

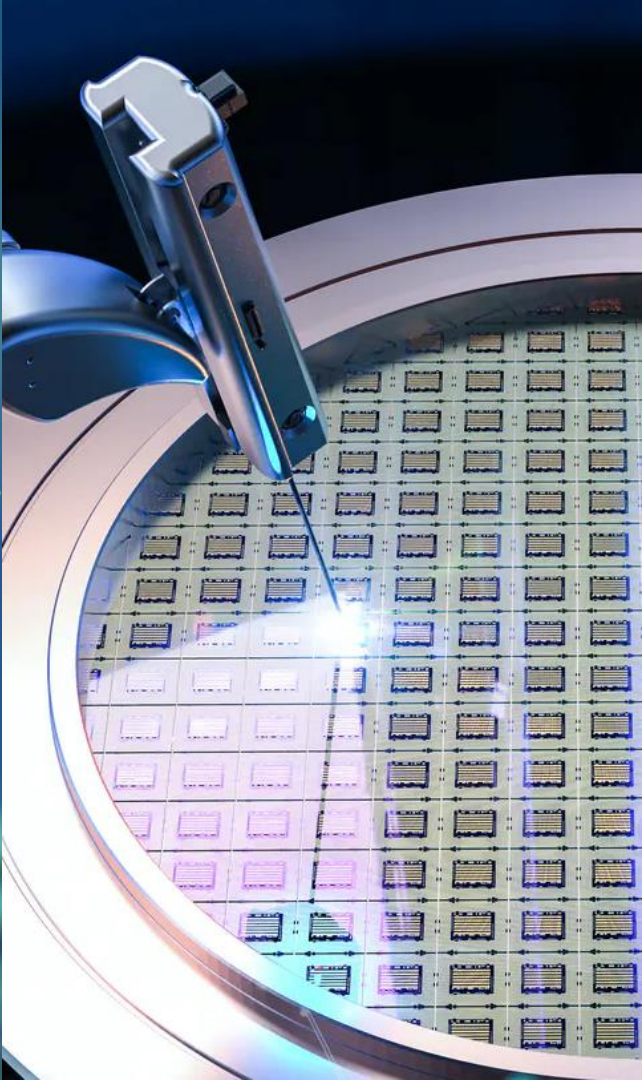
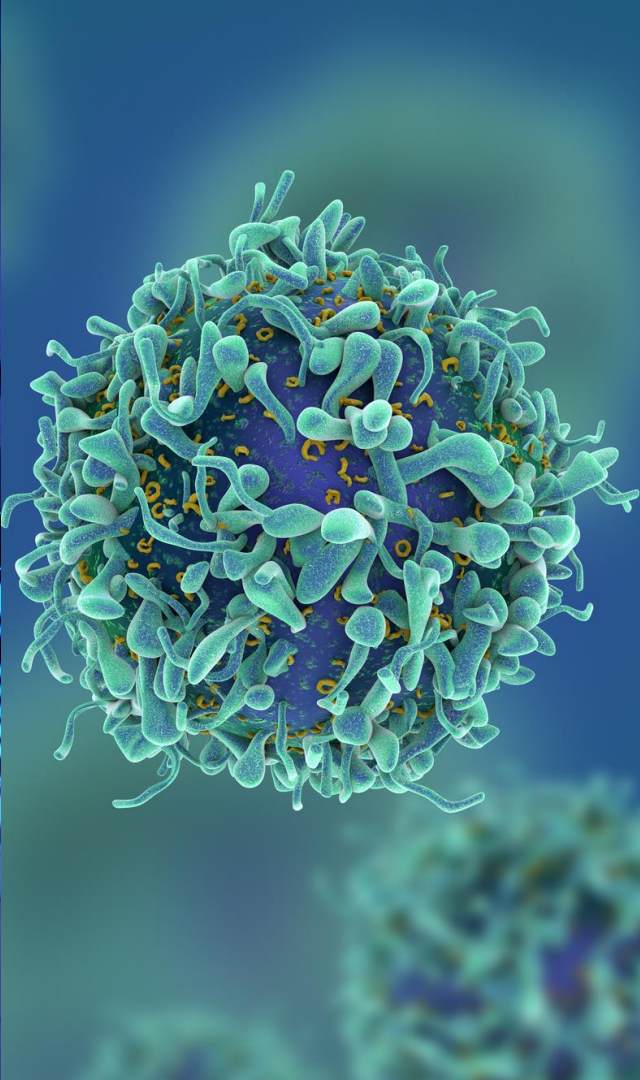
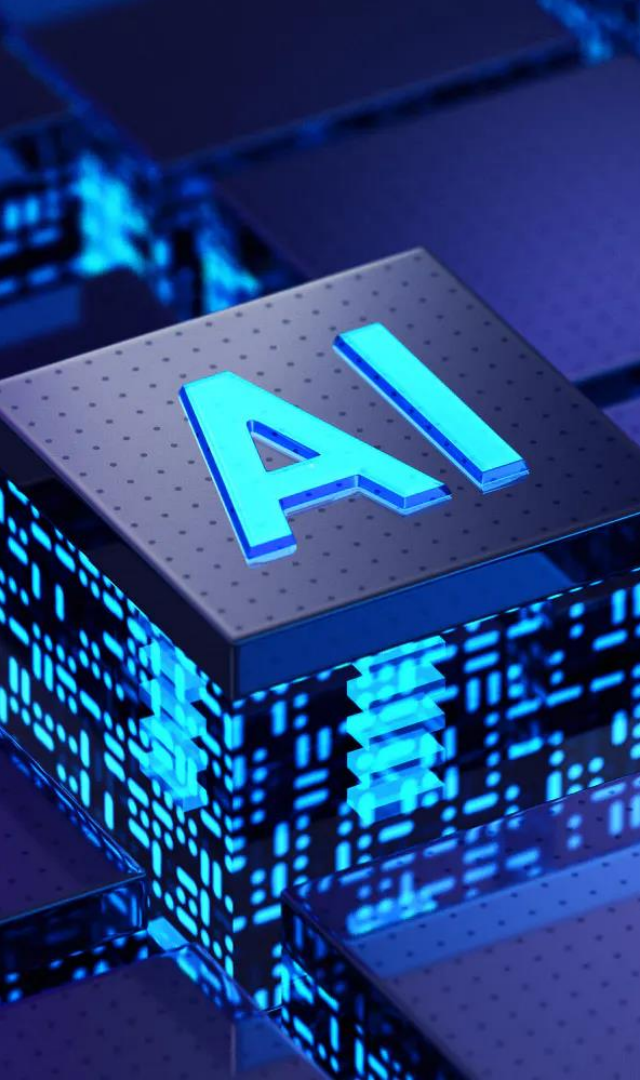


mmeC

AI & Sensing For Health in the Age of Bioconvergence

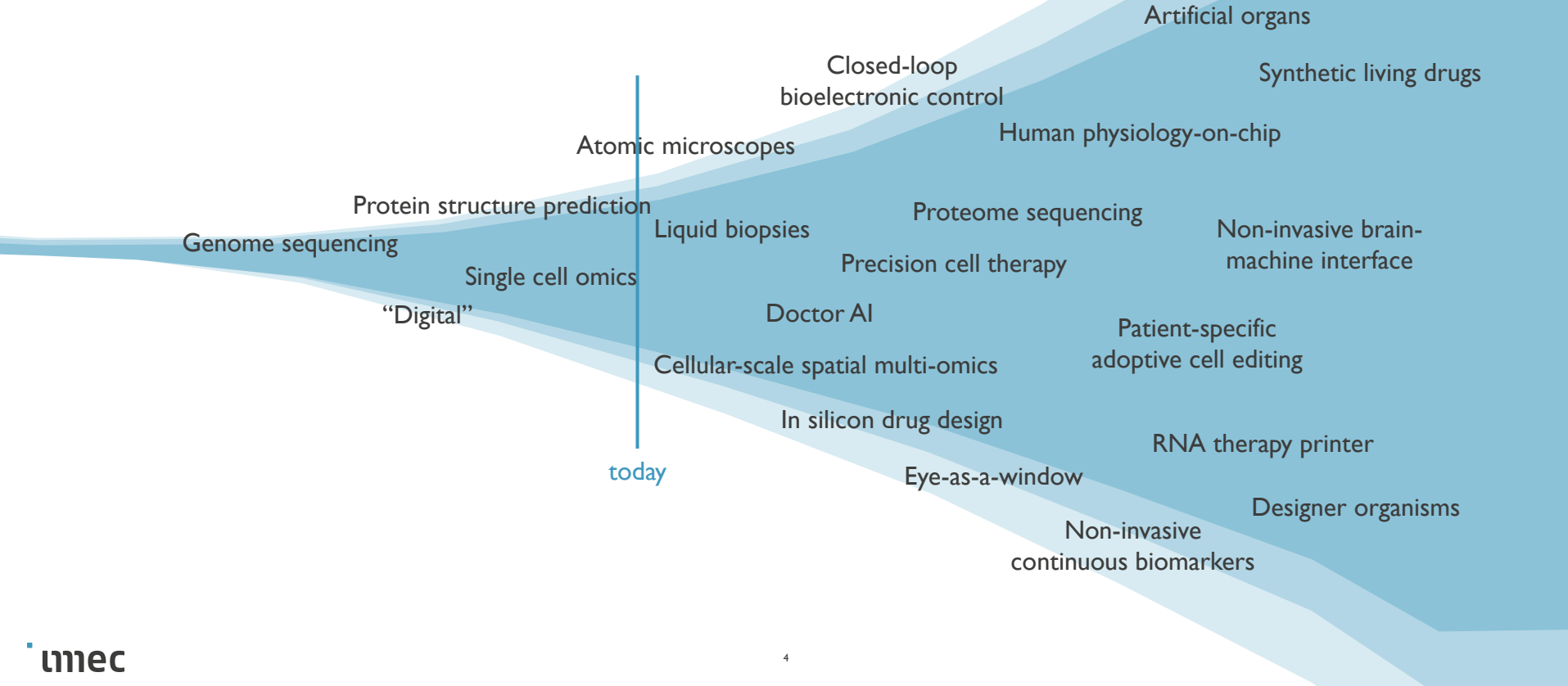
Wouter Van den Bosch





The Cambrian explosion in Bioconvergence has just started

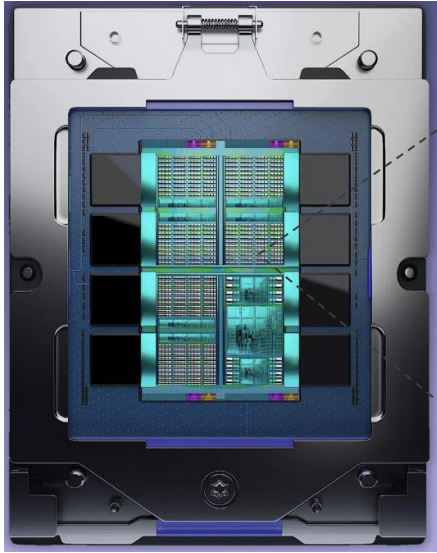
New possibilities at the **intersection of biotech and deeptech** require new technology



Biology at scale is (finally) becoming possible

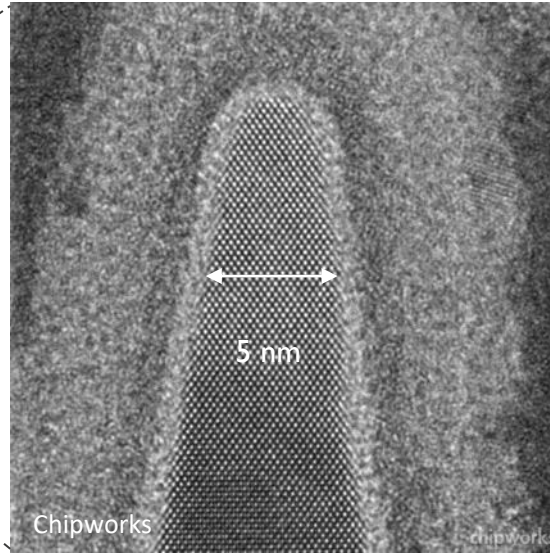
Nanotechnologies that make modern devices possible also provide a unique window into biology

AMD MI300



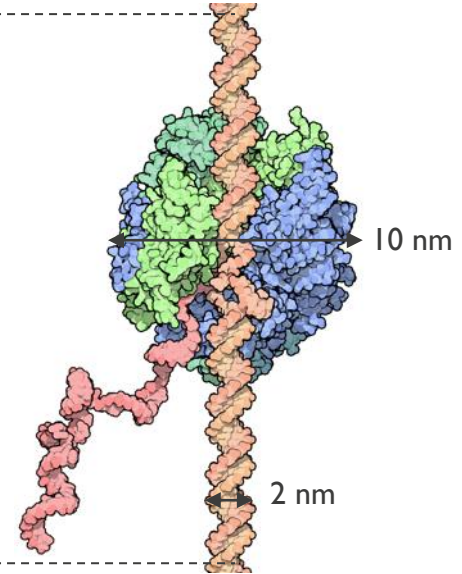
13 chiplets 3D stacked onto interposer, 5 nm FinFET, 146B transistors, 3277 GB/s memory bandwidth, 306 TFlops @ 600 Watt

State-of-the-art transistor



State-of-the-art FinFET, hi-k dielectric, metal gate

RNA polymerase



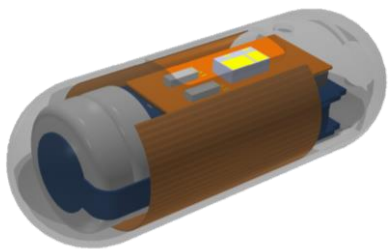
<https://pdb101.rcsb.org/motm/40>

PREVENTIVE HEALTH

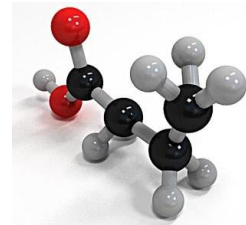
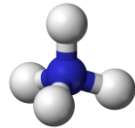
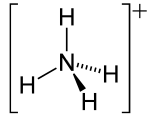
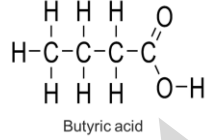
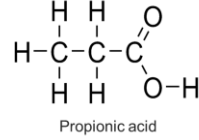
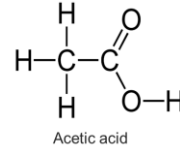
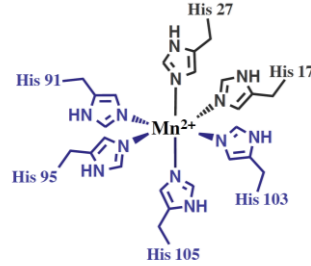




Westernization of diet leads to increased health problems



Sensor innovations to enable (bio)chemical measurements in real-time in an ingestible sensor

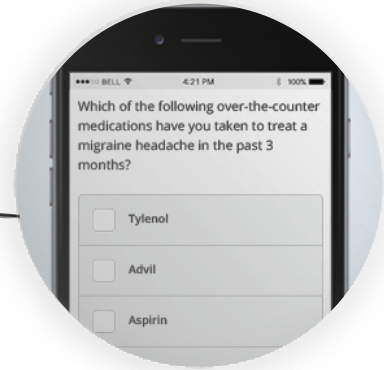


Food & digestion

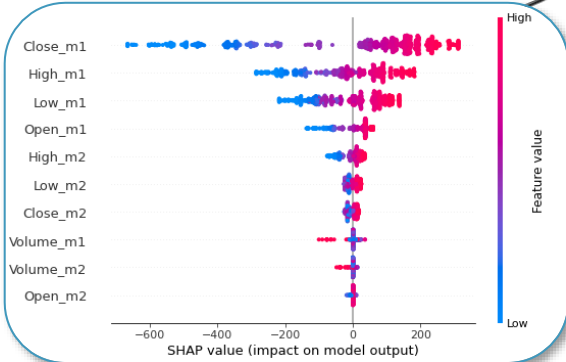
Inflammation

Nutrition/food & microbiome

AI to understand disease

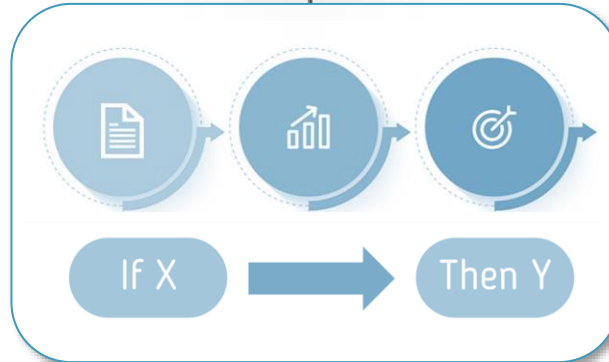


MODEL EXPLAINABILITY



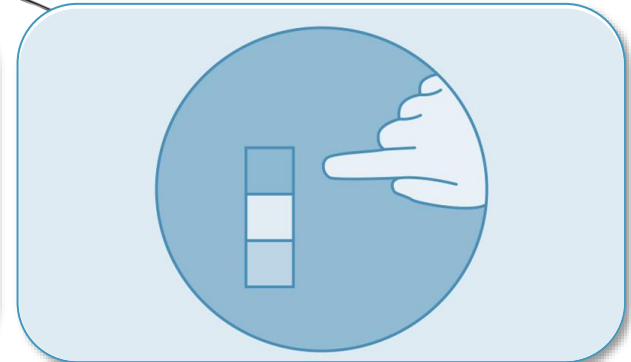
E.g., feature importance

CORRELATION DERIVATION

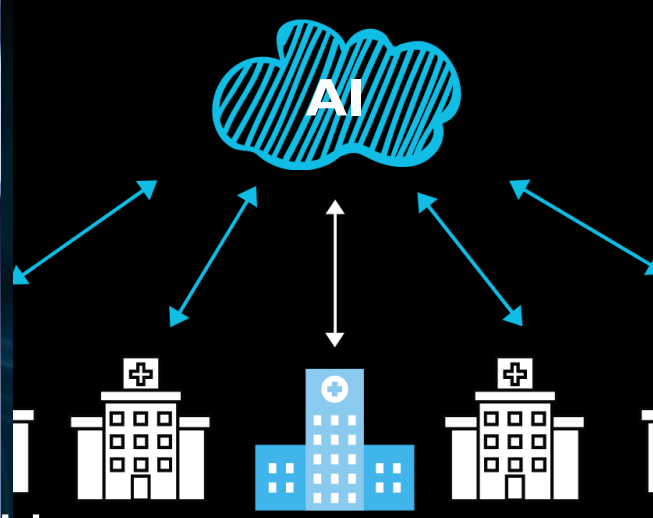


E.g., migraine triggers

CAUSAL AI



E.g., treatment effect



PREVENTIVE HEALTH HEARTFELT

Build an AI-based model using electrocardiogram and electronic patient file data to predict atrial fibrillation.

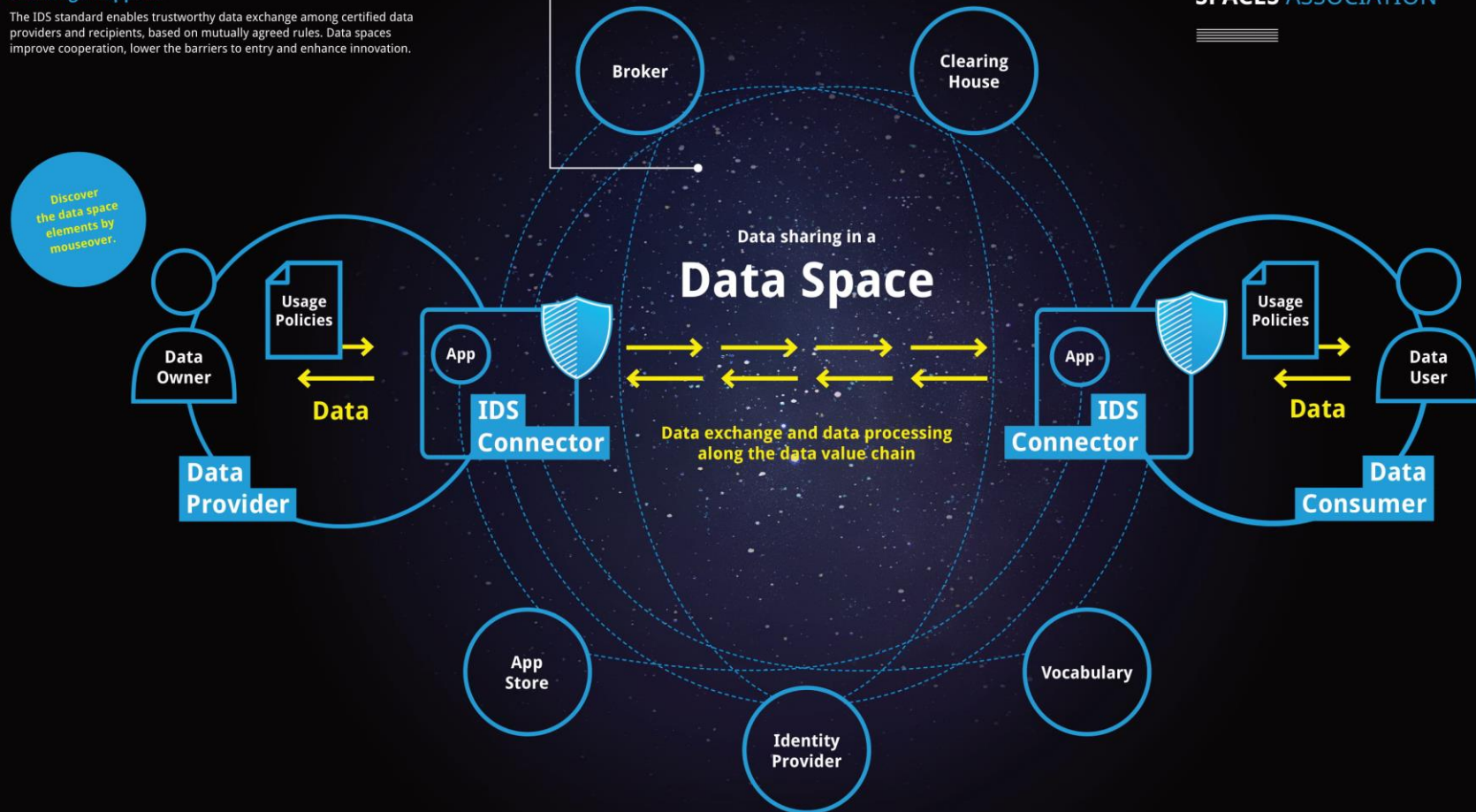
Integrate a federated learning pipeline to allow multiple hospitals to collaborate securely to optimize the model

Build a decision support tool to demonstrate the model's use in a real-world situation

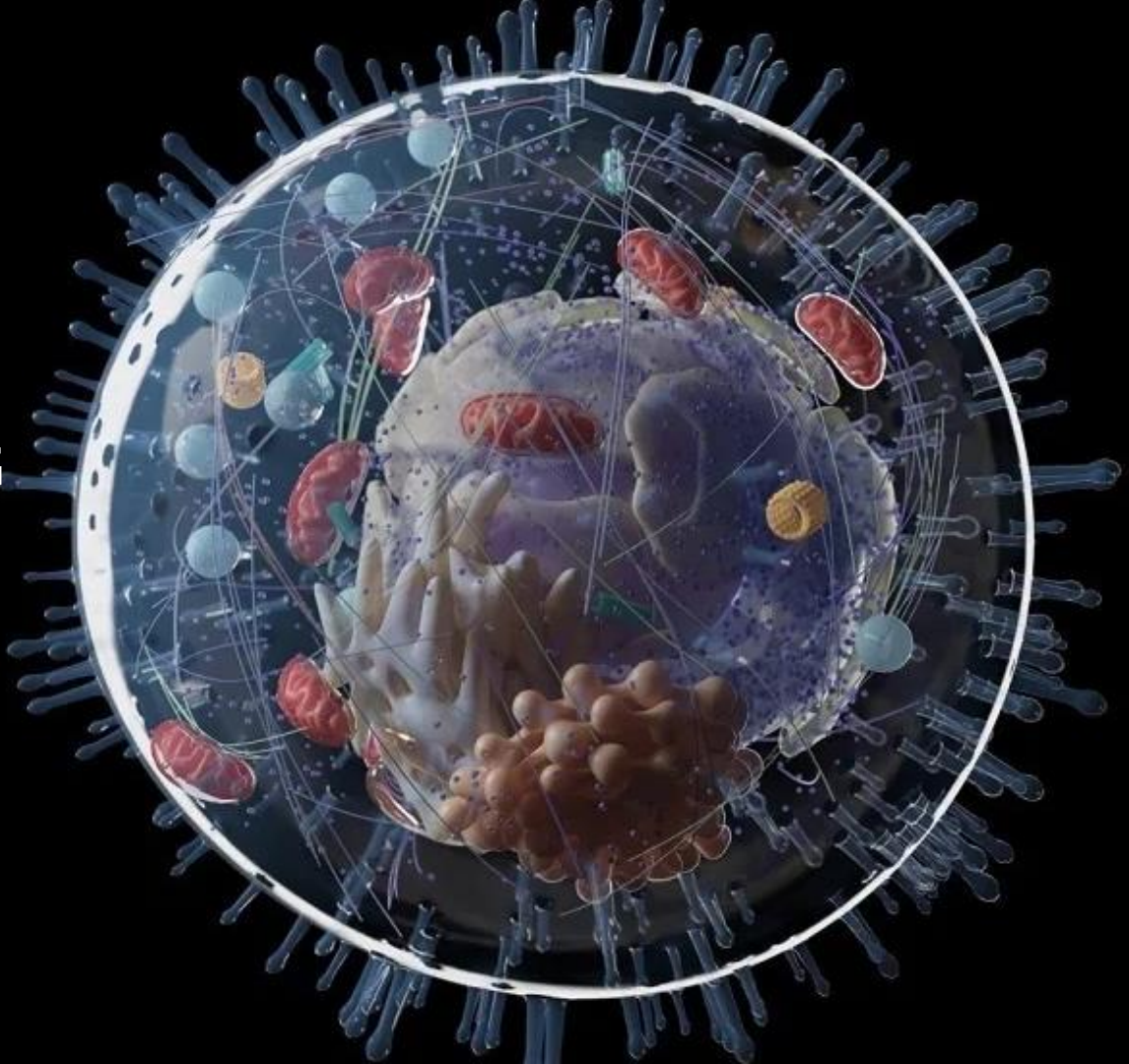
Data spaces are where sovereign data exchange happens

The IDS standard enables trustworthy data exchange among certified data providers and recipients, based on mutually agreed rules. Data spaces improve cooperation, lower the barriers to entry and enhance innovation.

INTERNATIONAL DATA
SPACES ASSOCIATION



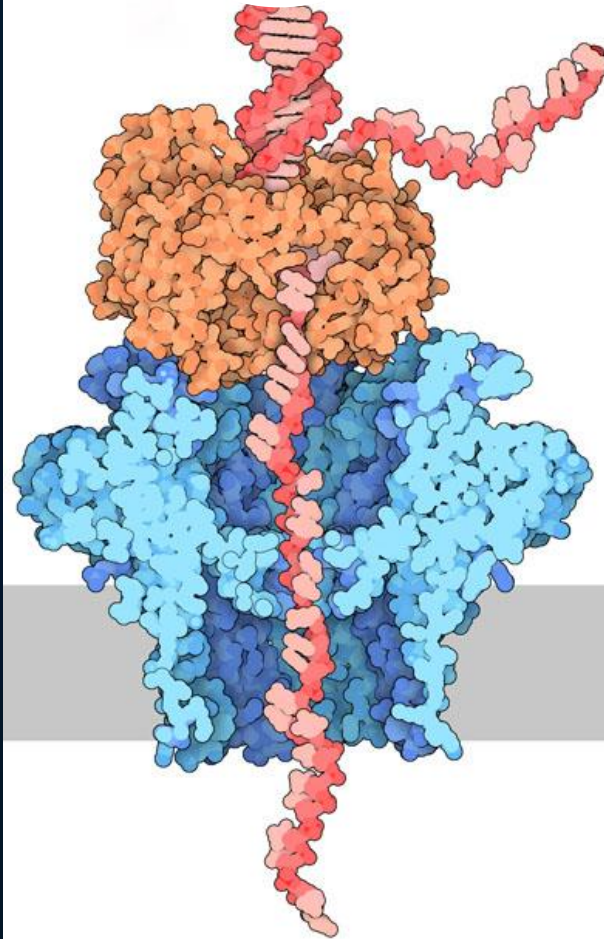
UNDERSTANDING DISEASE & DIAGNOSTICS



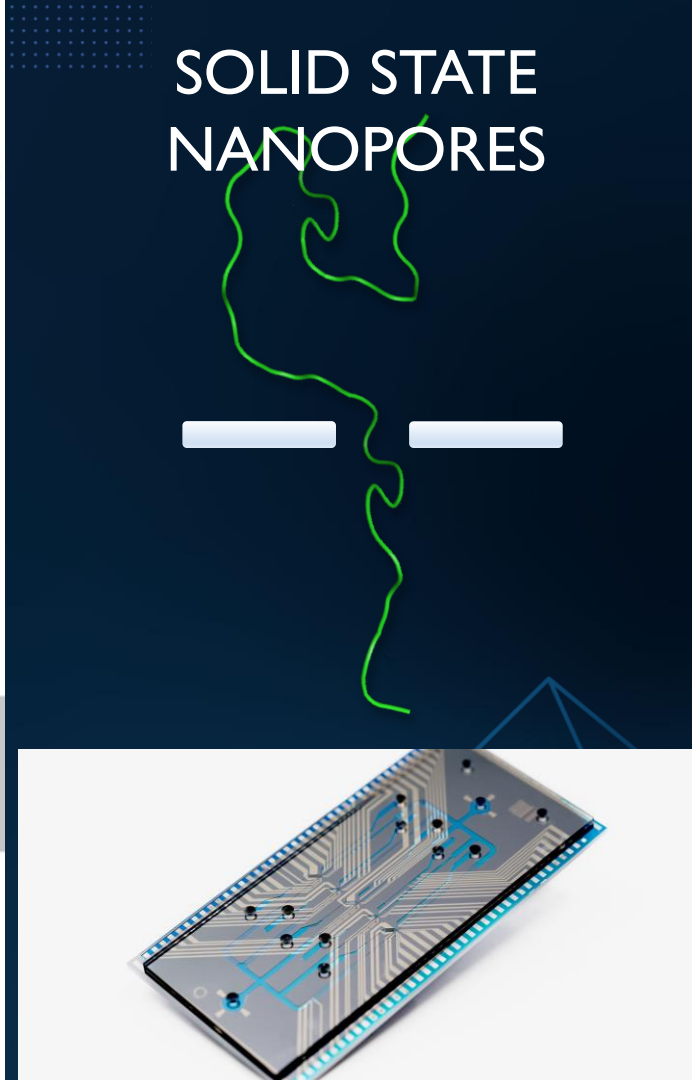
PROTEOMICS



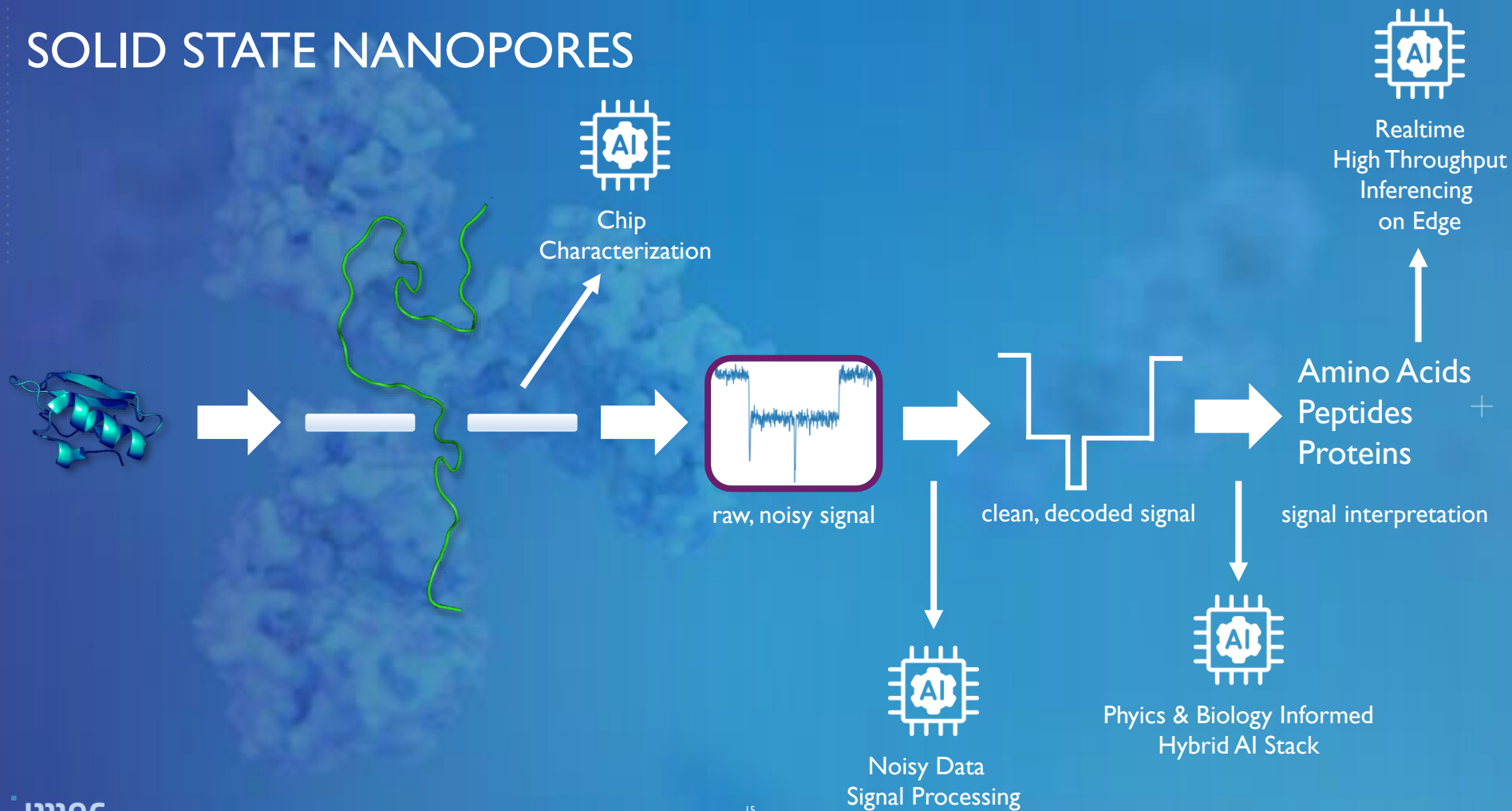
NANOPORES



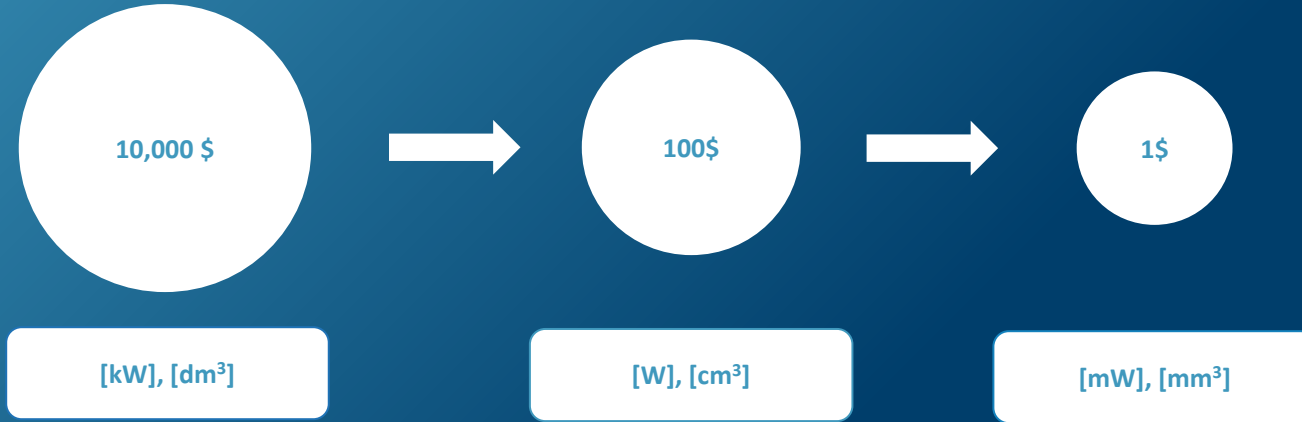
SOLID STATE NANOPORES



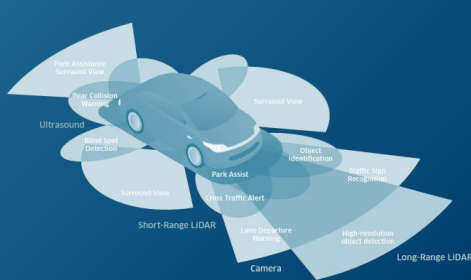
SOLID STATE NANOPORES



Our goal with AI : driving down cost and power at the **edge**



...while (edge sensing) TOPS requirements are increasing exponentially

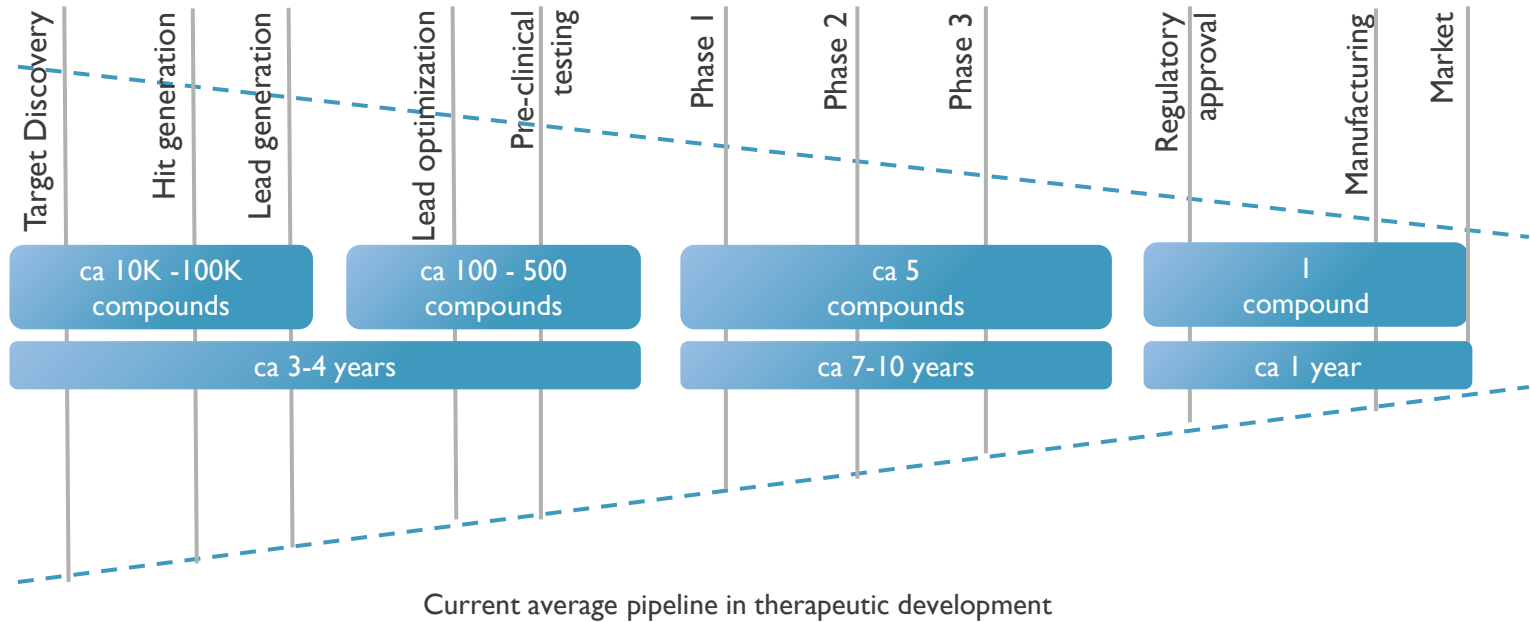




DRUG DISCOVERY & DEVELOPMENT

Therapeutic discovery and development

Increasing timelines



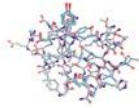
Advanced therapies and their manufacturing

Novel powerful and complex therapeutics require new R&D and manufacturing tools



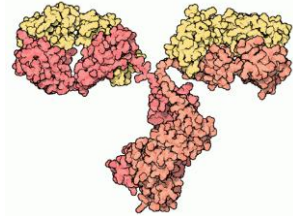
Aspirin

1899



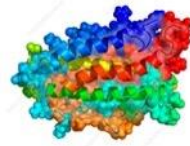
Insulin

1982



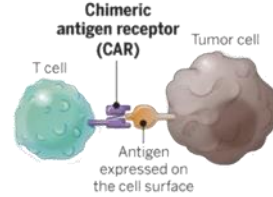
Monoclonal antibody

1986



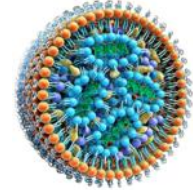
Erythropoietin

1989



Engineered cells (e.g. CAR-T)

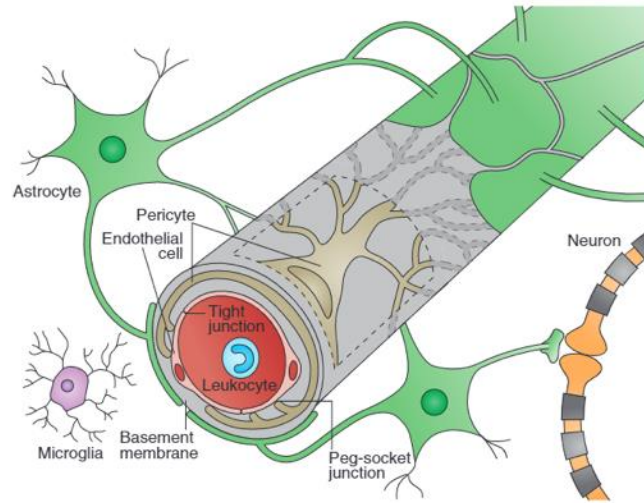
2017



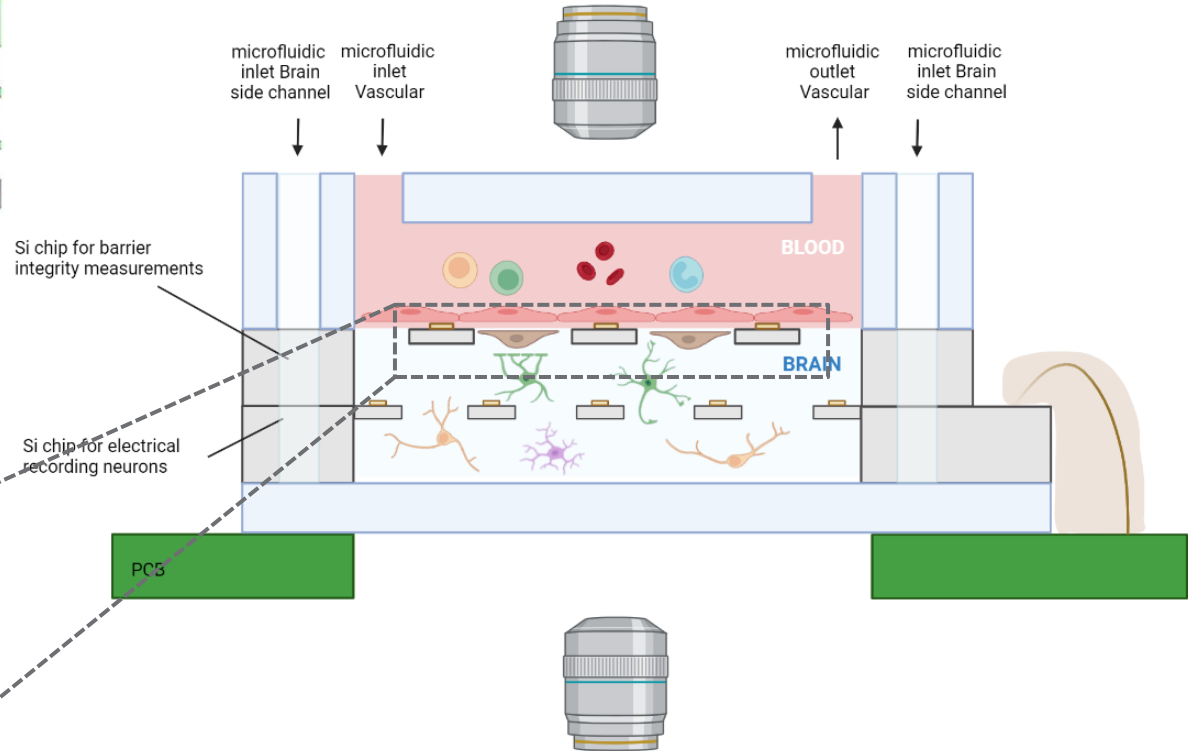
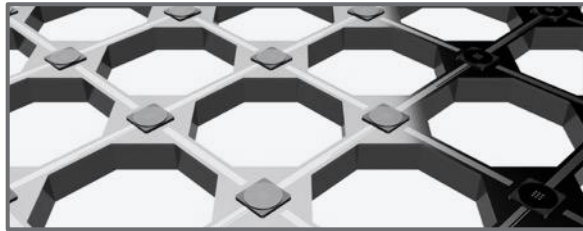
Lipid nanoparticle packaging mRNA

2020

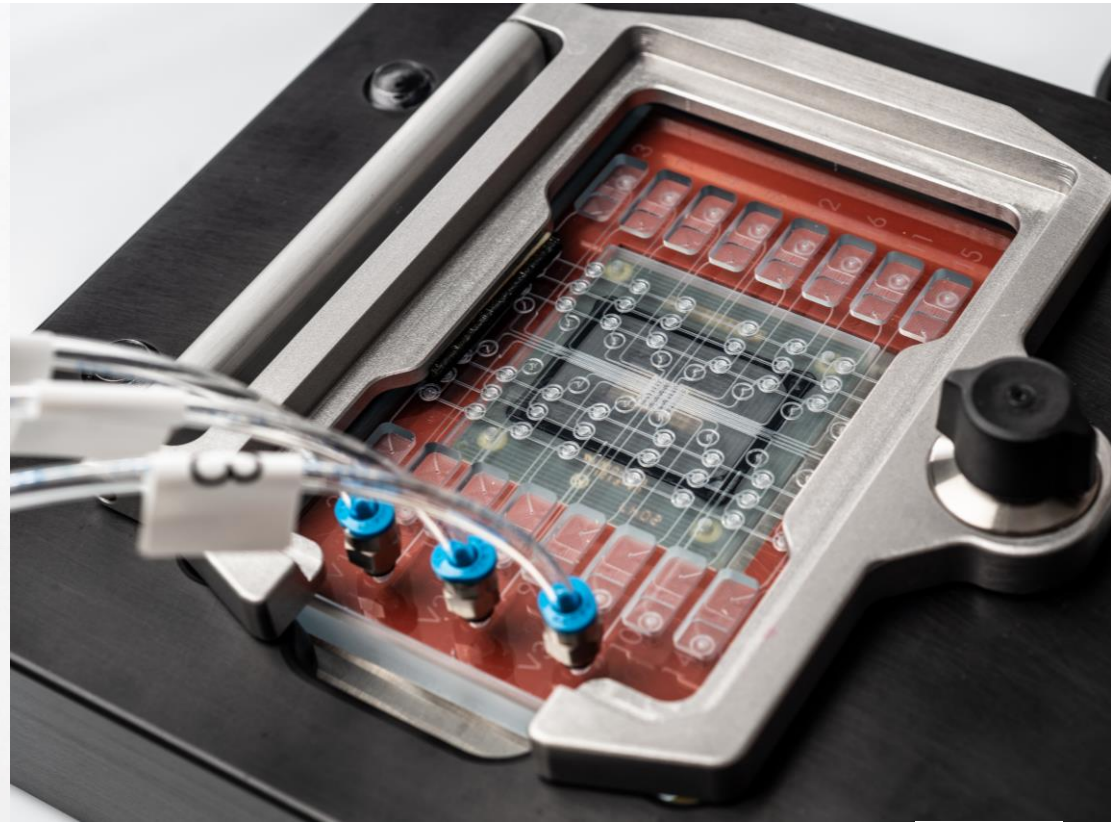
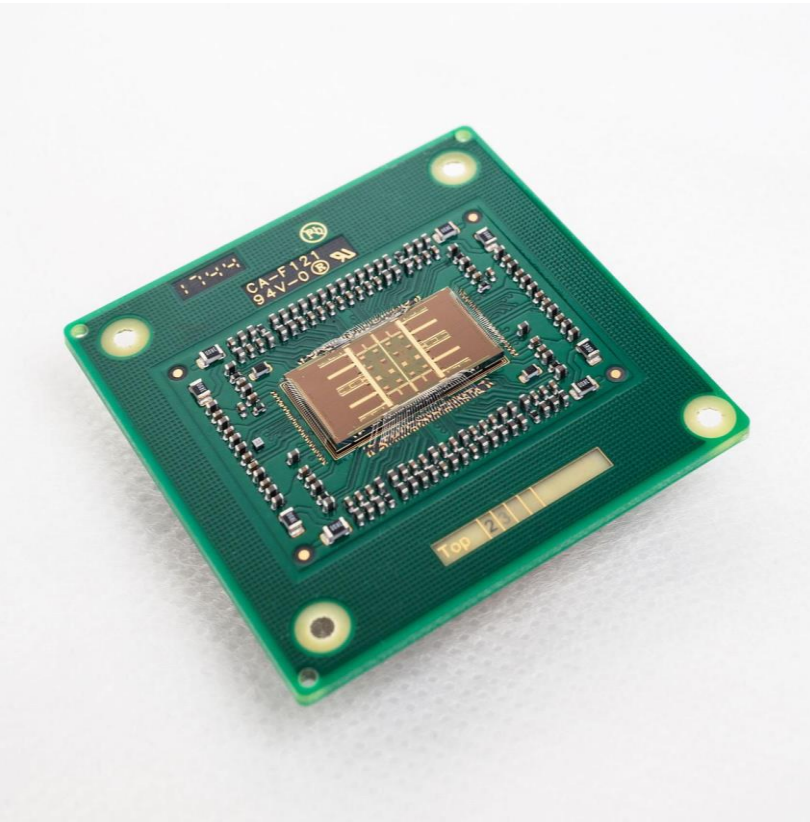
Using full stack engineering to enable true 3D tissue-on-chip



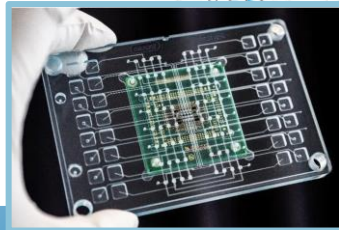
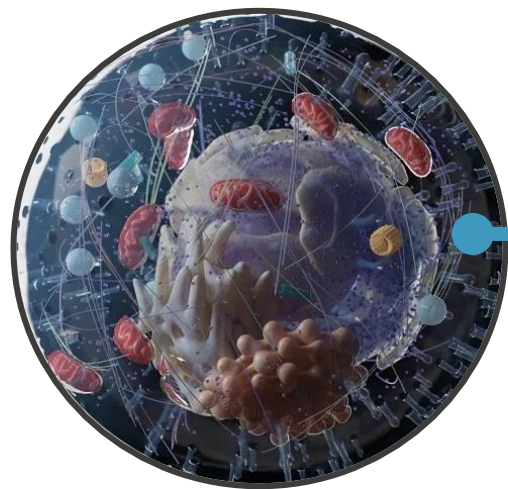
Obermeier et. al., Nat. Med., 2013



Toward industry-compatible high-throughput systems



IN SILICO DRUG DESIGN



WET LAB



LIGAND GENERATION

DRUG CANDIDATE

MOLECULAR DYNAMICS



PROPERTY PREDICTION



mec

embracing a better life