

AI and Scientific Discovery

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AI Inflection Point

VISION

SPEECH

LANGUAGE

LANGUAGE

SPEECH

LANGUAGE

LANGUAGE +
VISION

2016

2017

2018

2018

2018

2019

2020

Object
recognition
human parity

Speech
recognition
human parity

Reading
comprehension
human parity

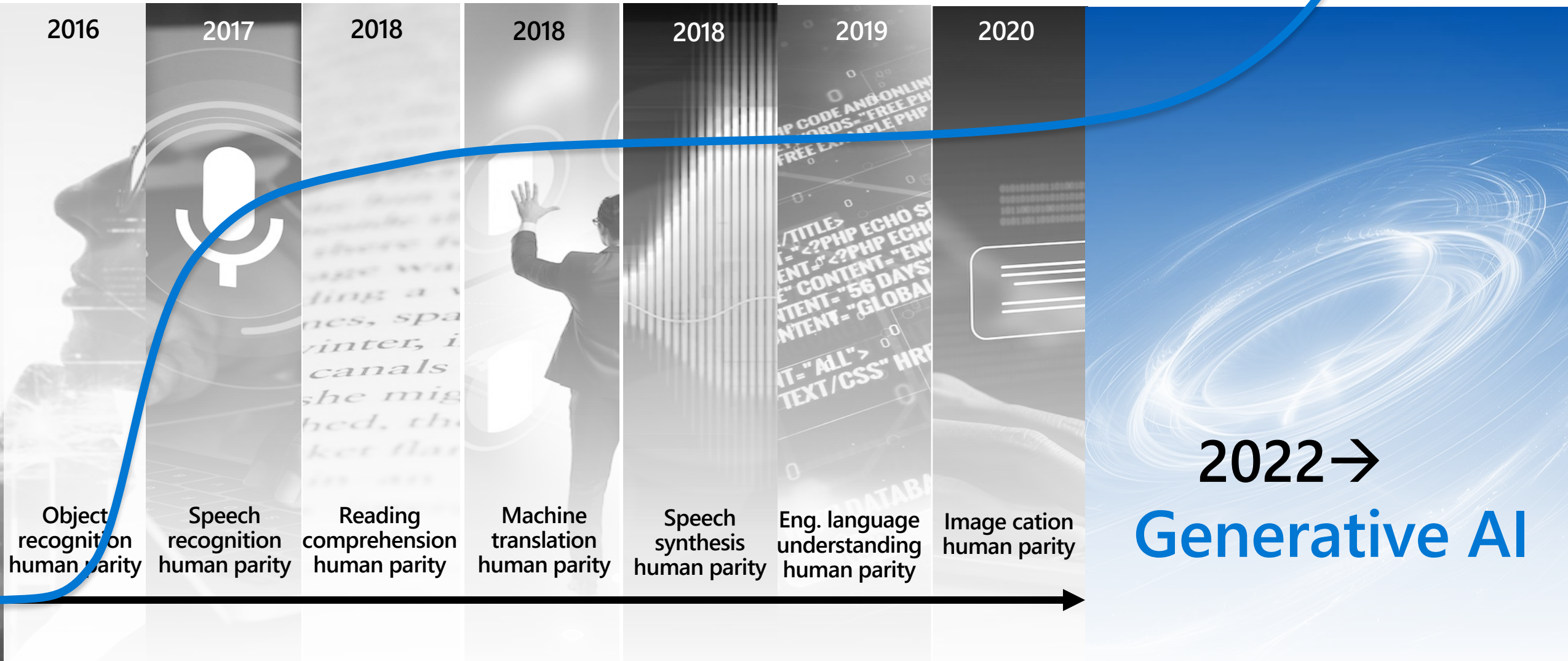
Machine
translation
human parity

Speech
synthesis
human parity

English
language
understanding
human parity

Image
Captioning at
human parity

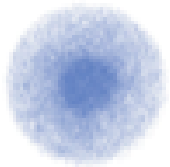
AI Inflection Points



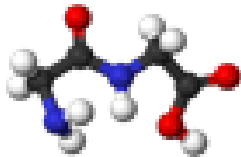
Supercharging Discovery

Modeling, generation, simulation at multiple scales

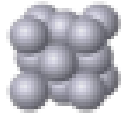
Electrons



Molecules



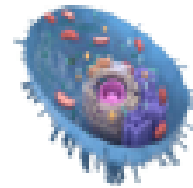
Materials



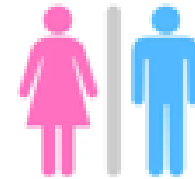
Proteins



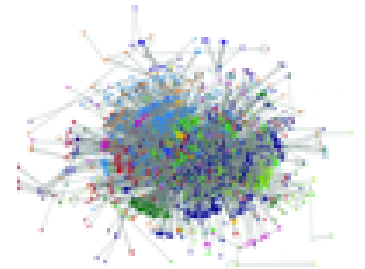
Cell



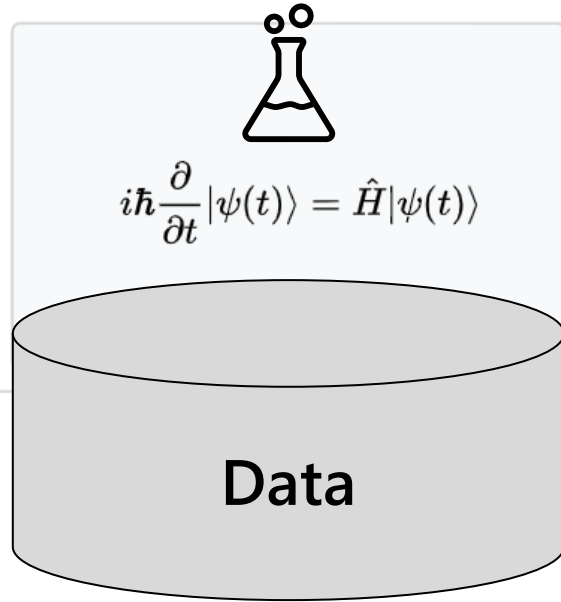
Human



Population



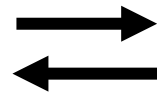
Supercharging Discovery



Experimental data

Computed data

Synthesized data



Neural
Approximation
Models

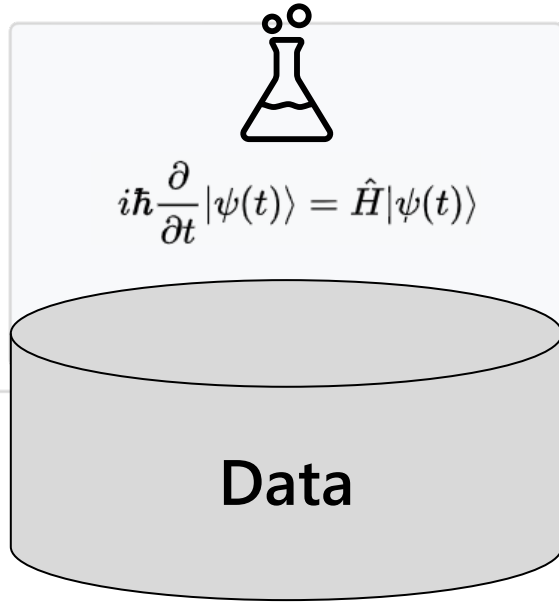
Invariance, equivariance
Conservation laws



Inferences
&
Workflows

Efficient evaluation

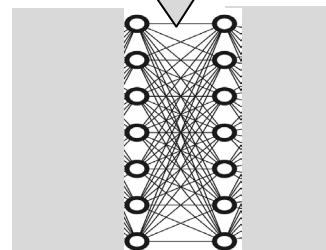
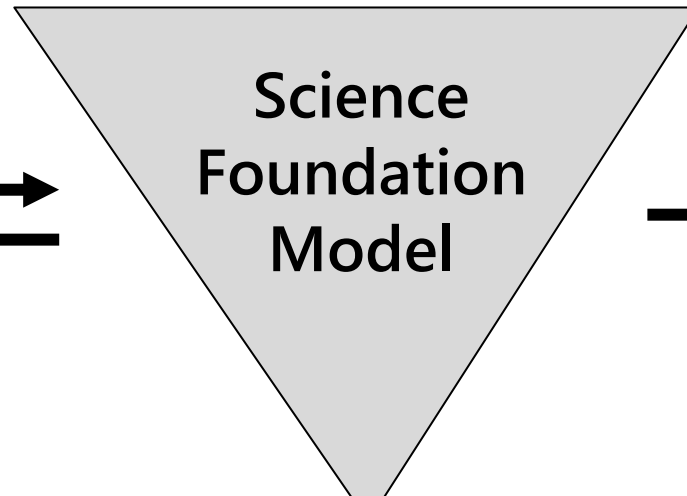
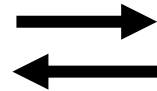
Supercharging Discovery



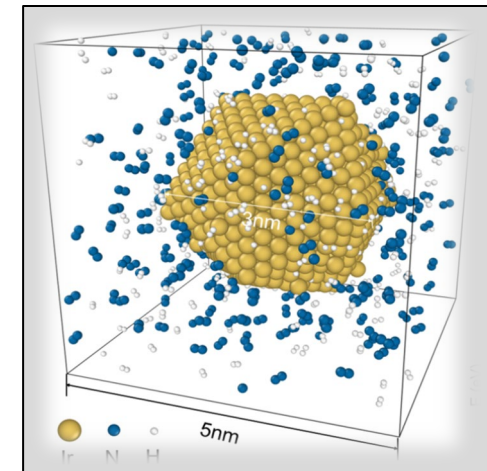
Experimental data

Computed data

Synthesized data

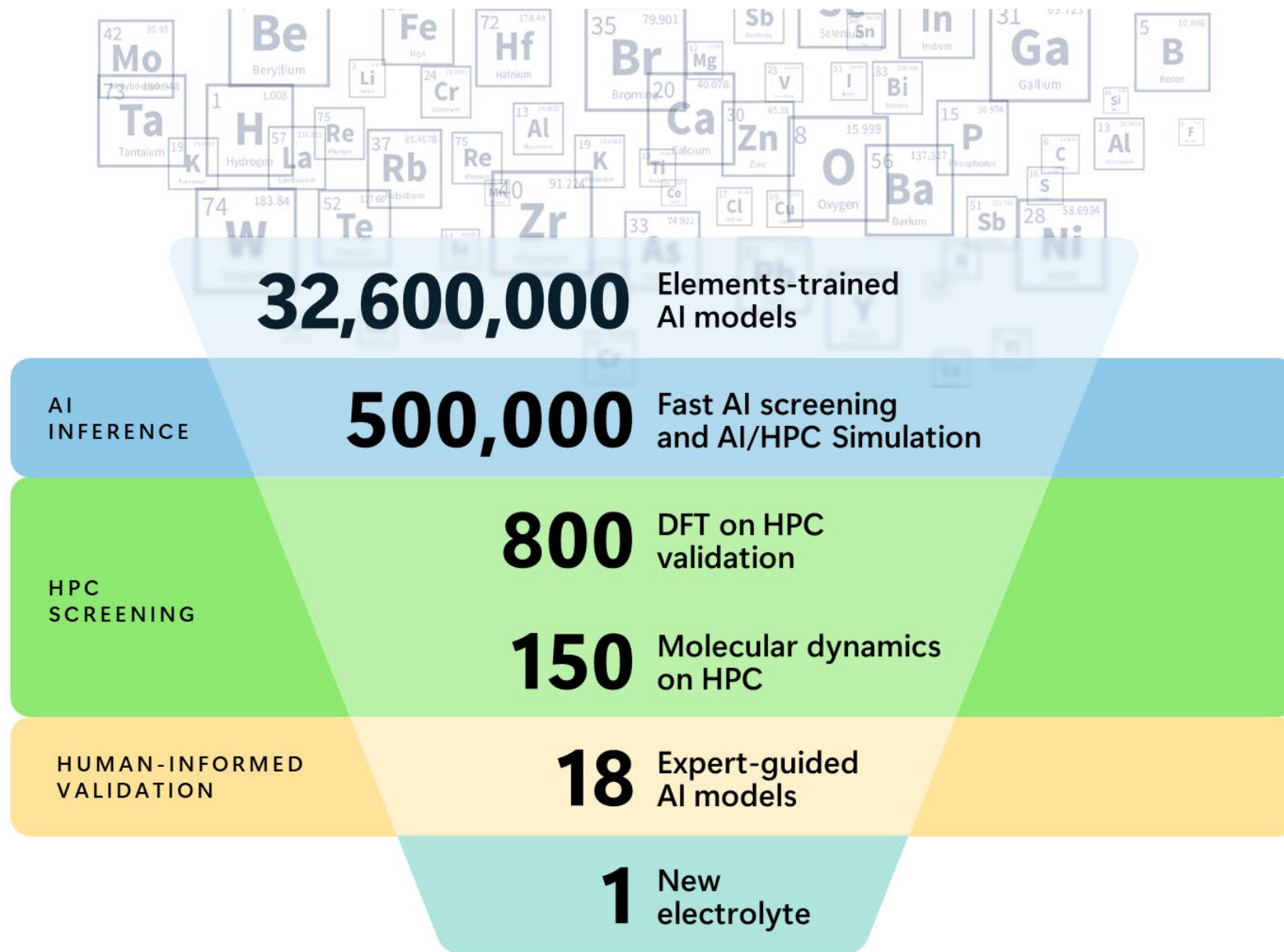


Creative syntheses
Scientific insights



Efficient evaluation

Refining Discovery Workflows



Technical & Sociotechnical Priorities

Resources

Shared models & data
Compute
Tools & pipelines

Empowerment

Skilling
AI + disciplines

Integrity

Scientific validation
Replicability
Provenance & attribution

Responsibility

Ethics & values
Safety (e.g., biosecurity)