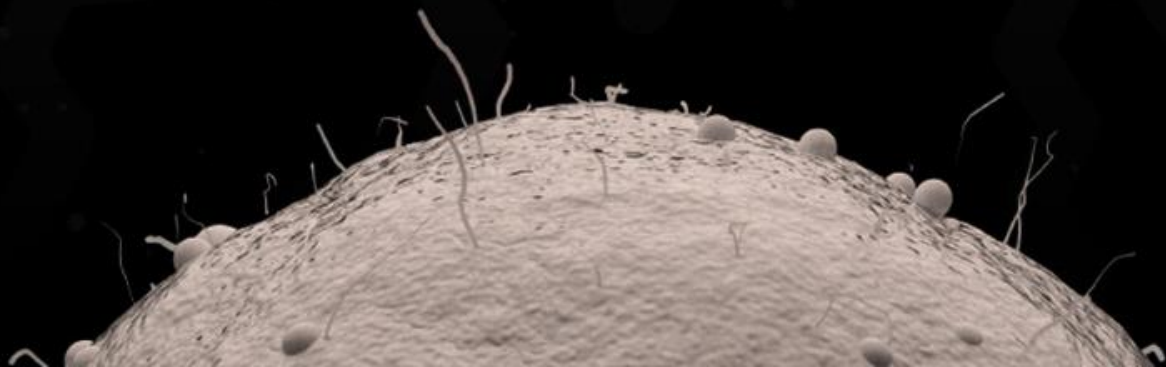




Building a predictive
Simulated Cell



Daily life at pharma..

DRUG DEVELOPMENT

IDO rout: Pivotal trials with Bristol-Myers, Merck and AstraZeneca dumped in wake of PhIII implosion

BIOTECH VOICES, R&D

Pharma's broken business model: An industry on the brink of terminal decline

RESULTS, SETBACKS

Roche's big PhIII Tecentriq/Cotellic combo study for colon cancer fails, damaging Exelixis shares

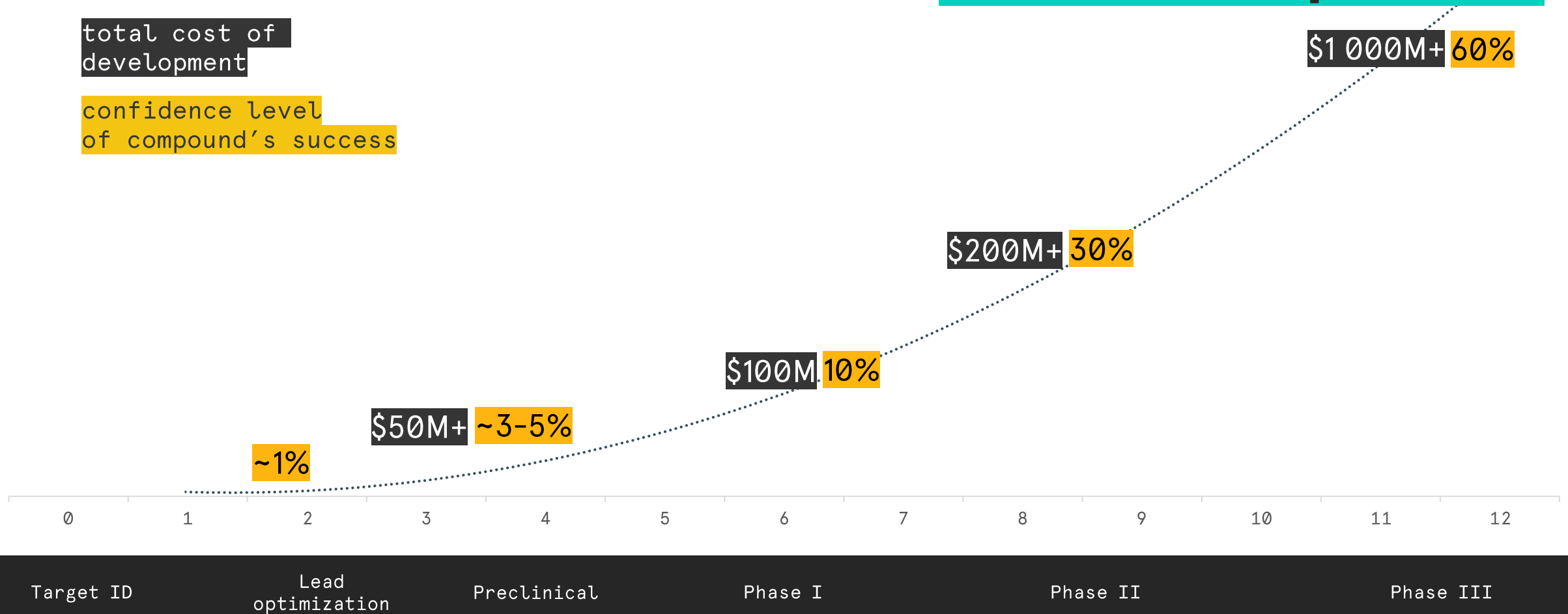
BIOTECH

Incyte's cancer drug fails trial, marking major blow for immunotherapy combination treatment

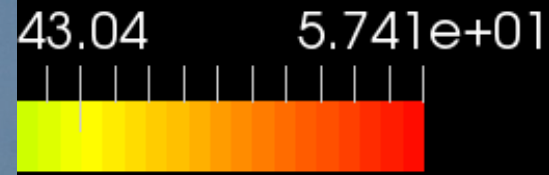
Gaining confidence in drug efficacy with current tools is slow & expensive

total cost of development

confidence level of compound's success



Trying to build this..



..without this

The Simulated Cell's track record

100M

simulated cells
analyzed / day

2x

as promising findings
as current workflow

15k

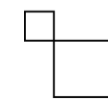
validated
experiments



SEMMELWEIS
UNIVERSITY

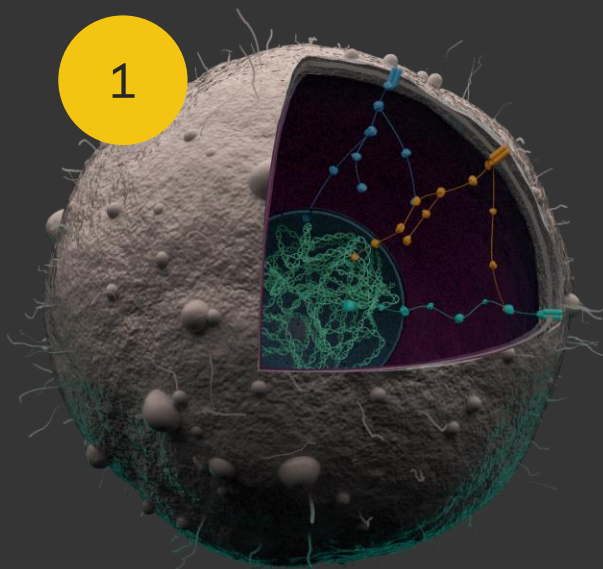


**UNIVERSITY OF
CAMBRIDGE**



Transforming Medicine
THE ELIZABETH KAUFFMAN INSTITUTE

Turbine simulates biological behavior to generate data for machine learning



Simulated Cell



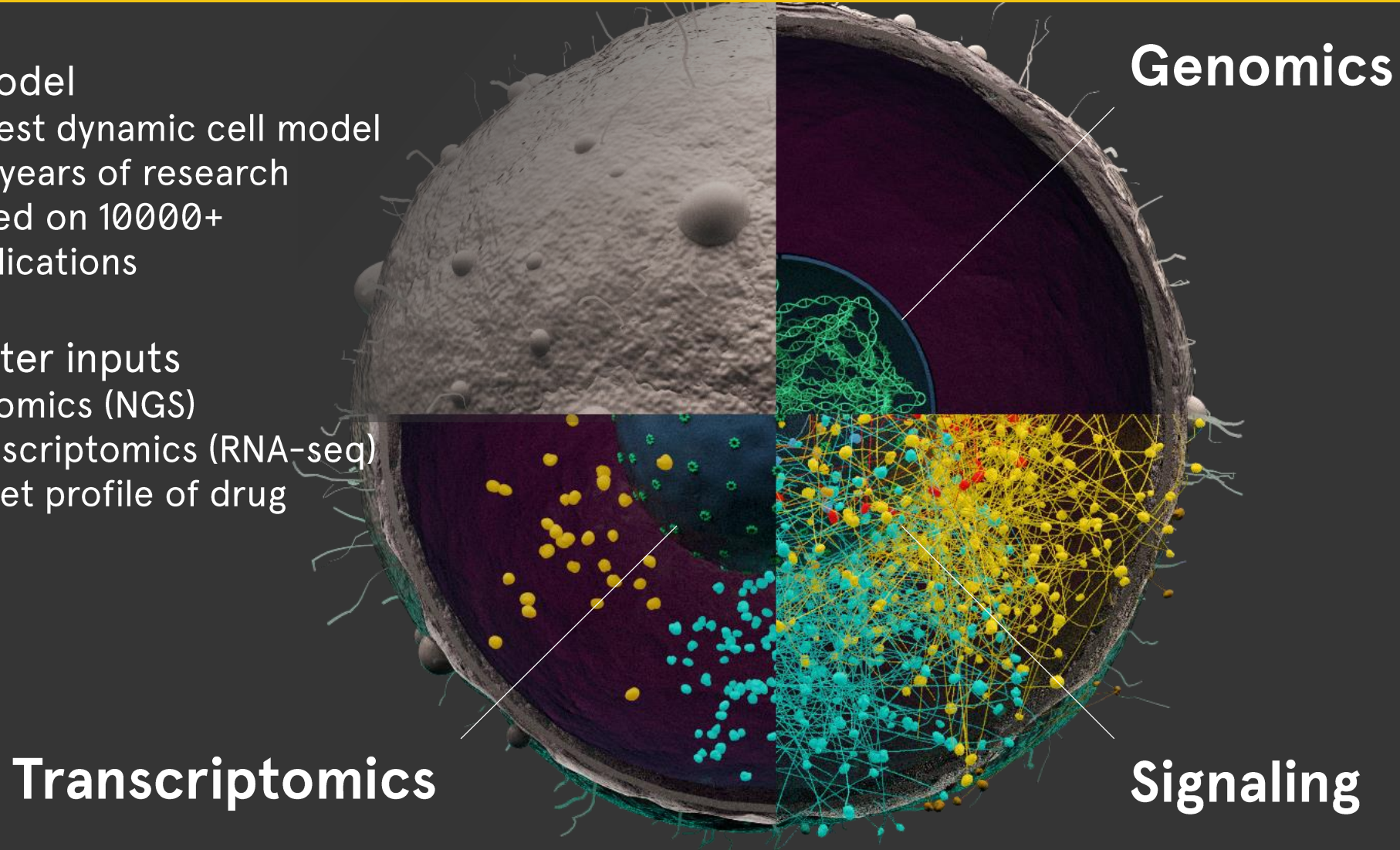
Behavior modeling



Learning and
interpretation
with AI

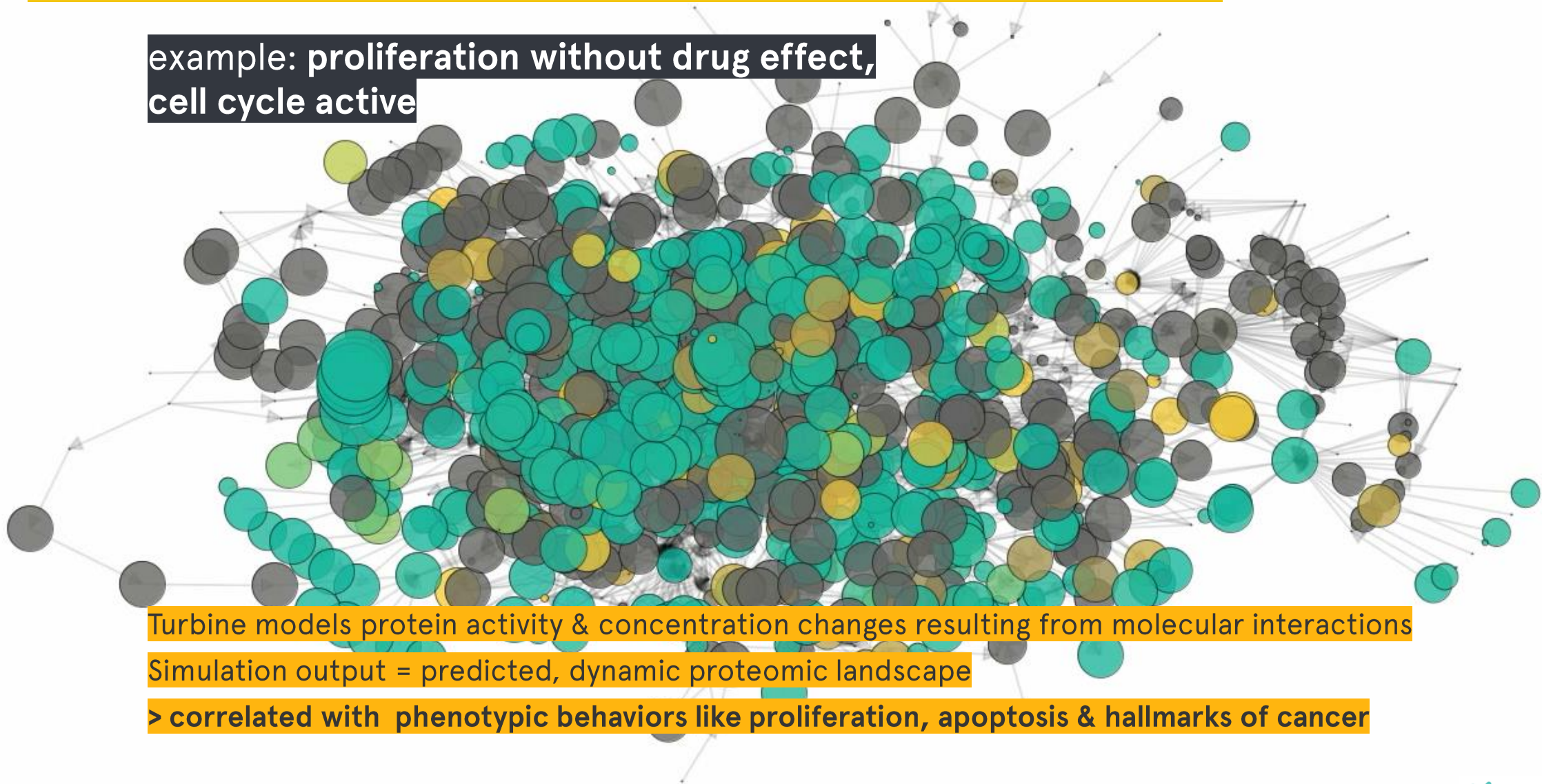
Integrating data in Simulated Cell model

- Base model
 - largest dynamic cell model
 - 15+ years of research
 - based on 10000+ publications
- Parameter inputs
 - genomics (NGS)
 - transcriptomics (RNA-seq)
 - target profile of drug



Simulated biological behavior

example: proliferation without drug effect,
cell cycle active

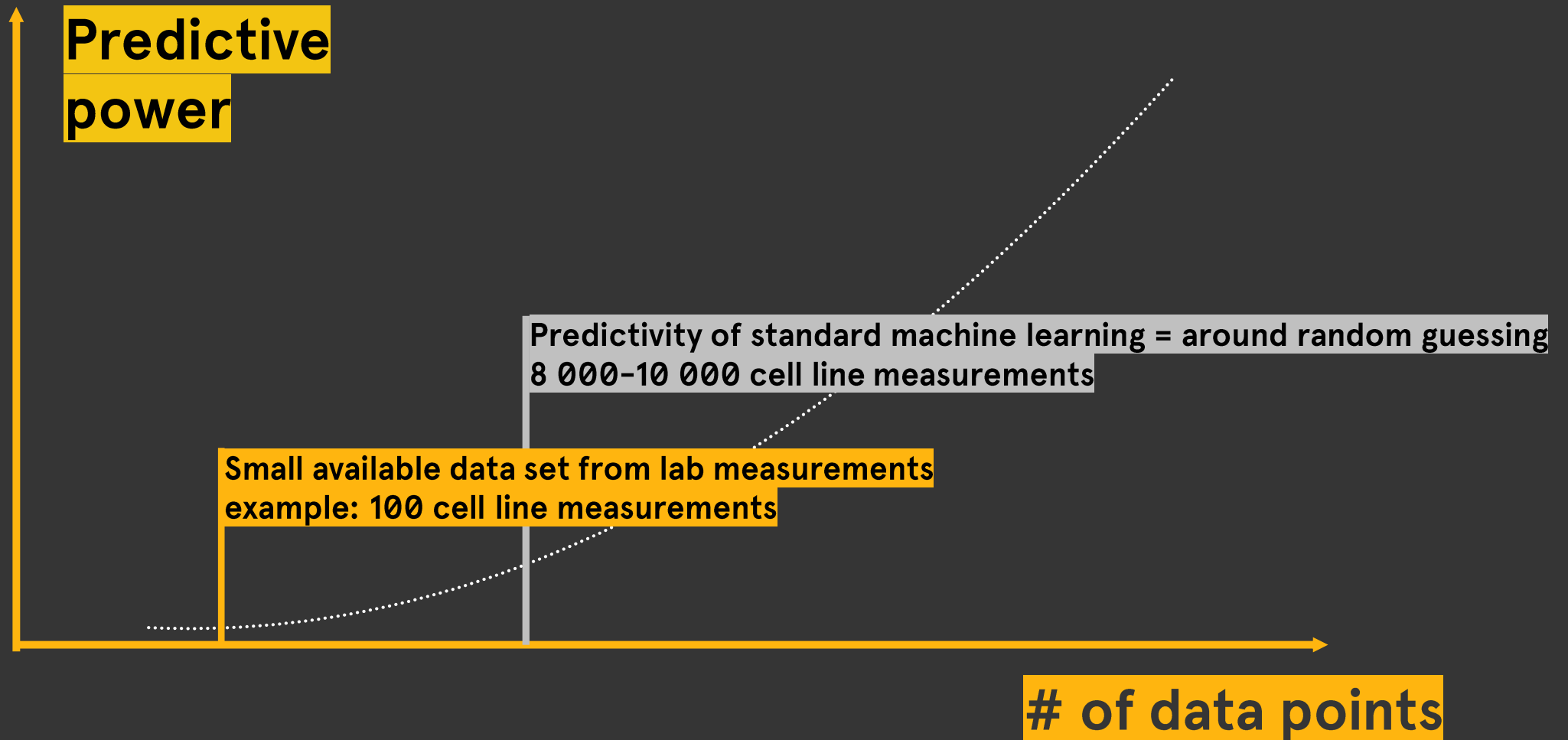


Turbine models protein activity & concentration changes resulting from molecular interactions

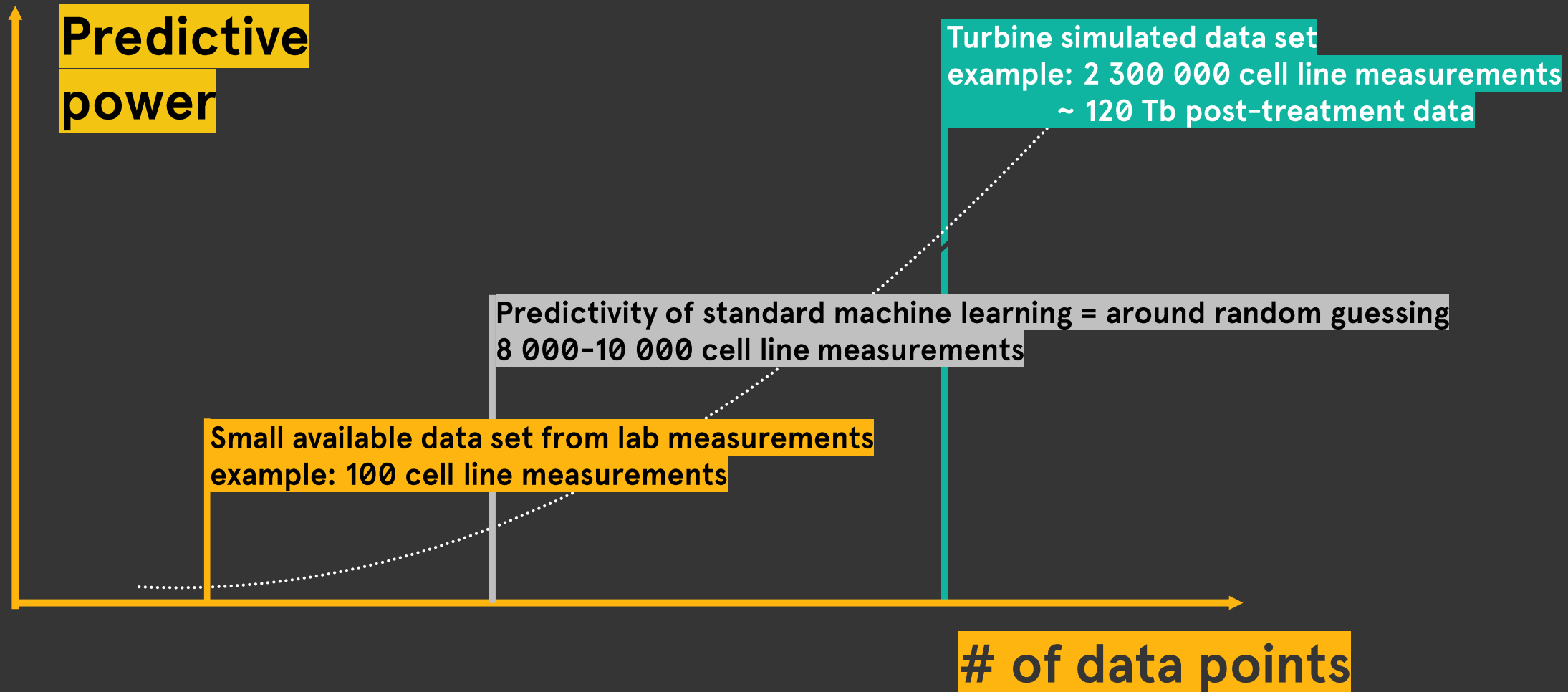
Simulation output = predicted, dynamic proteomic landscape

> correlated with phenotypic behaviors like proliferation, apoptosis & hallmarks of cancer

Predictions on simulation output



Cost & speed of data generation is orders of magnitude more efficient than traditional labs, enabling machine learning on simulated datasets





Combination therapy design

- synergistic combinations in search space unfeasible in lab
- block escape routes of cancer
- simulate optimal dosing



Biomarker identification

- complex biomarkers of sensitivity or resistance
- compare responder and non-responder patient populations
- ID best fitting patients



Understanding cancer biology

- novel biological mechanisms impacting drug response & driving cancer behavior

Sensitivity biomarkers for DDR inhibitor

Problem: DNA damage is complex, hard to deconvolute

Workflow

60 cell lines



2M different
cells simulated

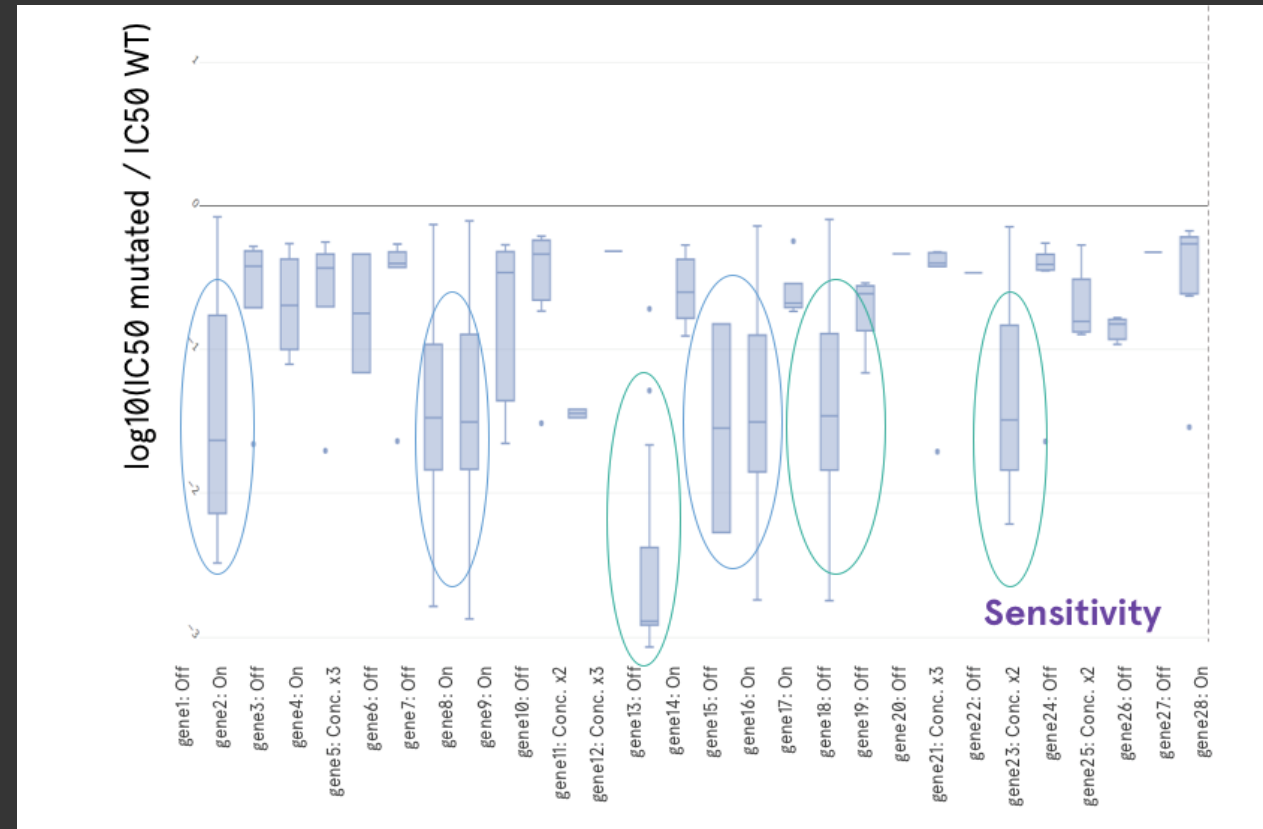


16 biomarker
hypotheses



7 effects
validated

Single gene biomarkers impacting sensitivity, strong effects validated



Combination search for RTK inhibitor

Problem: designing novel combination strategy for a well-researched MoA

Workflow

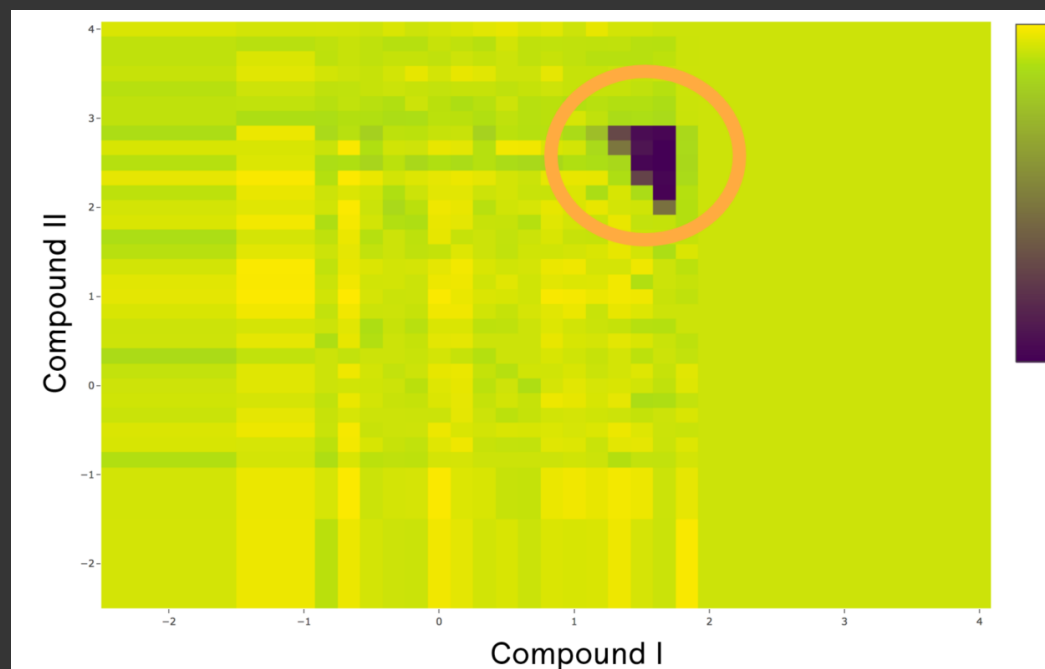
20 combination partners

100k *in silico* experiments

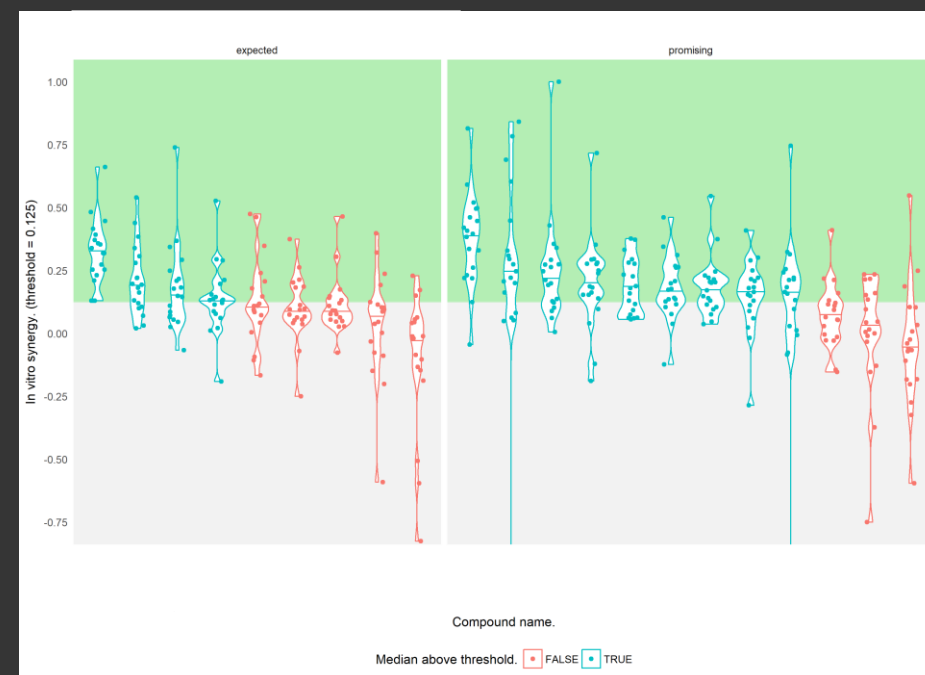
21 suggestions

13 validated combinations

Compound I & Compound II combination synergy heatmap



Validated 62% of proposed combinations, esp. novel ones



Optimizing computationally unsolved steps of drug discovery

Target ID Molecule search



Biological modeling



Challenges:

- low quality datasets from various lab and clinical protocols
- too little data for training traditional AI

Turbine's advantage:

- + accurate predictions of biological response with general simulated cell model
- + generate own, simulated data for machine learning
- + integrate several, different datasets = faster scale-up in predictivity

Clinical decision making



Target ID

Lead
optimization

Preclinical

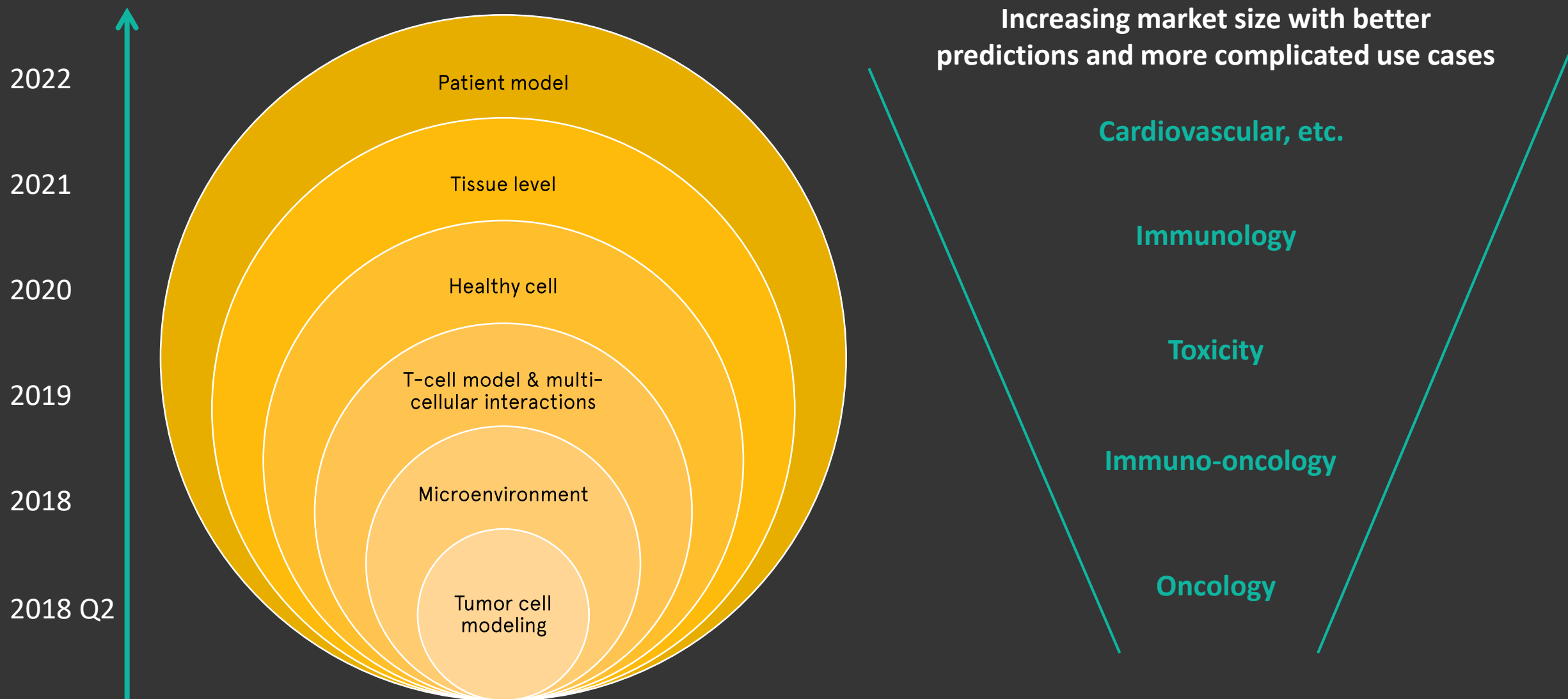
Phase I

Phase II

Phase III

Clinical
decisions

General Simulated Cell enables novel use cases and disease areas at fraction of initial investment



30 AI experts, biologists and data scientists who are
happy to optimize your development strategy

