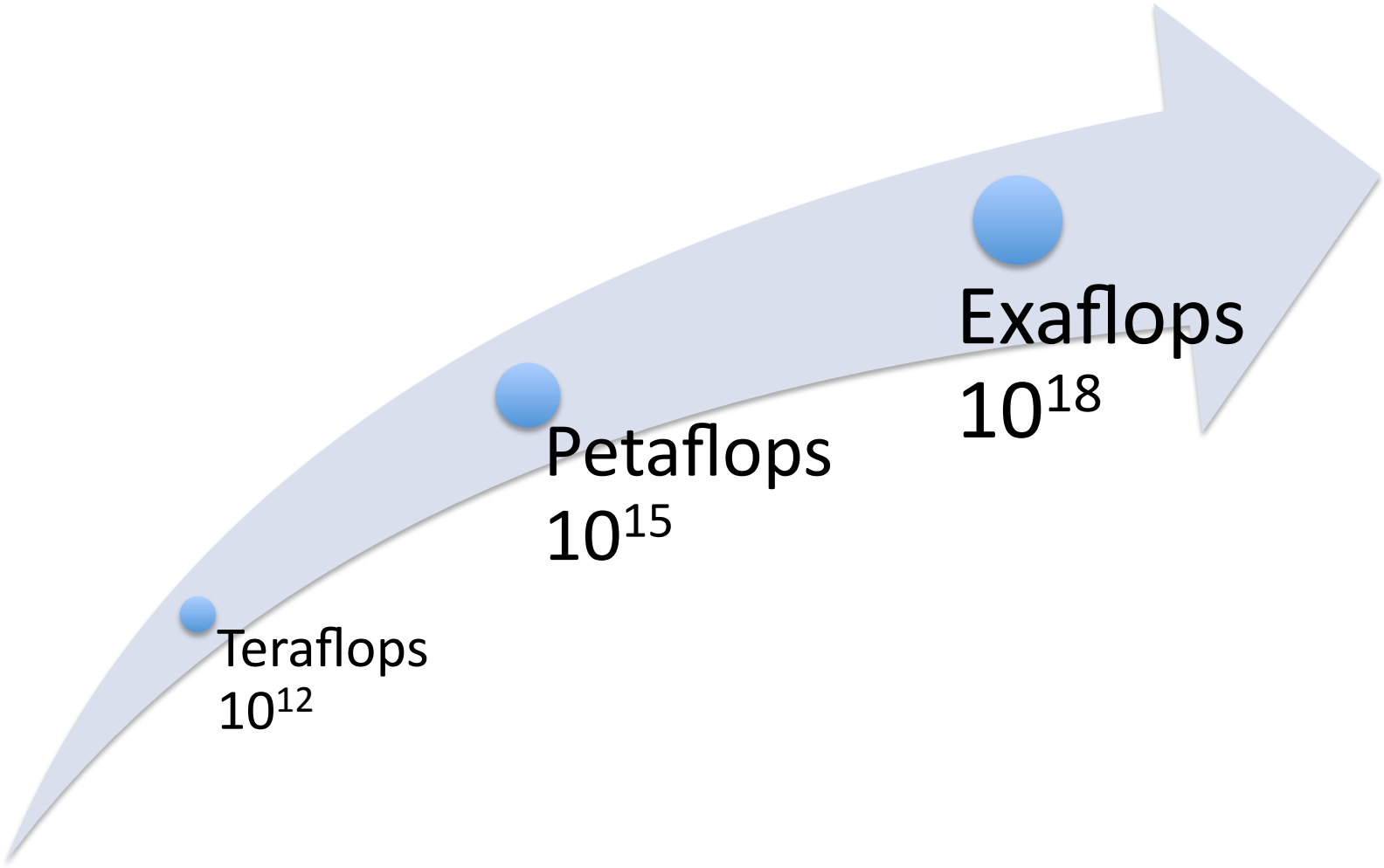
Deluge of Data



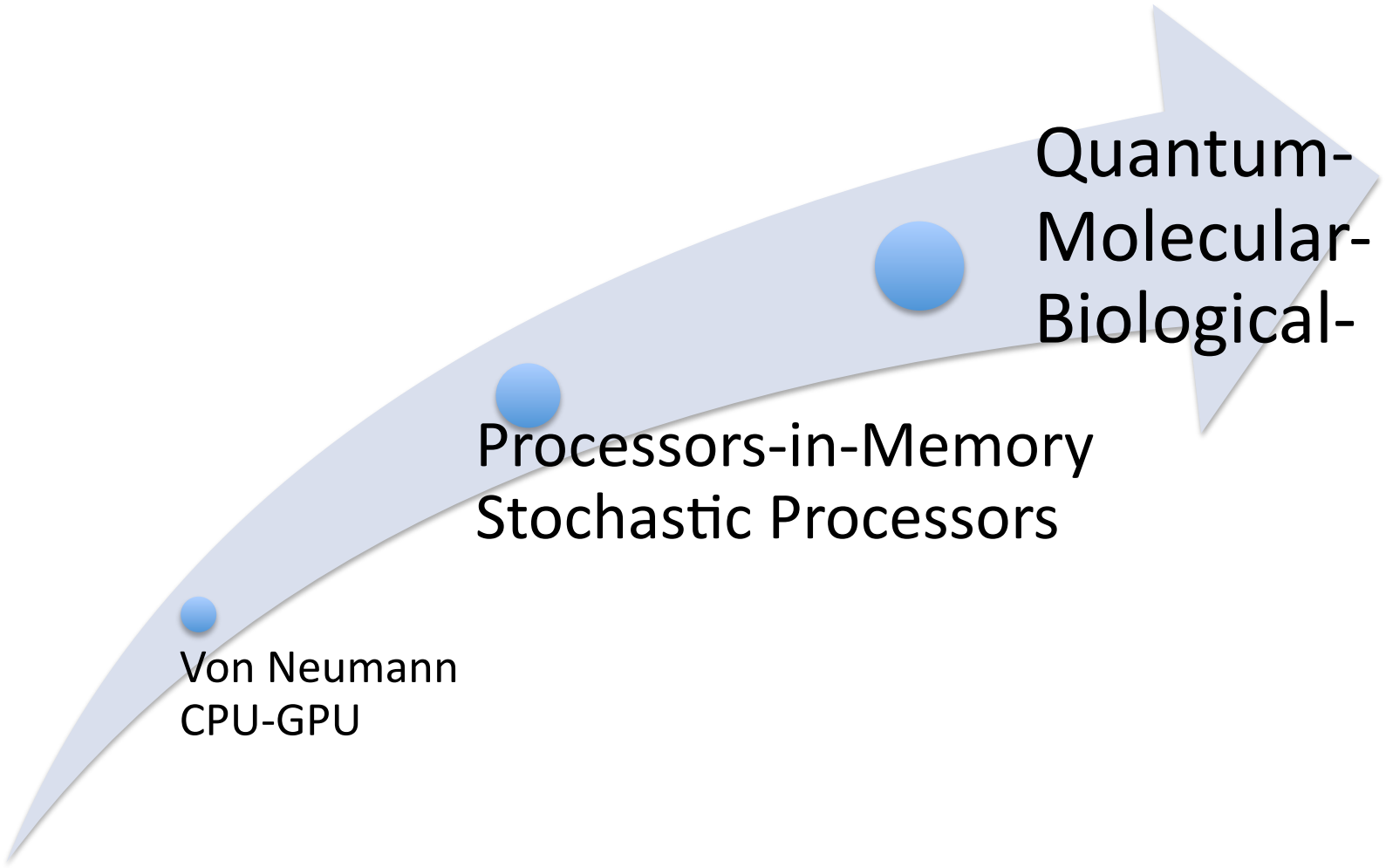
Plethora of Pipes



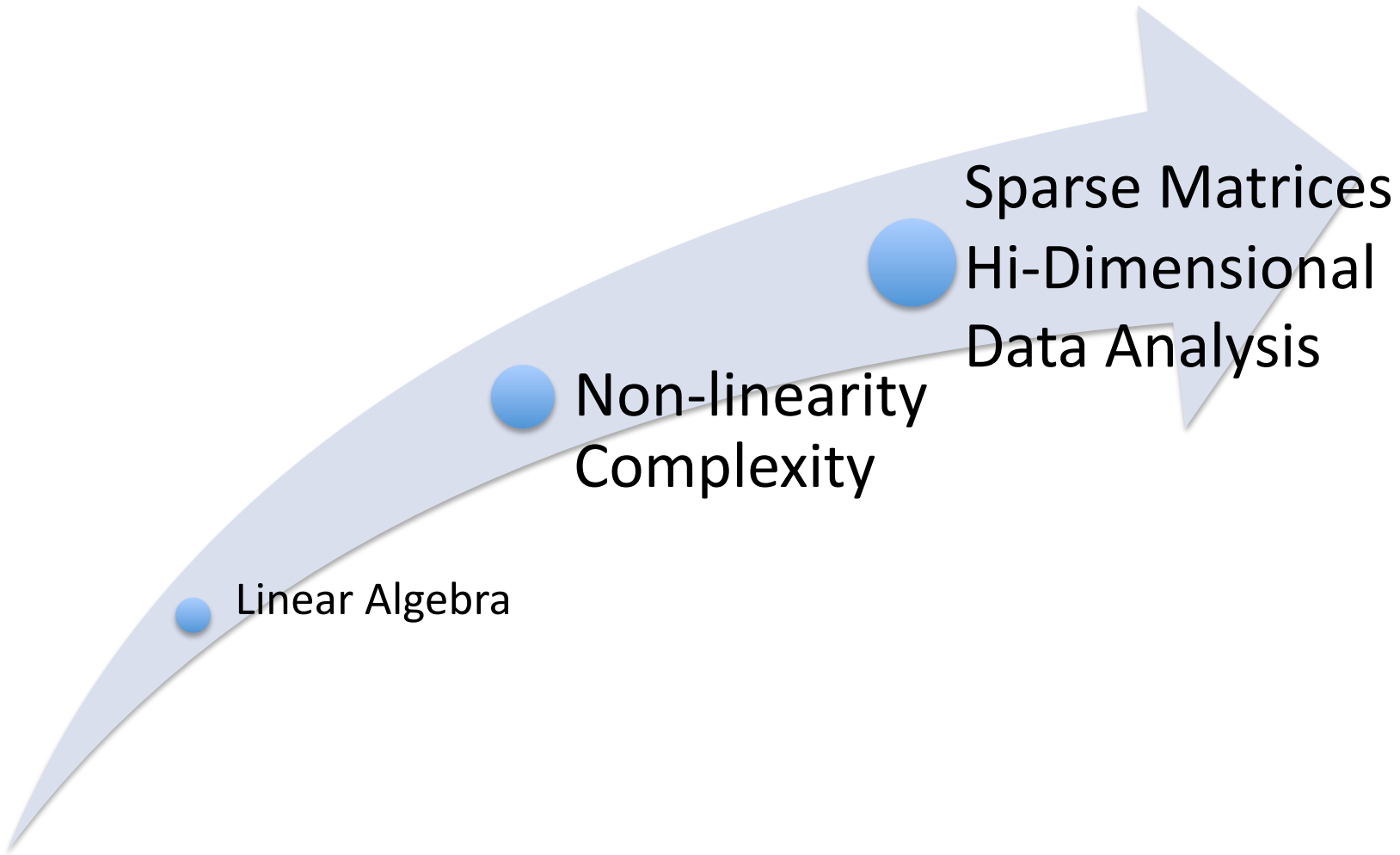
Fanfare of Flops



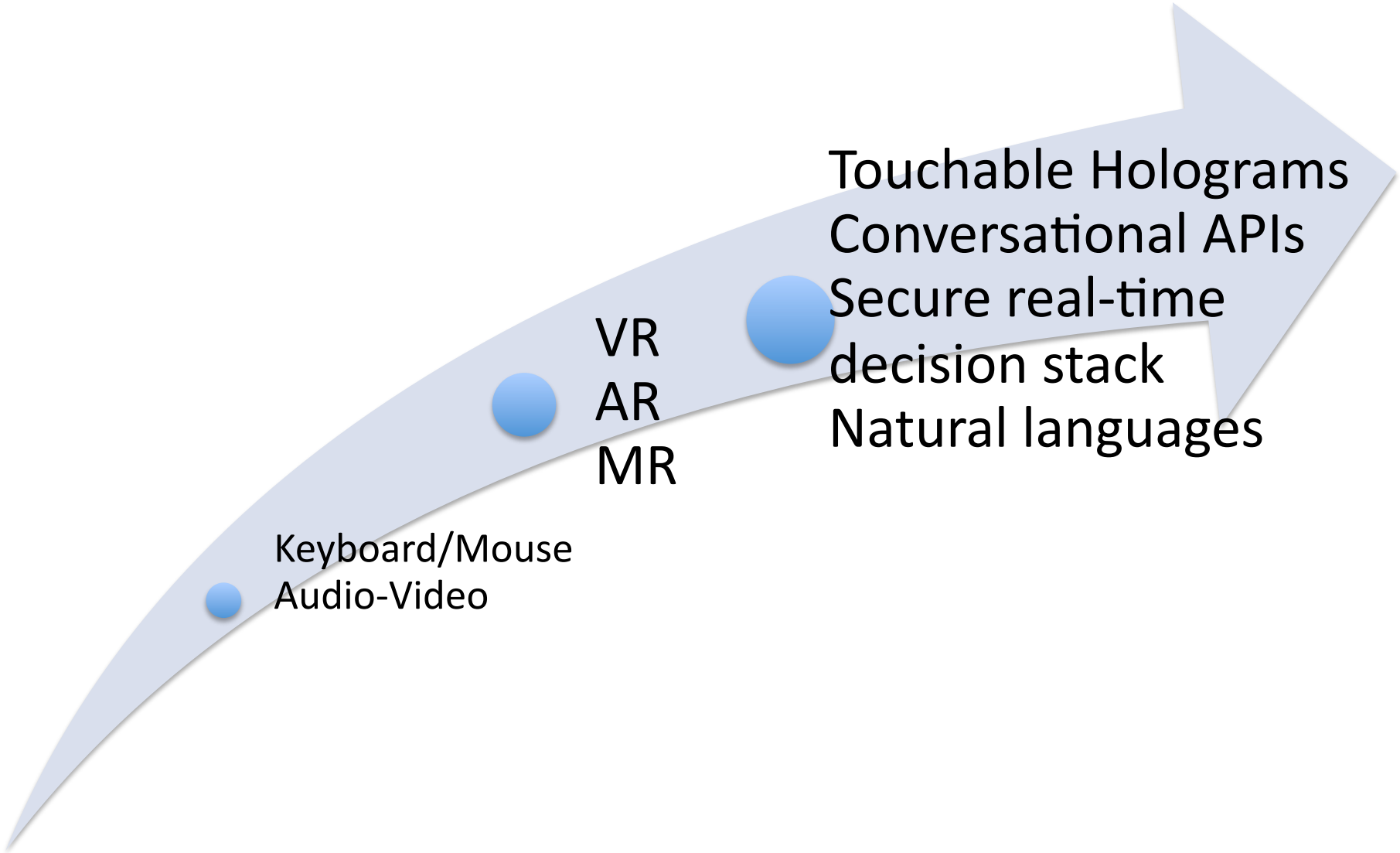
Arsenal of Architecture



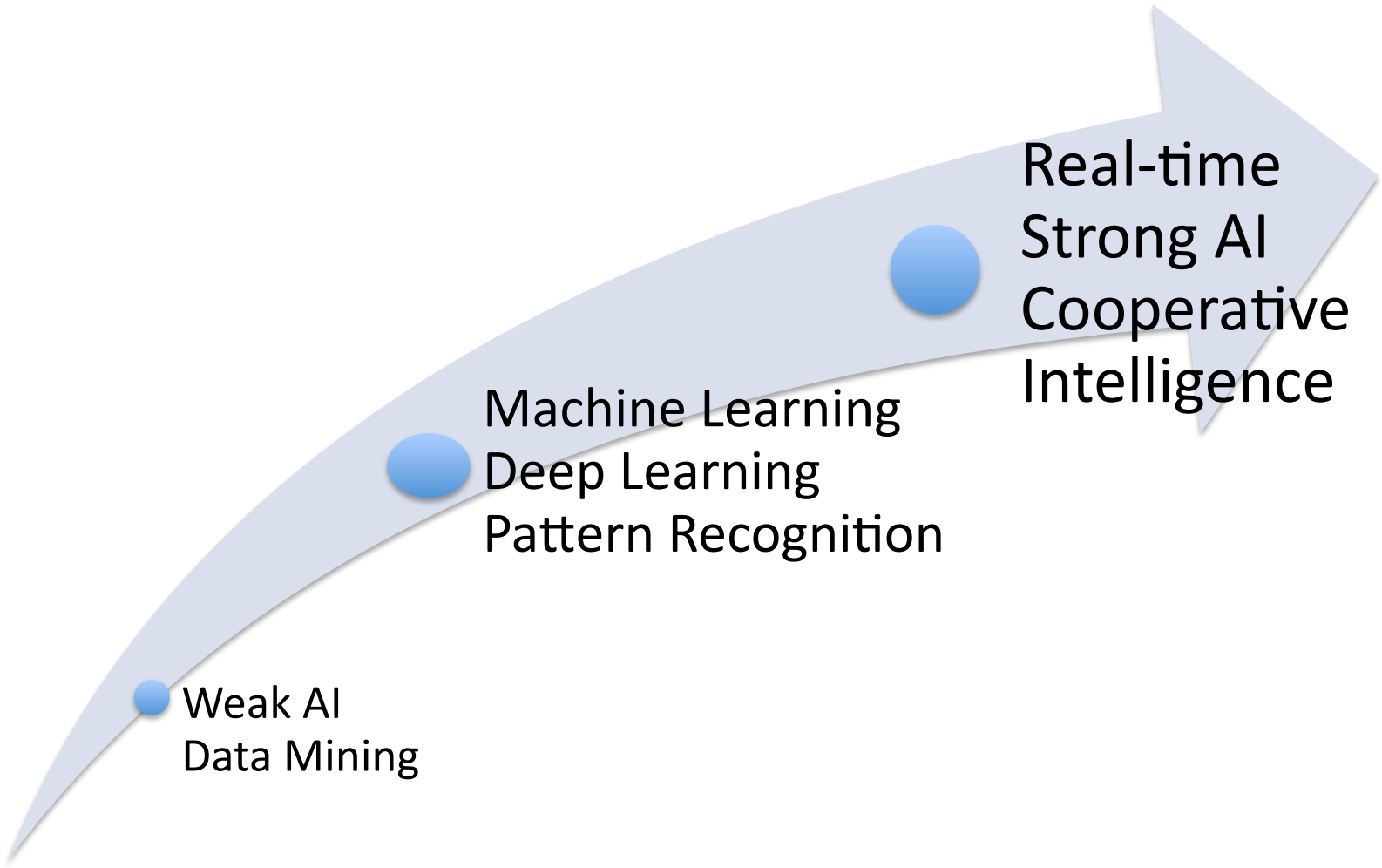
Swarm of Software



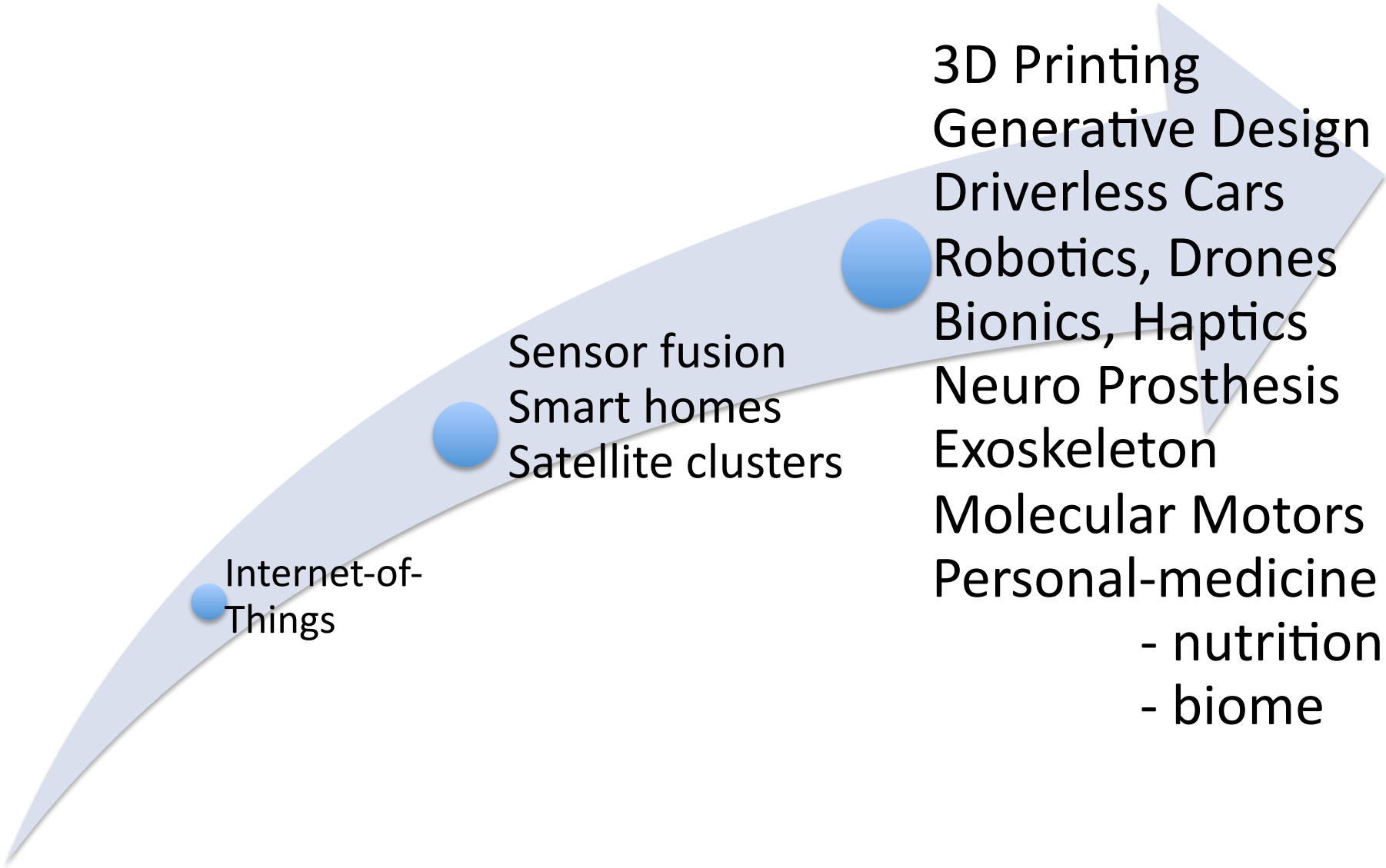
Marvels of Machine-Human Interface



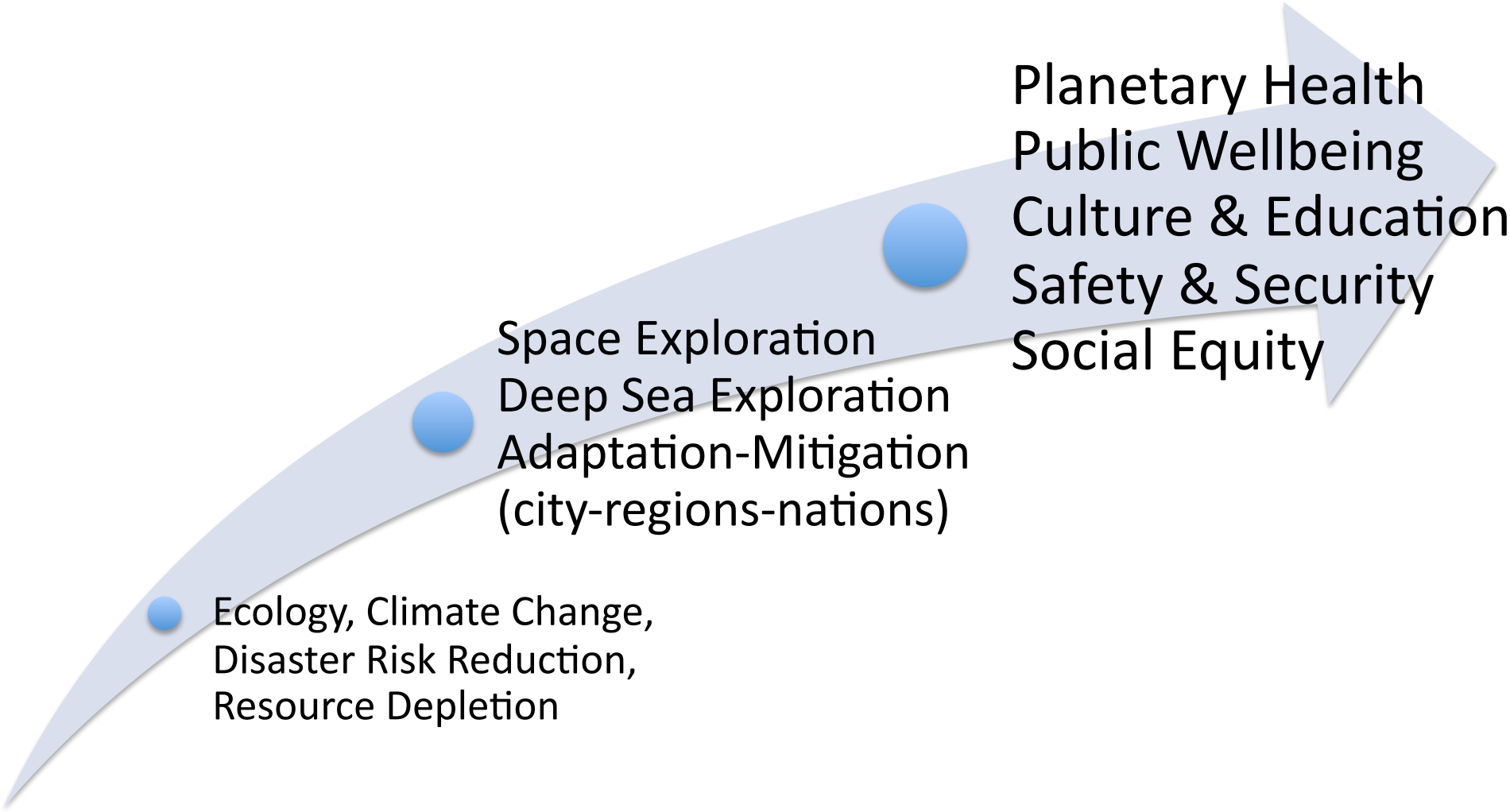
Lots of Learning



Plenty of Platforms



Wicked Problems lie ahead!



RoboCup
LEIPZIG
GERMANY
2016
30 JUNE to 4 JULY

5-aside soccer

ETH Zurich

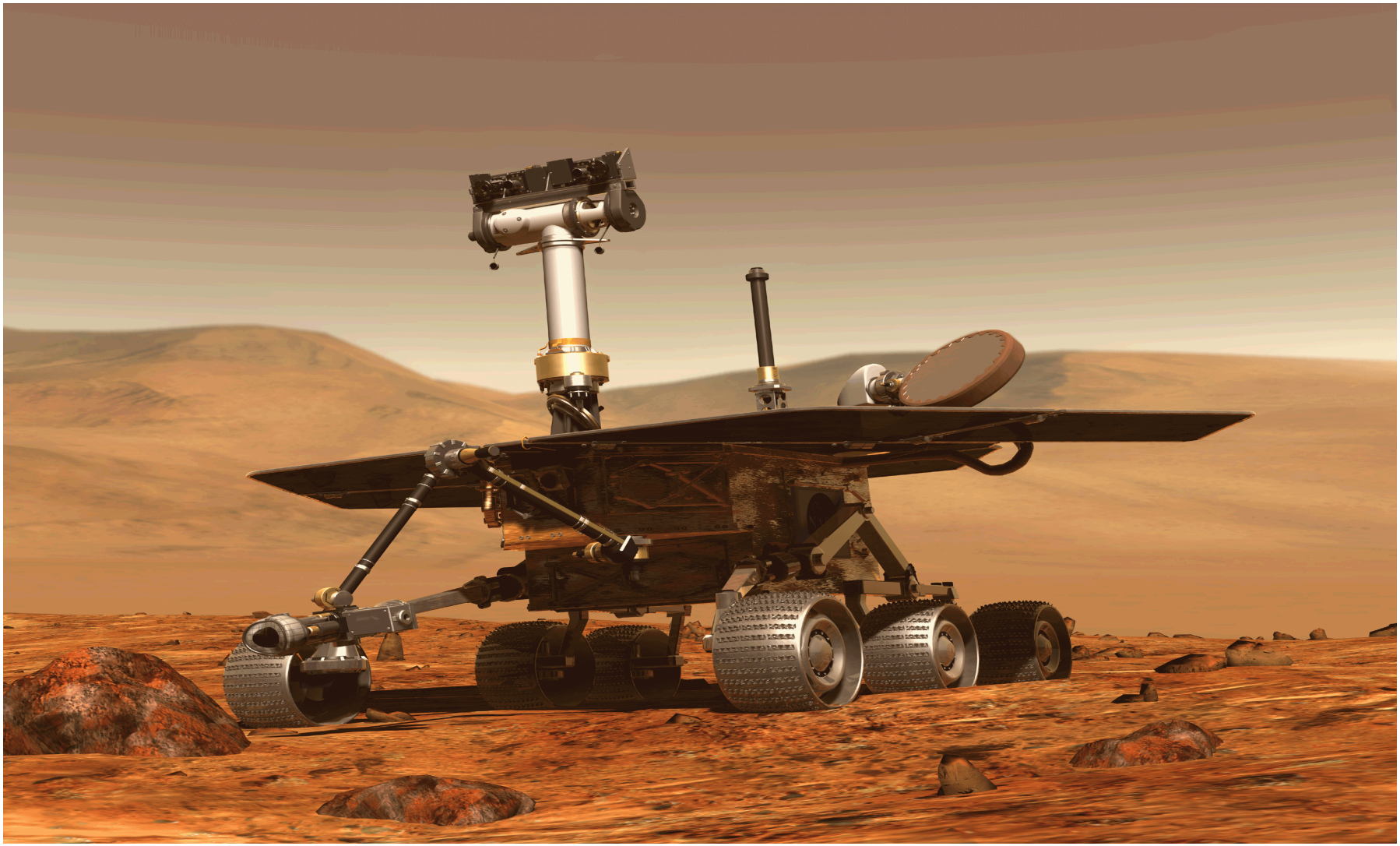
Assistive Exoskeletons

Strength Assistance

Robots in Agriculture

Drones on the Farm

Mars Robotics

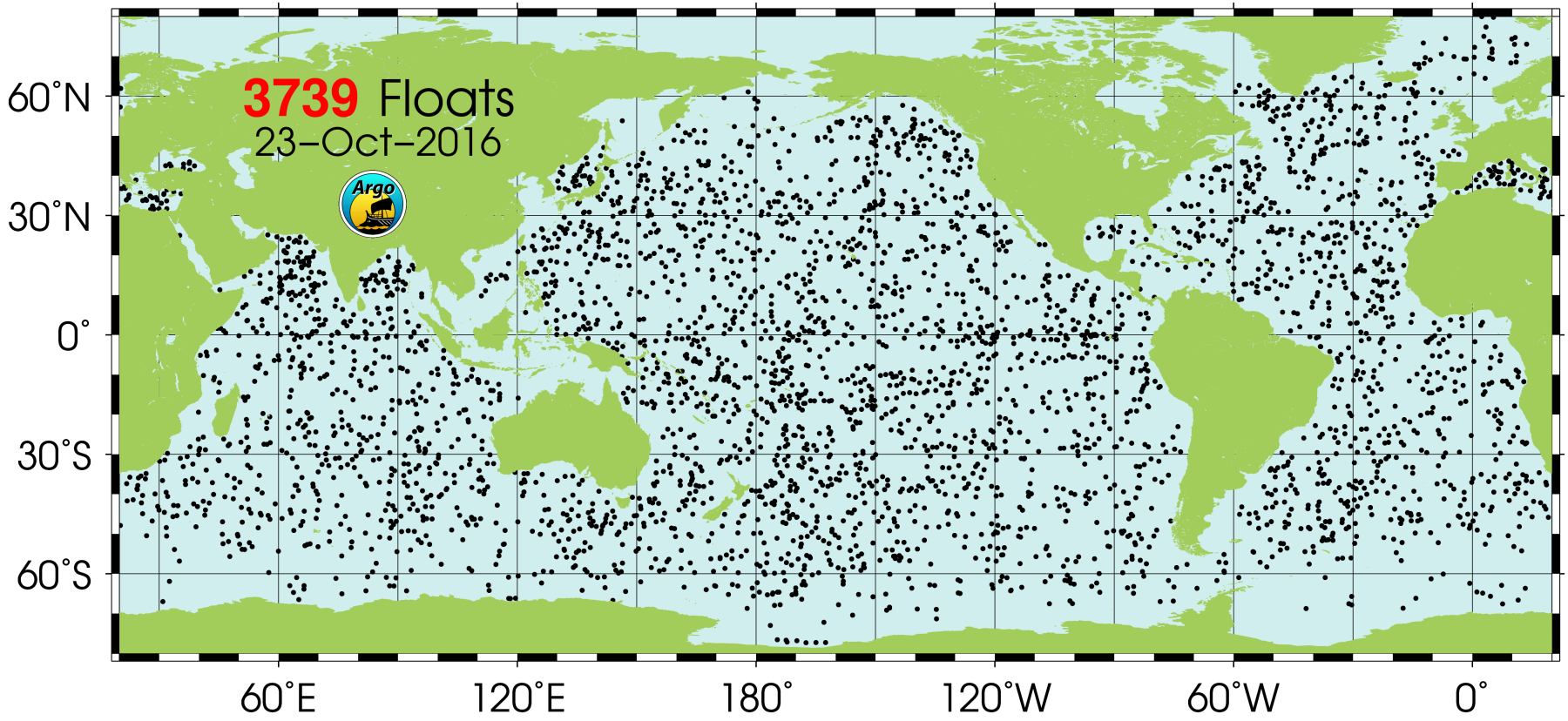


Deep-sea Robotics

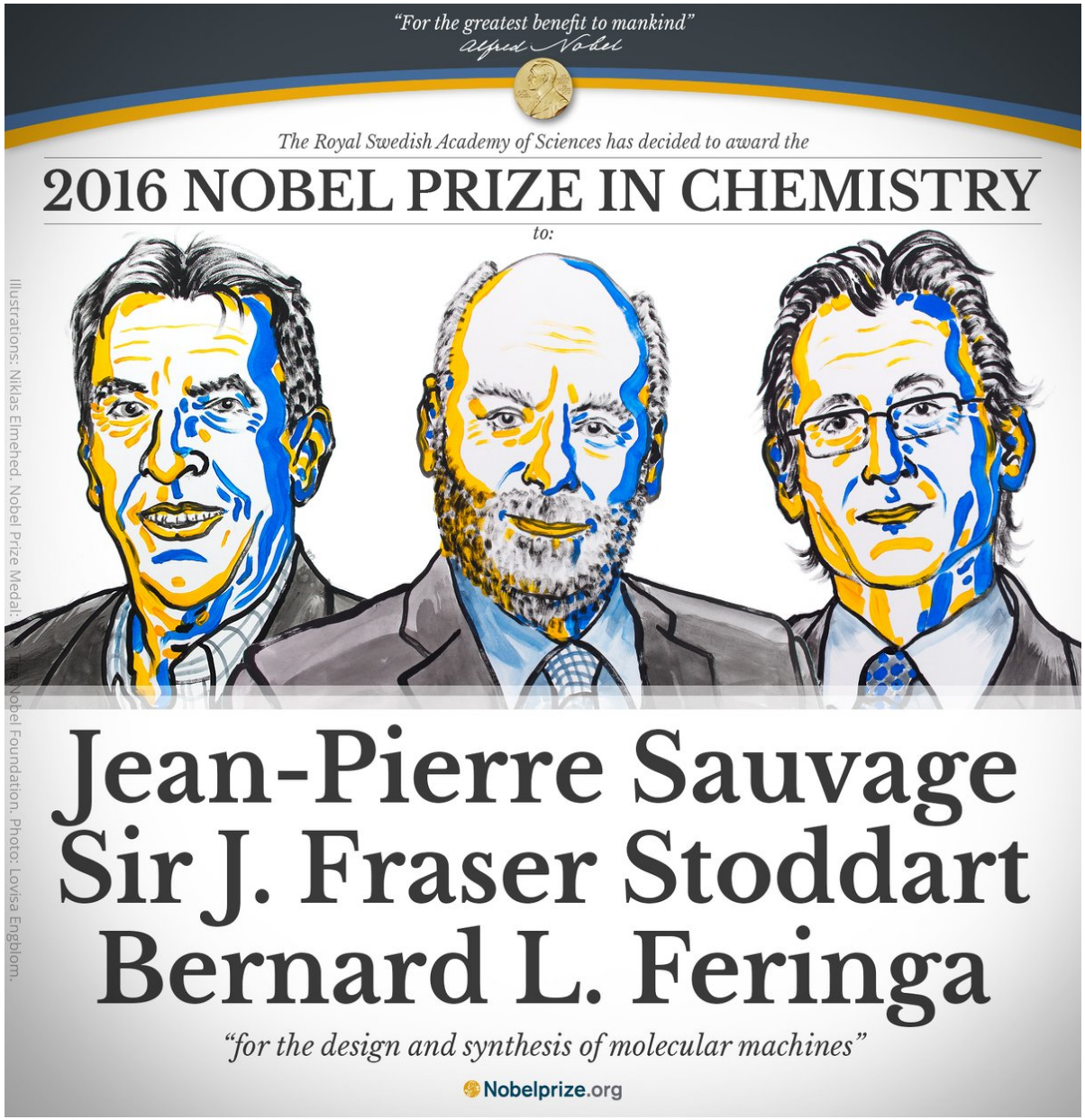
Remote Ocean – wave gliders

ARGO global float array

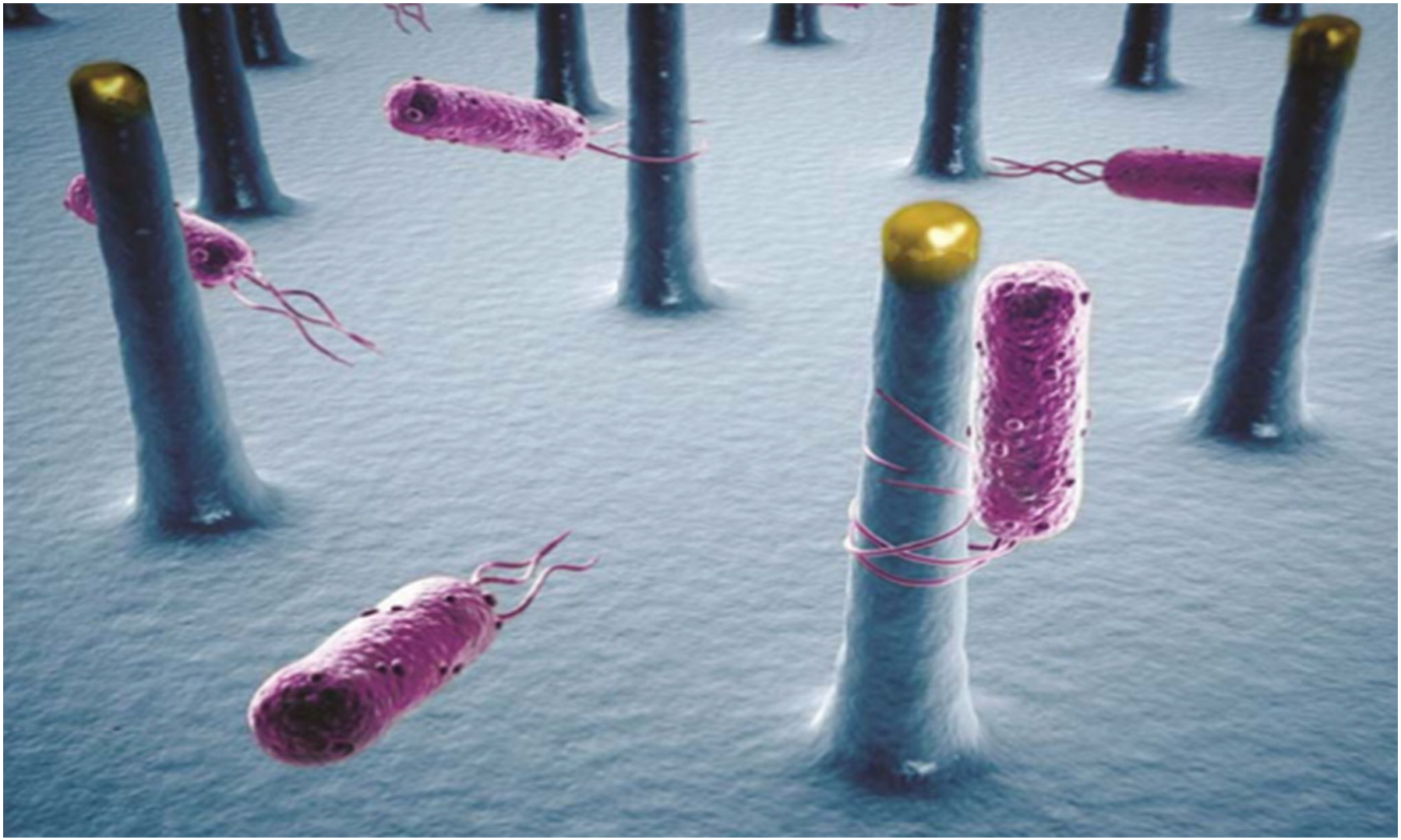
3,739 real time ARGO floats



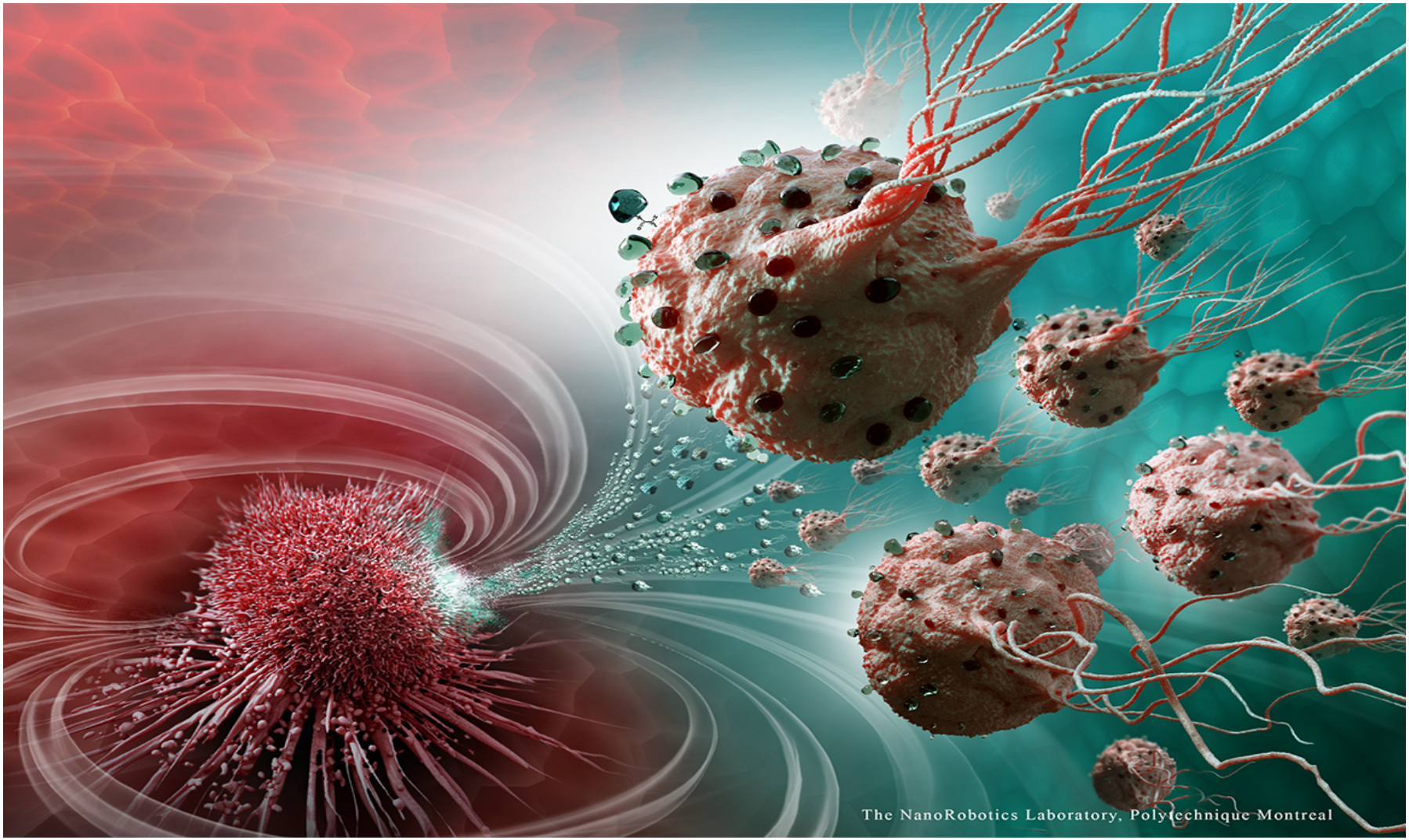
Molecular Machines



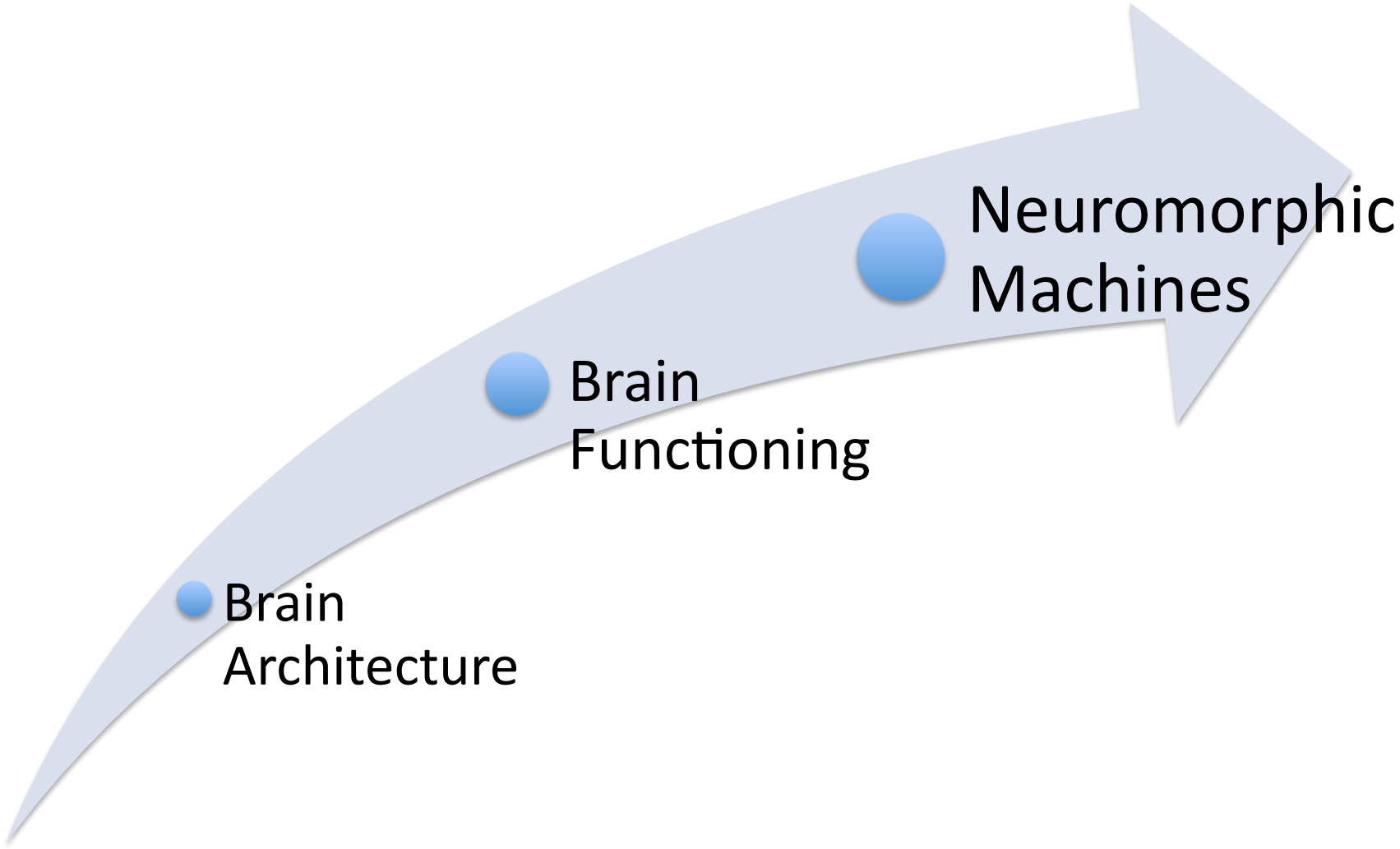
Artificial Photosynthesis



Nano-robots attack tumor cells

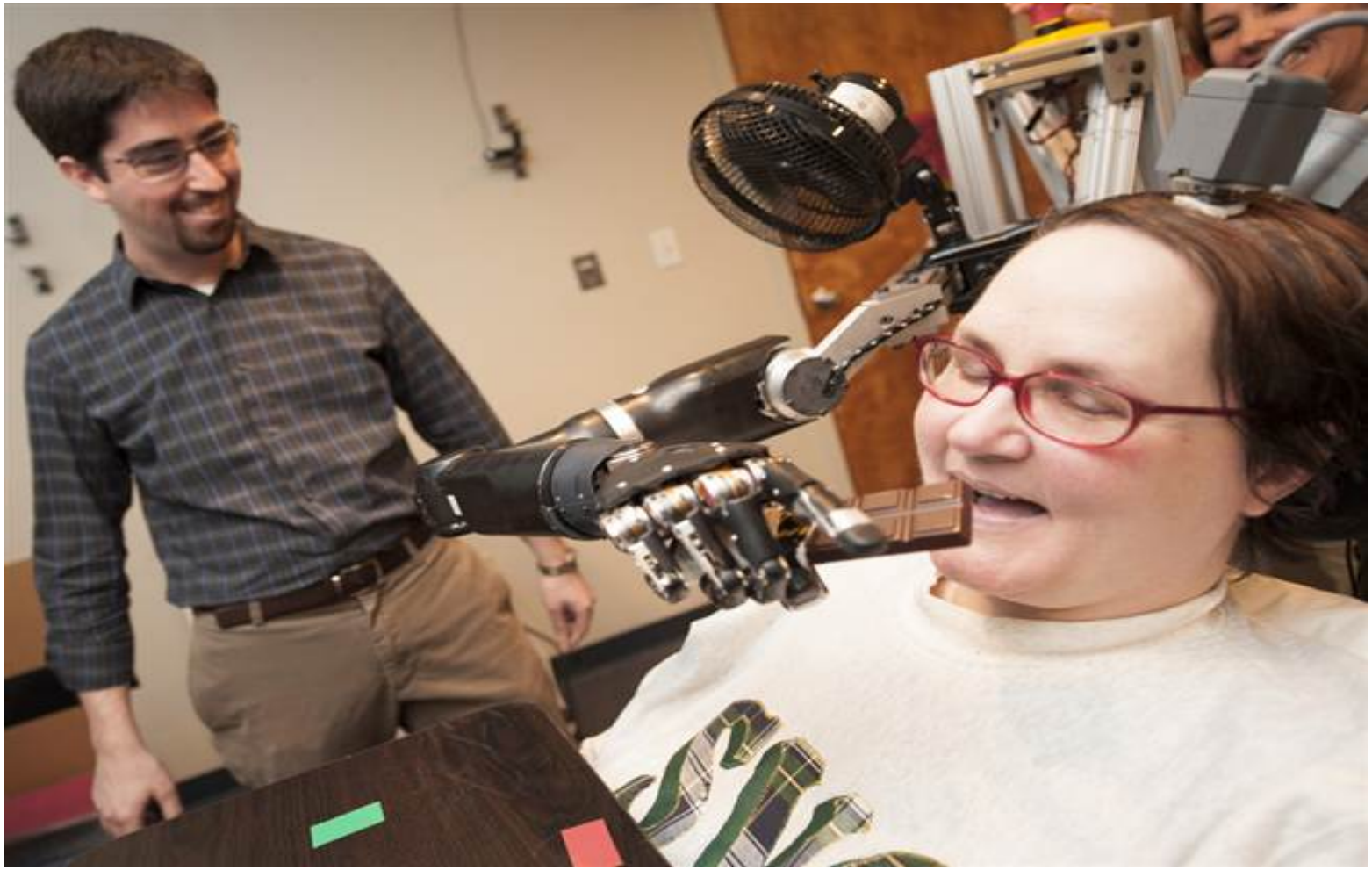


Toward Cognitive Computing



Bionic Eye

Thought-controlled robotic arm



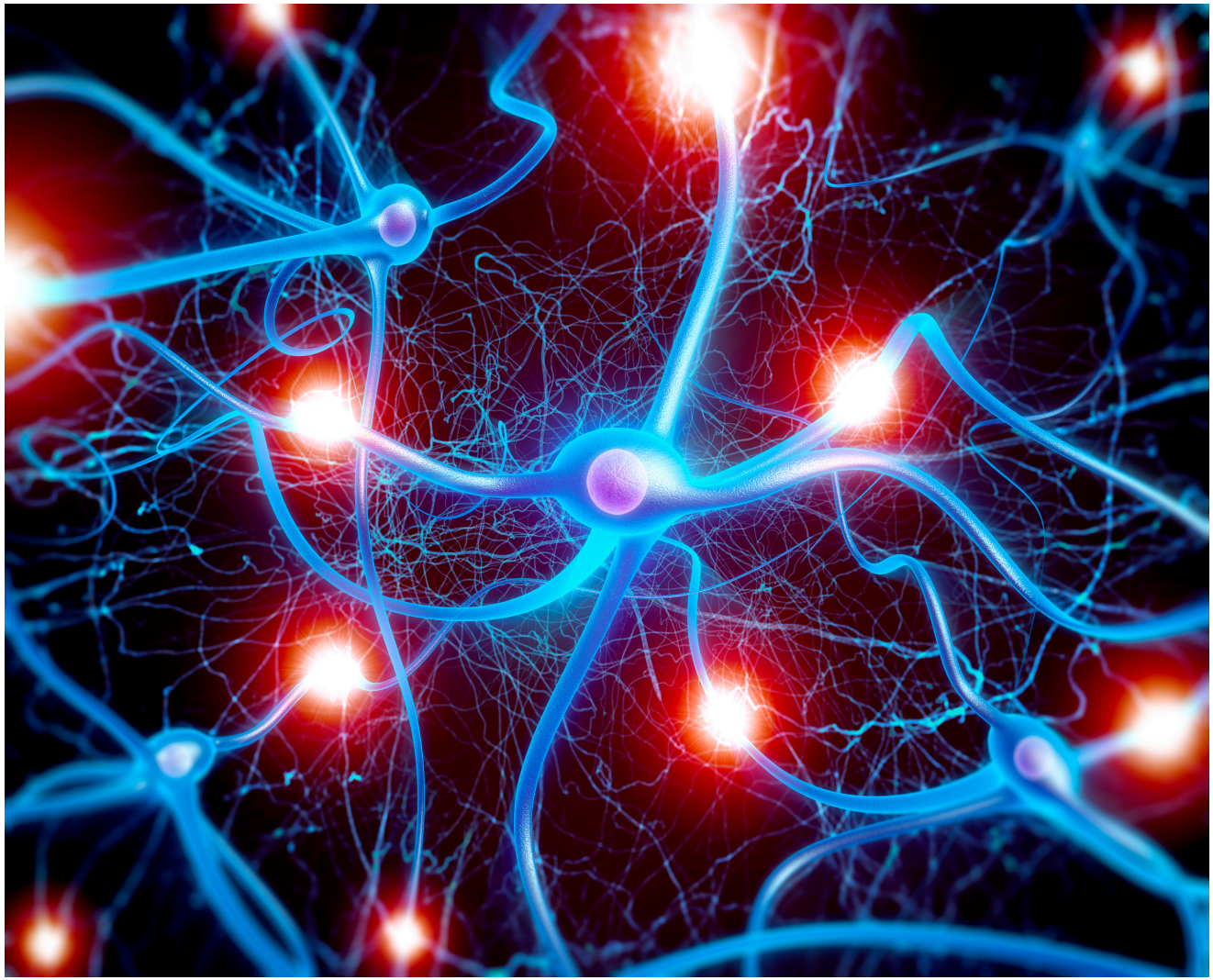
Contrasting the Brain to Digital Computing

- Analog – Digital
- Wet - Dry
- Plastic – Rigid
- Resilient - Fragile
- Intuitive – Logical
- Creative – Deterministic
- Self organised - Designed
- Self assembled - Manufactured
- Asynchronous – Mostly synchronous
- Embedded memory – Segregated memory
- Variable neural network – Fixed instruction set

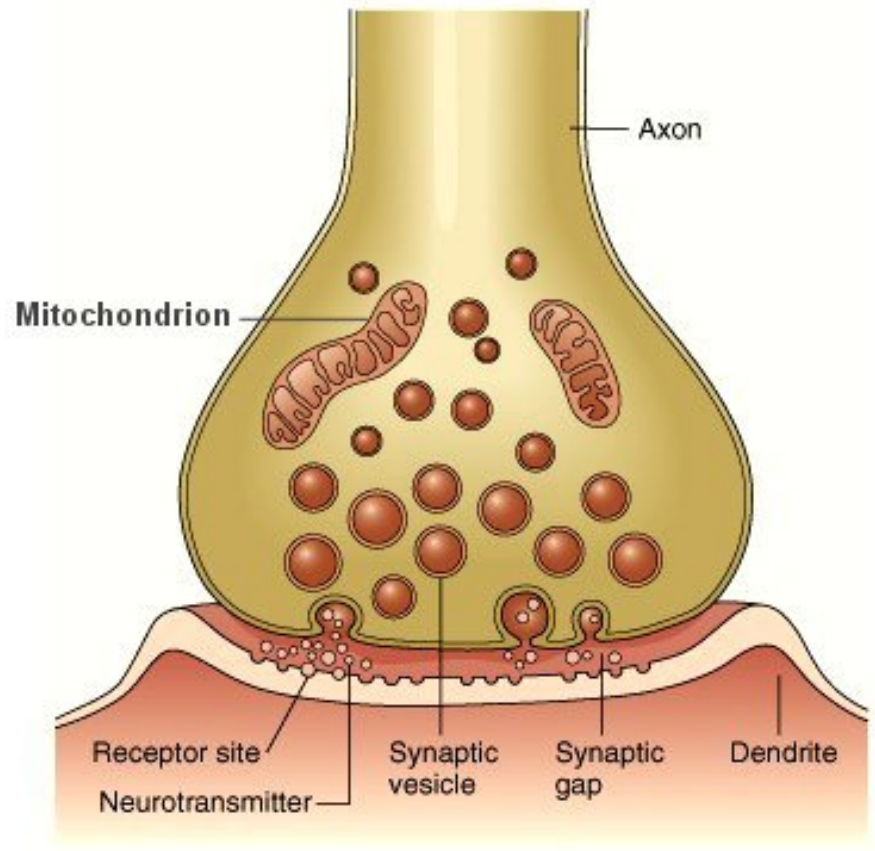
Overall structure of the human brain

- 80 billion neurons
- 500 trillion synaptic junctions
- 100 km of fibre
- 30 watts of power
- 3 meals/day

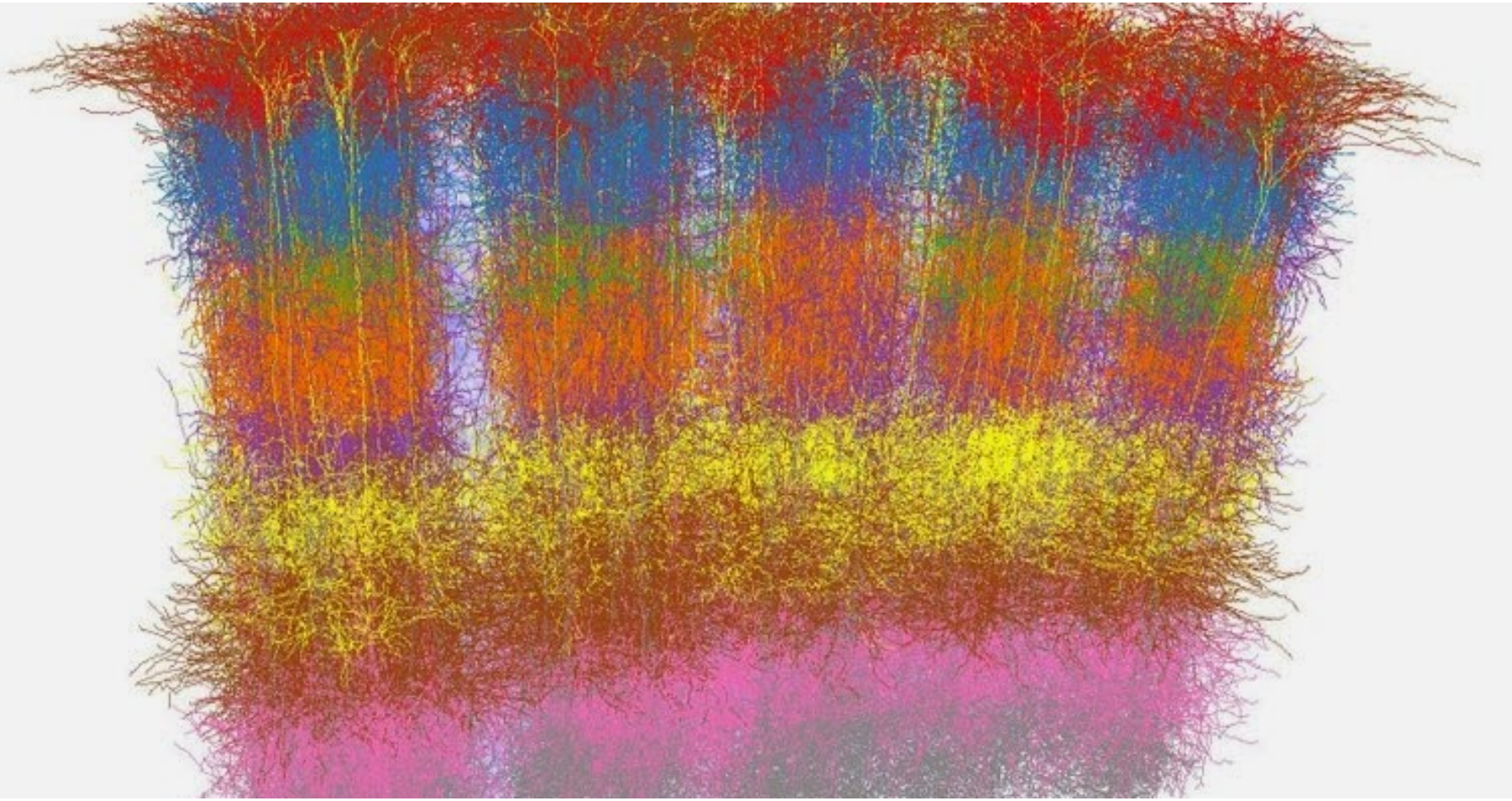
The neuron is the basic brain unit



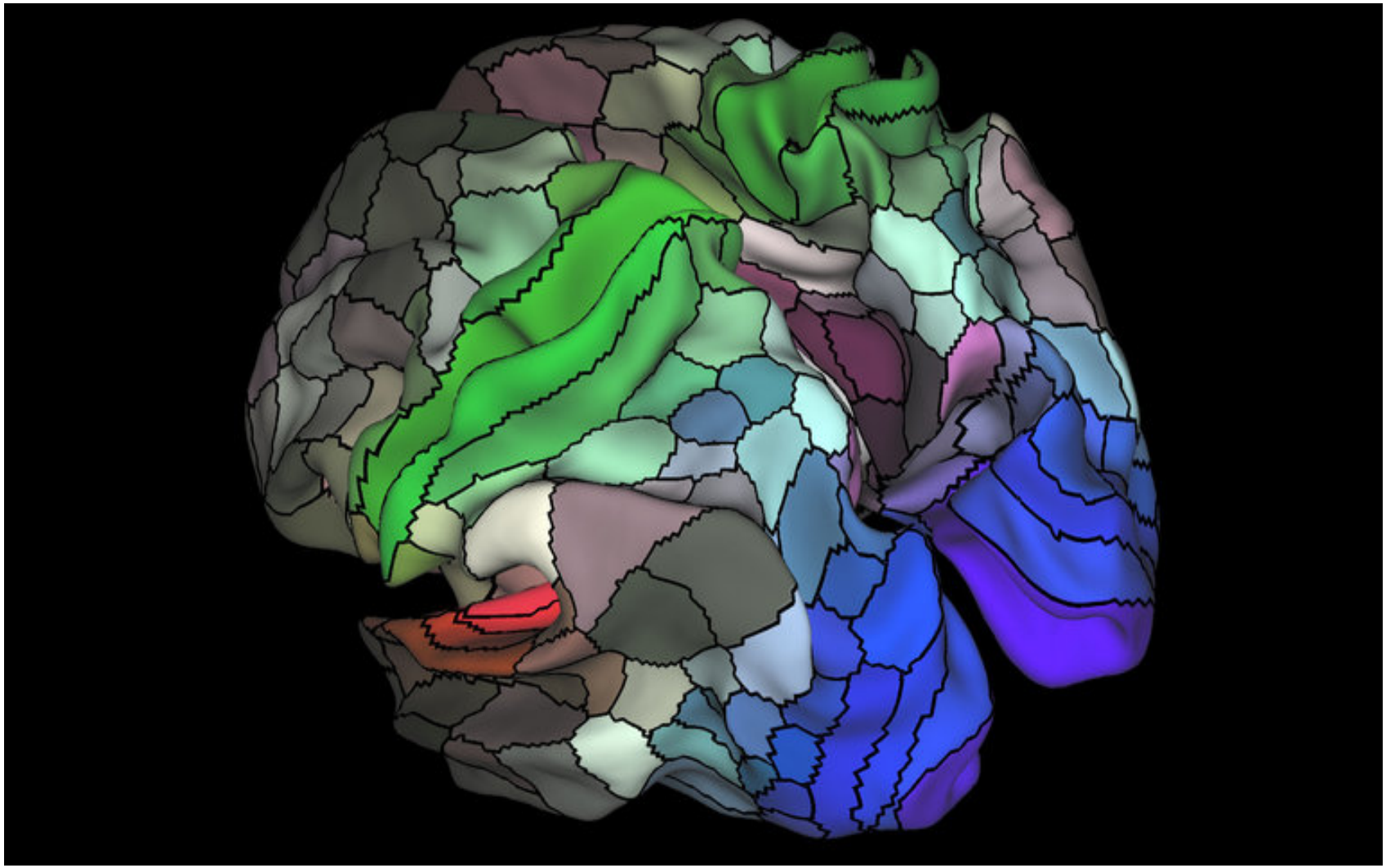
The synaptic junction is key



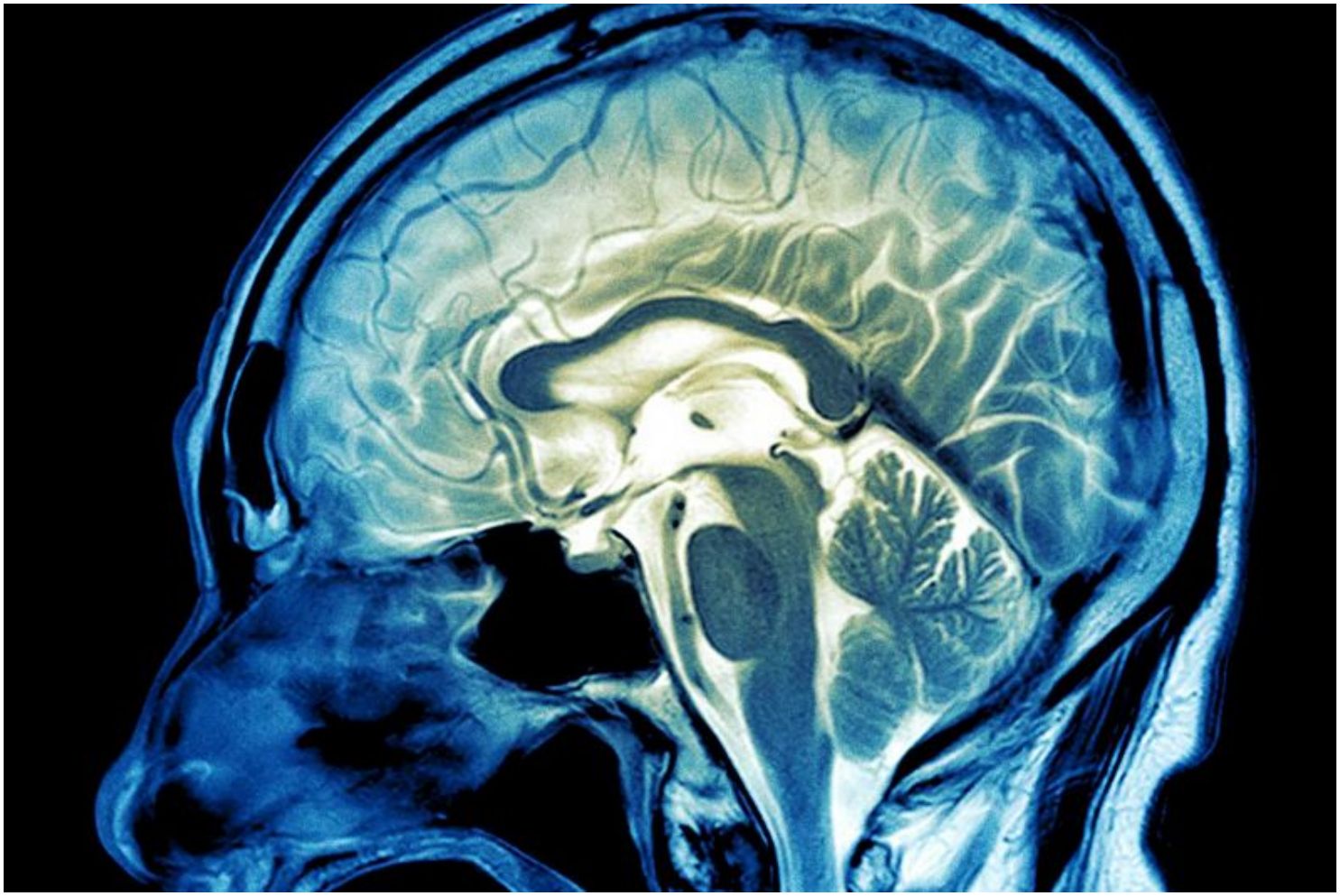
Cortical column organisation level



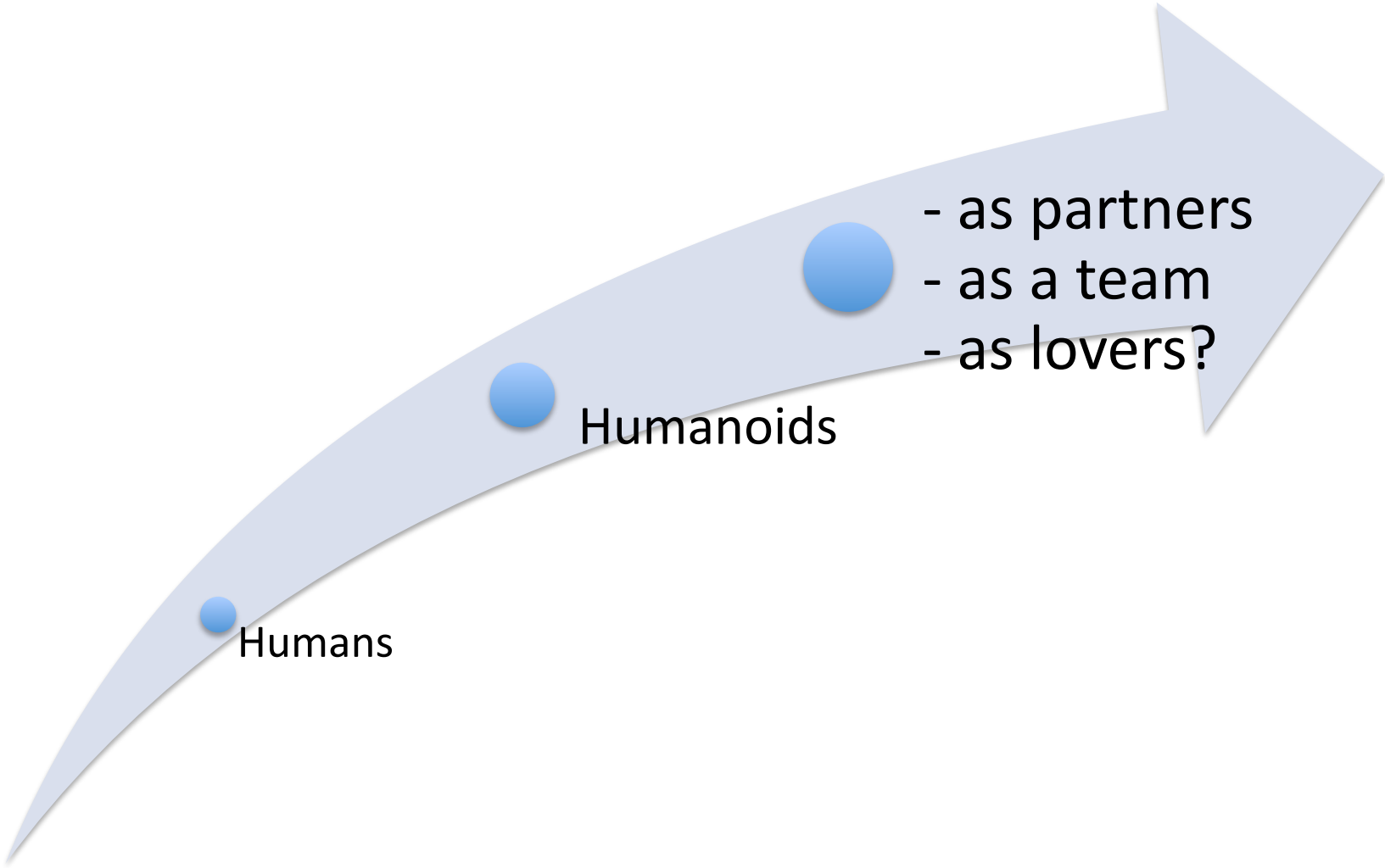
Brain regional organisation level



Mimicking the human brain



The Future = Affective Computing



Consciousness & Computers

Consciousness is the very essence
of what it is to be human

A quest for Artificial Consciousness will drive human beings
to more closely examine and understand themselves

At some time in the future we will have to decide
how human we wish to remain!