

Rapid Evaluator Talk

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Will Patrick

Career Highlights



X

Rapid Evaluator
2011-2013

MIT Media Lab

Research Assistant
2013-2015

Culture Bio

CEO and Co-Founder
2016 - 2025

Culture Biosciences

Traction

- Used by >100 biotech companies
- ~\$10M annualized revenue
- >\$30M revenue / yr expected by '27

Company building

- Raised \$100M
- Hired 100+

Service



Stratyx250

Personal Life



Family



Community Building



Creative Projects

Family



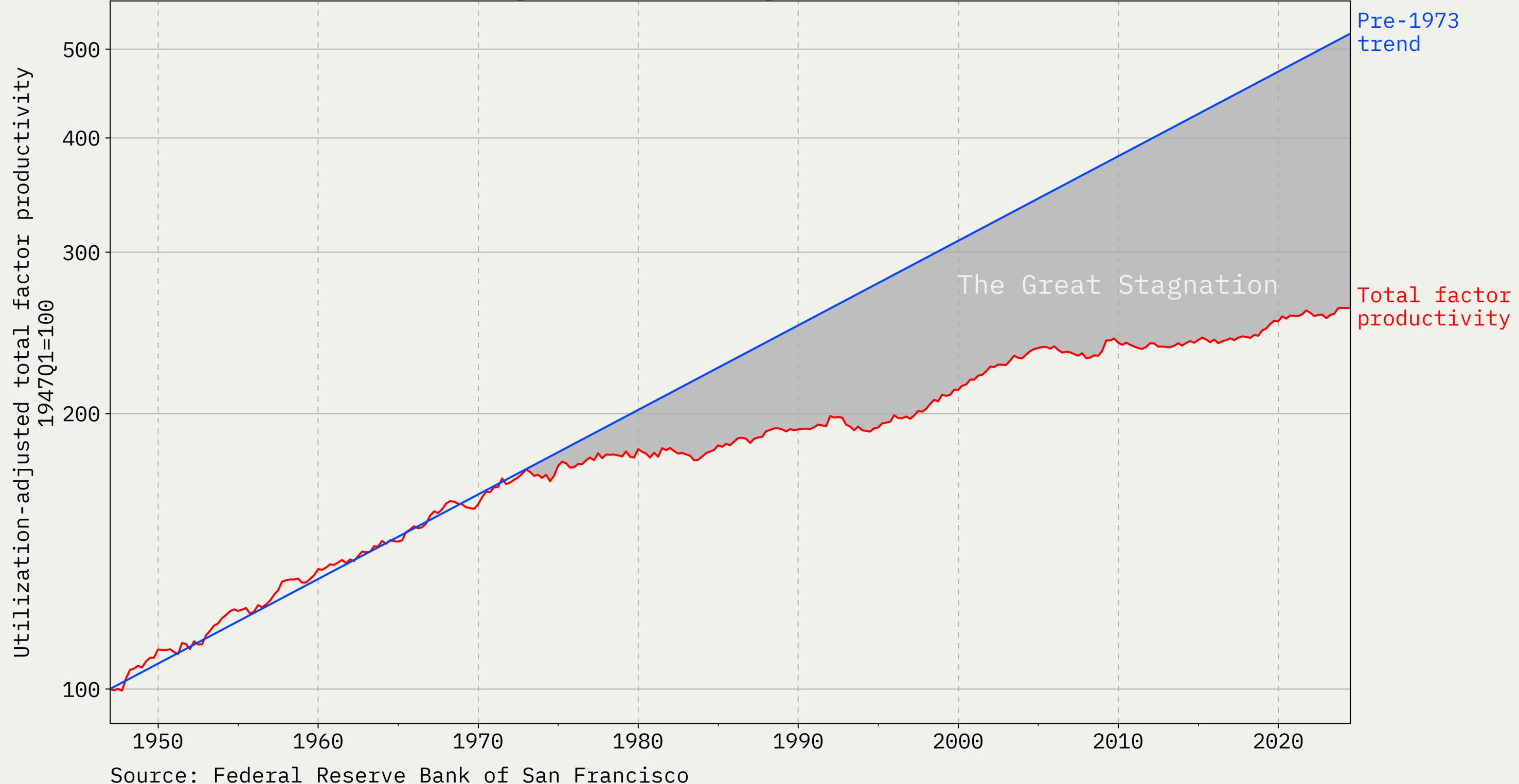
Will
Rachel
Jasper (3)
Mae (1)

What motivates me?

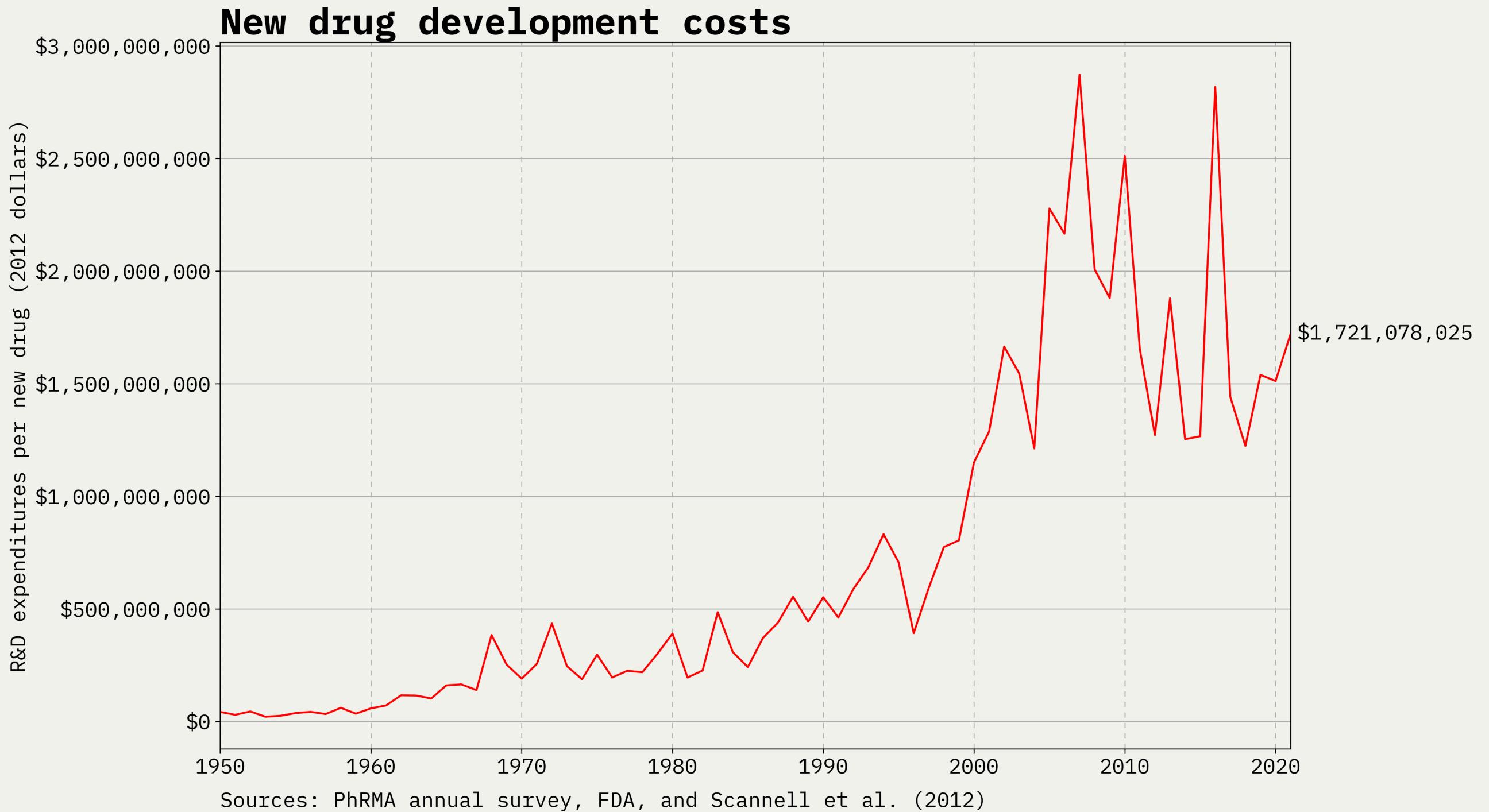
Helping solve big problems

How can we increase productivity?

U.S. total factor productivity

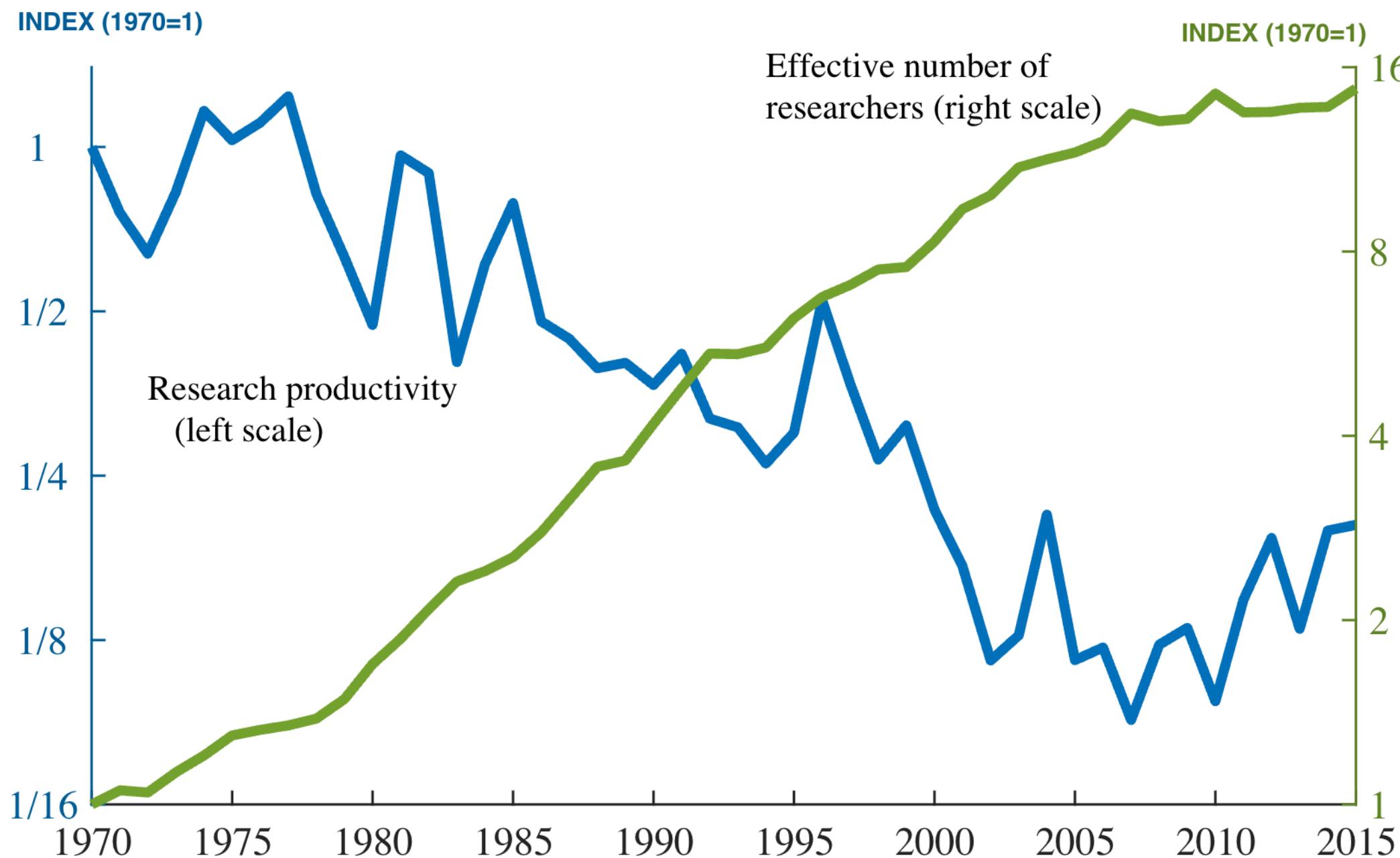


How can we increase productivity of biotech R&D?



How can we make researchers more productive?

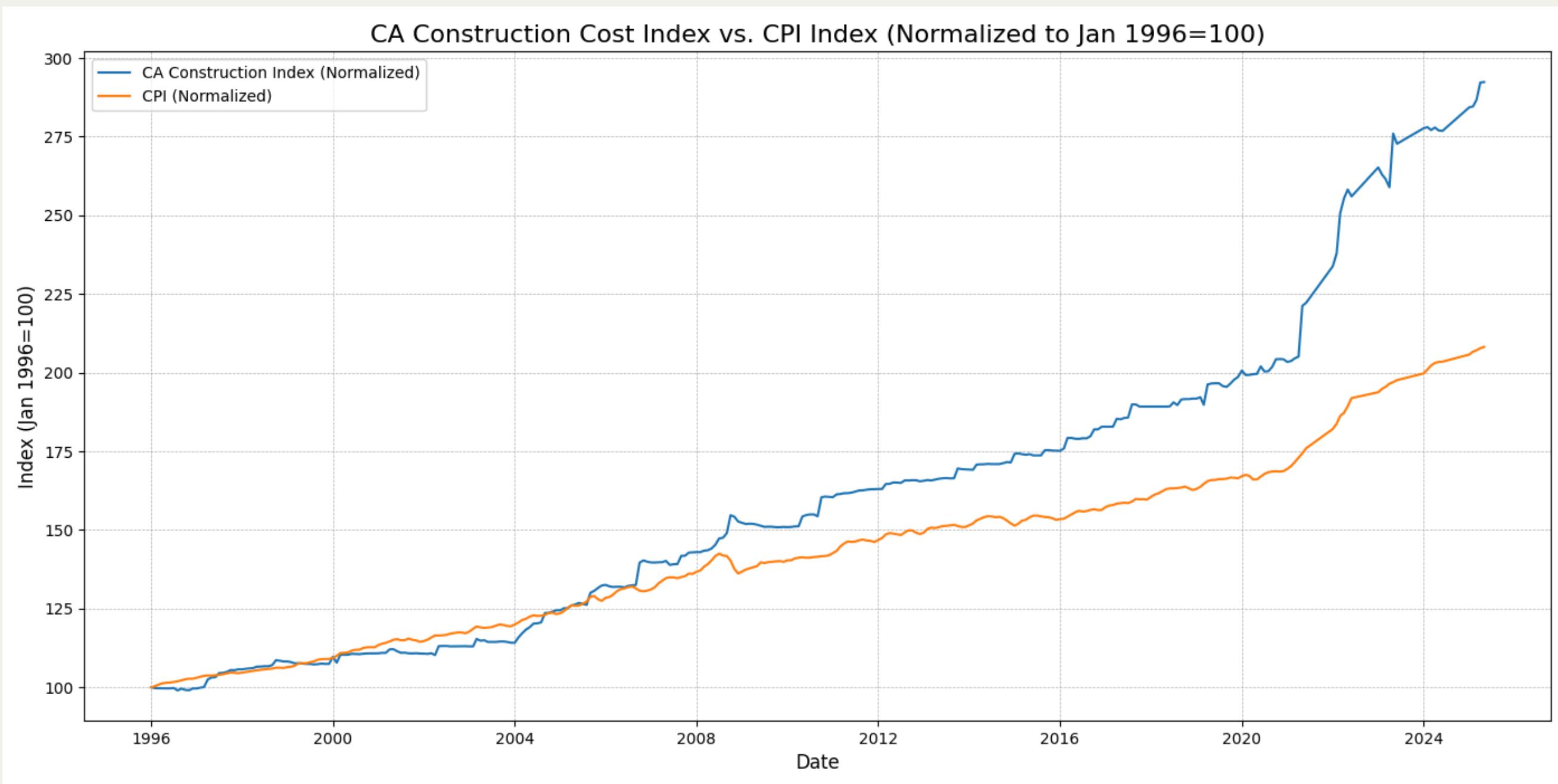
Figure 9: Research Productivity for New Molecular Entities



Data show that ~8X more researchers per new drug in 2015 than 1970

From: Bloom et al (2017)

How can we lower housing costs?



California building construction Costs have increased ~80% adjusted for inflation in last 30 years

Data Sources: California Construction Cost Index, Bureau of Labor Statistics

How can we make infrastructure cheap?



U.S. Department of Transportation
Federal Highway Administration

Select Year and Quarter:
2003 Q1 to 2024 Q3
and Null values

National Highway Construction Cost Index (NHCCI)

Select Series:
 NHCCI
 Seasonally Adjusted NHCCI



Highway Construction Costs have increased >3X since 2000

Source: National Highway Construction Cost Index, US DOT (NHCCI)

Why Come Back to X?

Build moonshots with awesome people

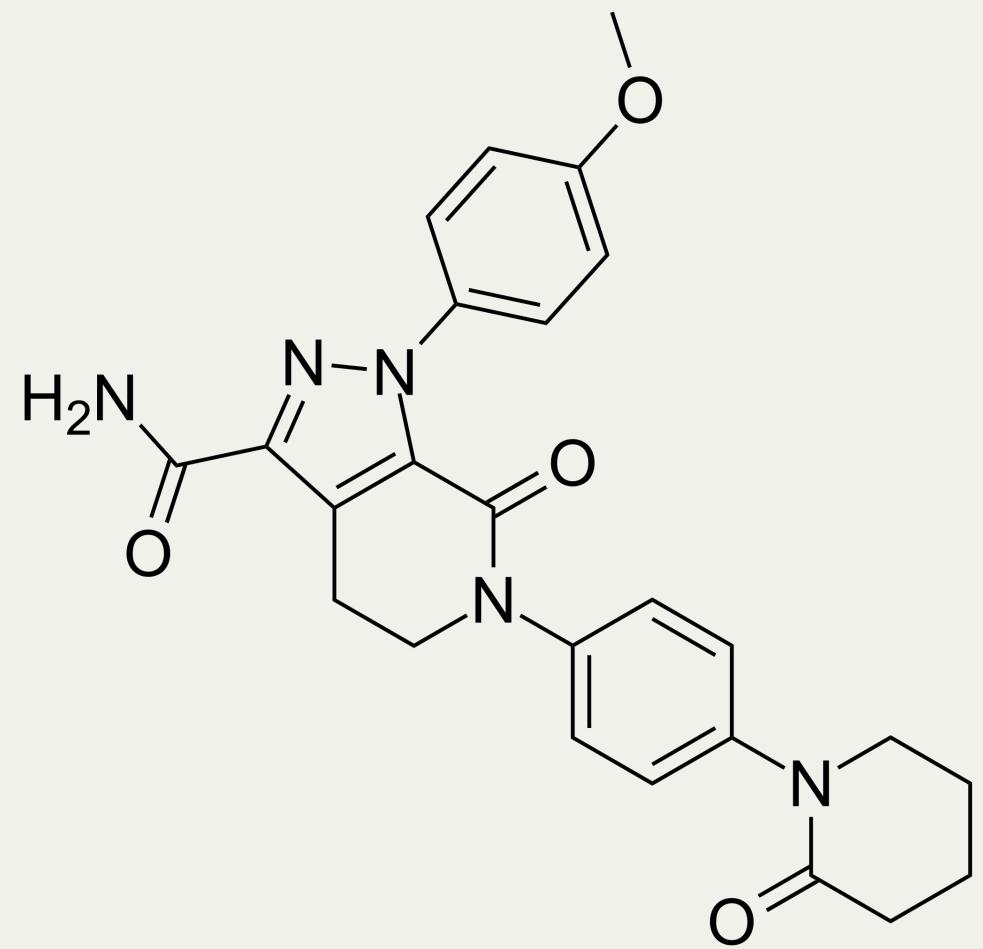
The Moonshot

A Self-Driving Biologics Factory

Evaluation

1. If successful, it will be a huge business
2. Technically possible within 5-10 years

Biologics are the future of therapeutics



Apixaban

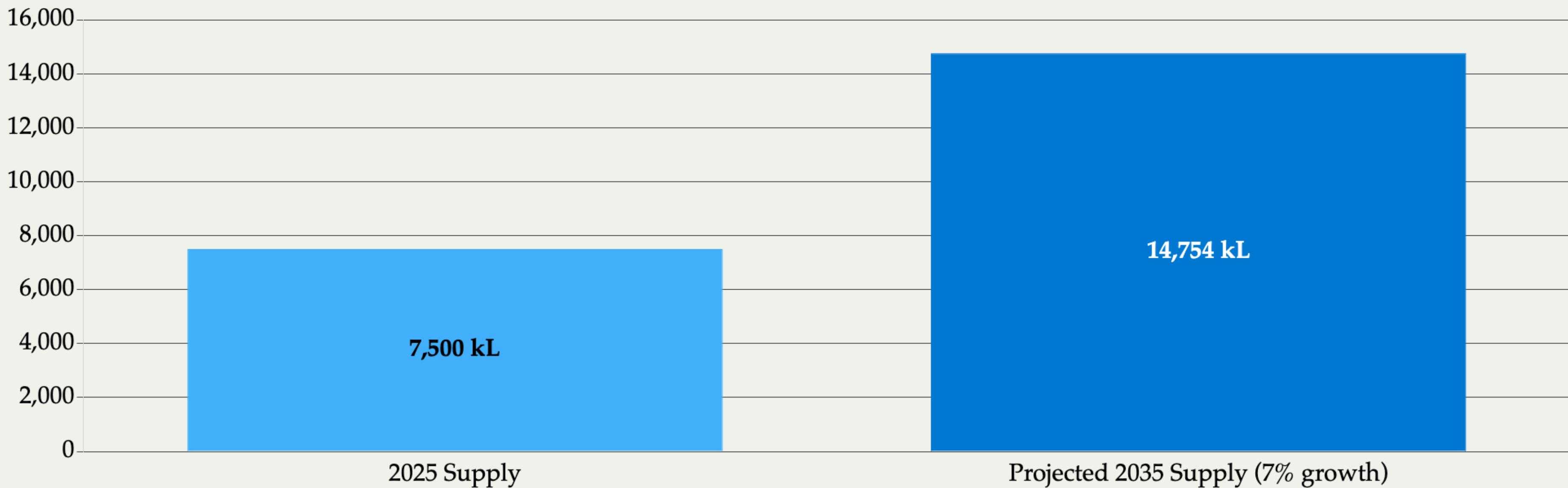
Molecular weight: ~460 Da



Adalimumab (Humira)

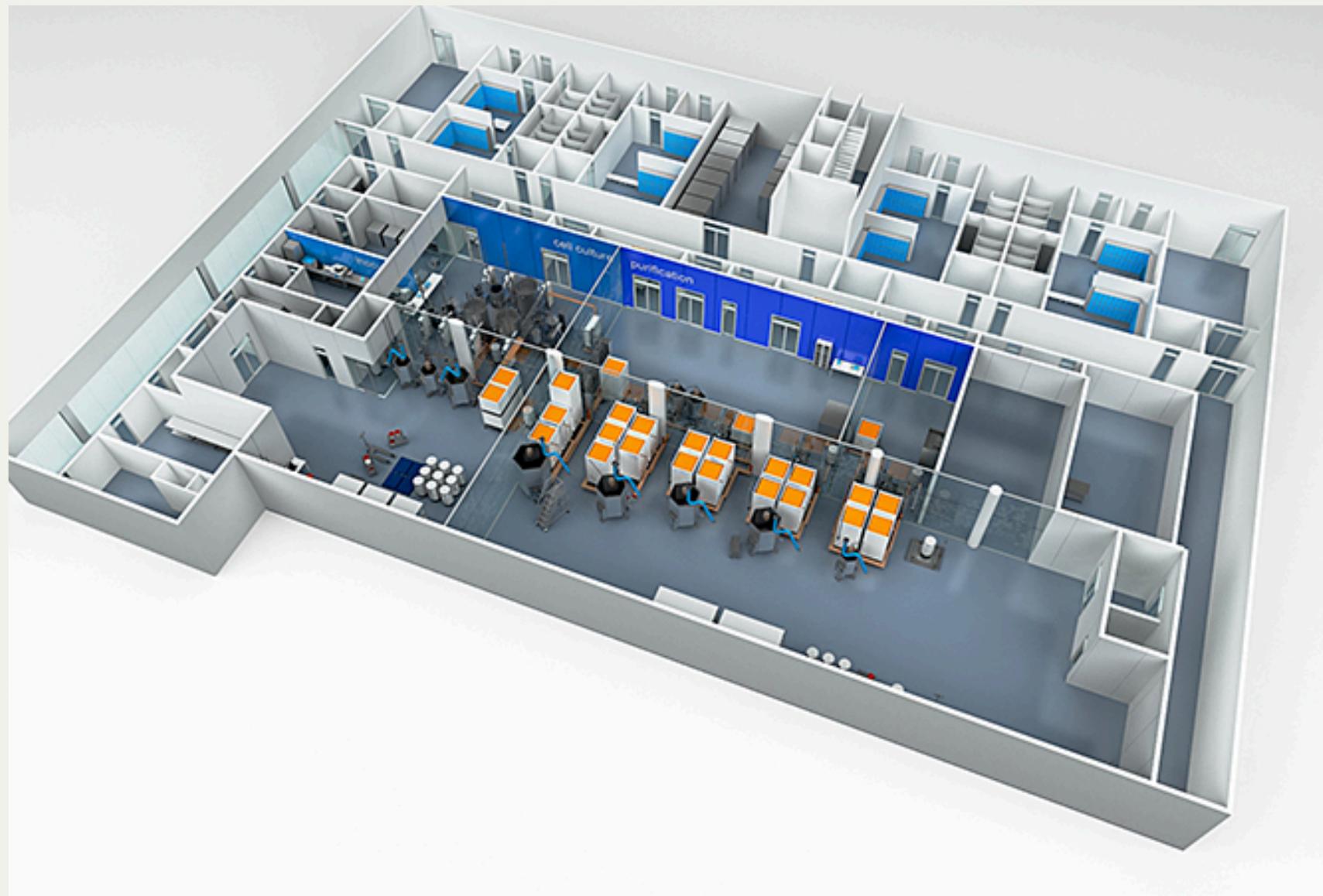
Molecular weight: ~148,000 Da

Biologics production volume¹ must double in the next 10 years to keep up with demand



¹ Specifically, mammalian cell culture production, which is the leading method for producing biologic therapeutics.

However, factories are expensive (\$500M–\$1B) and labor intensive to operate.



Substantial cleanroom layouts



Trained technicians required

A self-driving factory can scale to meet global needs



Features:

Eliminate clean rooms

Site anywhere

Eliminate lost batches

Impact:

Reduce opex by ~30%

Lower construction hard costs by
~40%

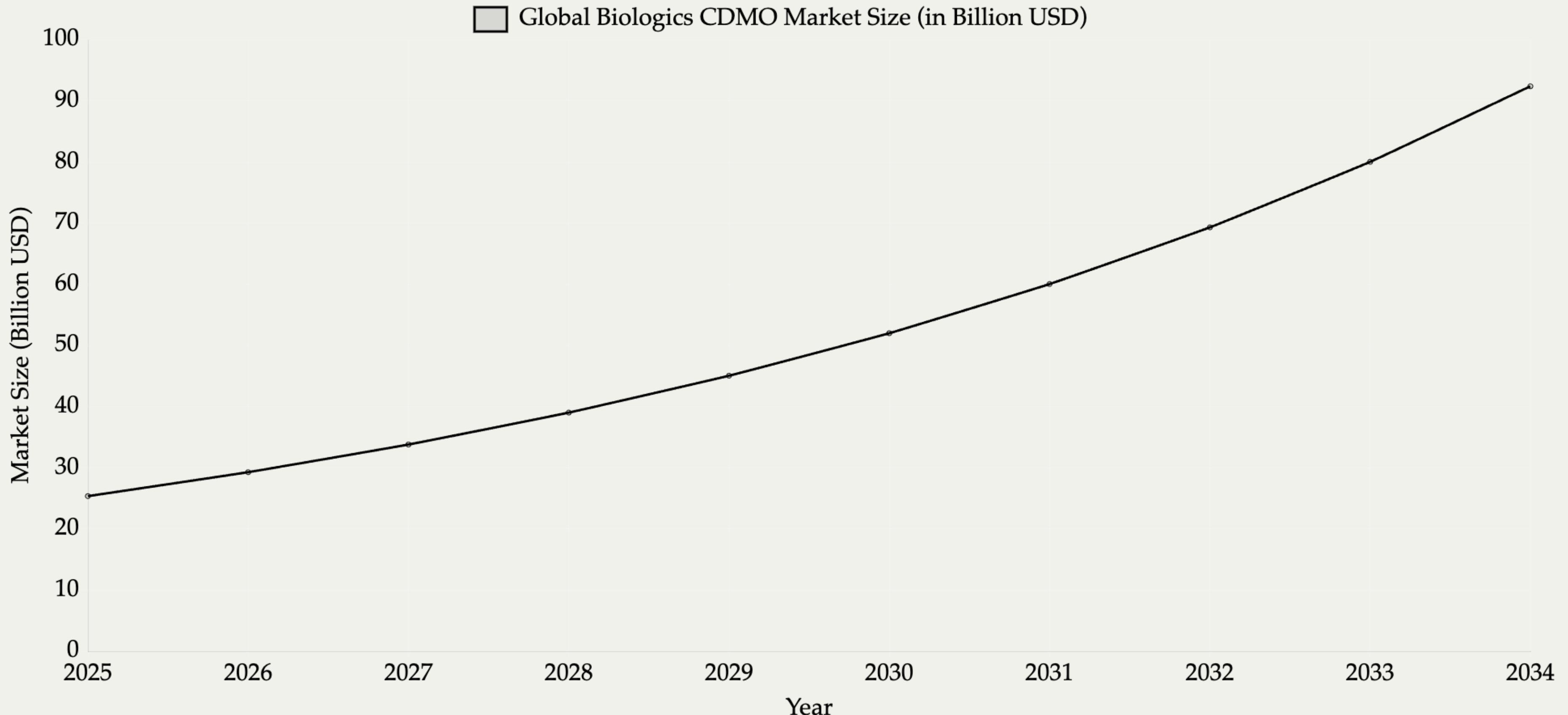
The opportunity is to create a TSMC for biologics

Market Opportunity

- \$25B+ market today
- Growing >15% annually
- Fragmented: Largest player has <15% share

How We Win

- Capital-efficient; easier to scale.
- Cheaper production for customers
- Higher margin



Source: Precedence Research (7)

Real Estate Cost Analysis

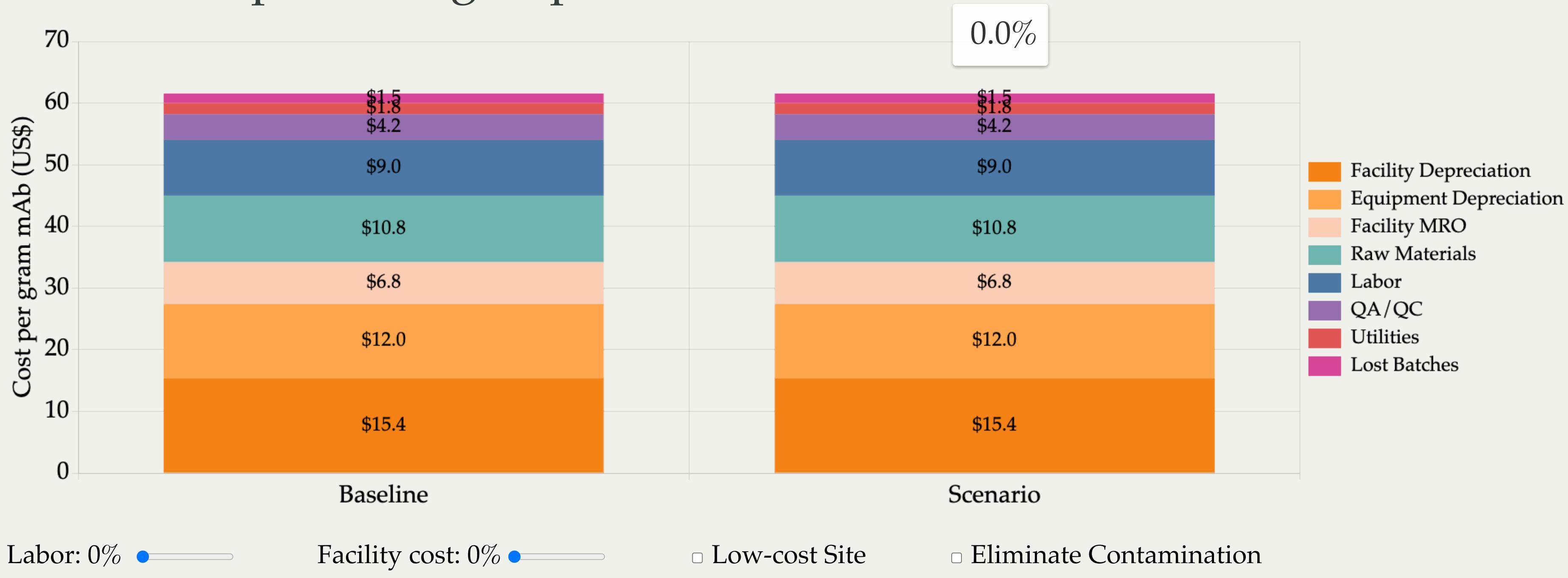
Eliminating clean rooms can reduce construction hard costs by >40%

Area	Clean-room grade	Avg hard cost (sq-ft)	Sq-ft % of total for avg GMP facility	Sq-ft % for Self-driving GMP facility
Core GMP operations	Grade C (ISO 7)	\$1,250	40%	0%
Corridors, lab	Grade D	\$500	20%	60%
G&A Space: Office, warehouse, utilities	Unclassified	\$300	40%	40%
Blended Average Cost (\$/sq-ft)		\$720		\$420

Source: Cushman & Wakefield (6)

COGS Analysis

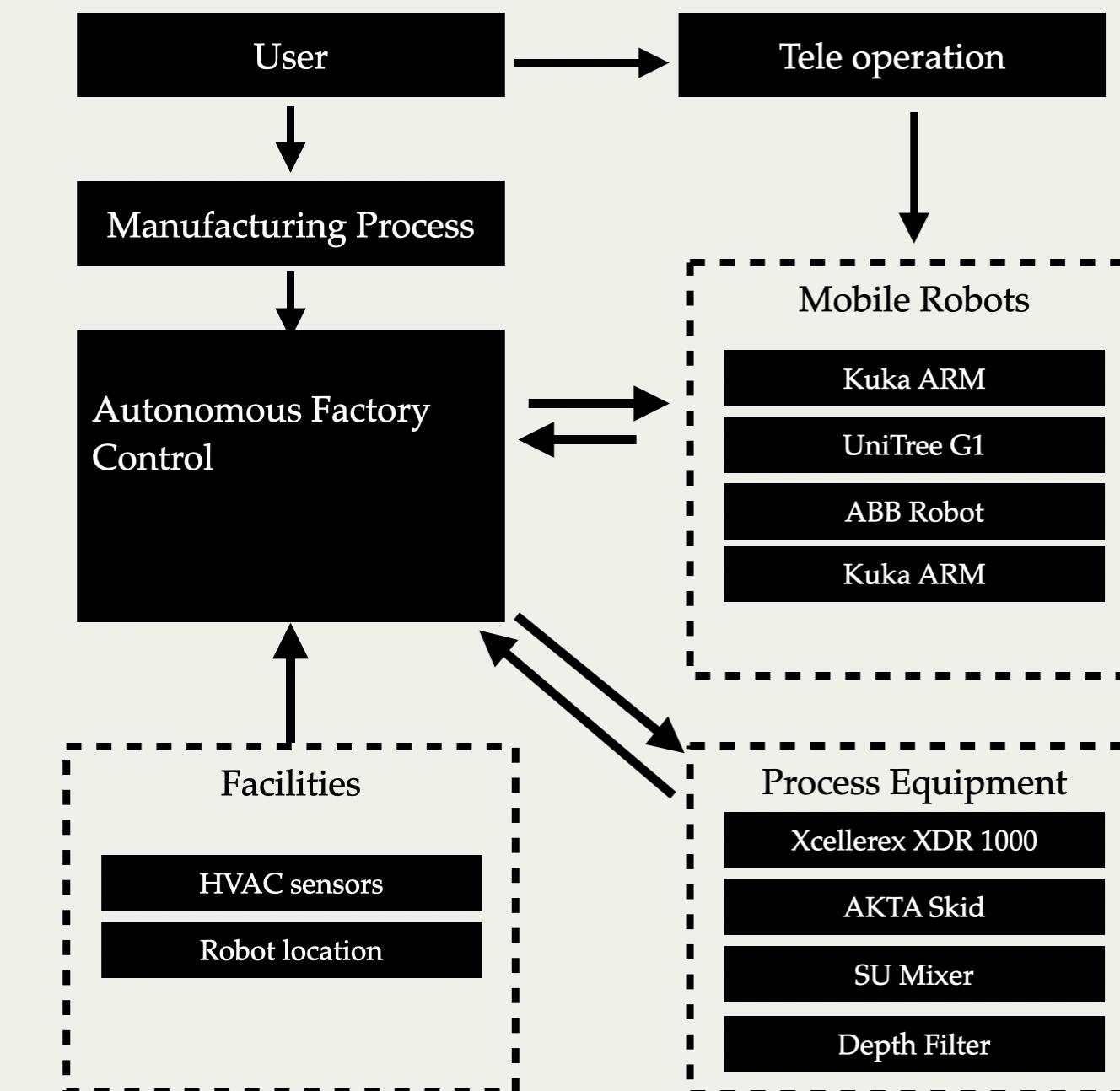
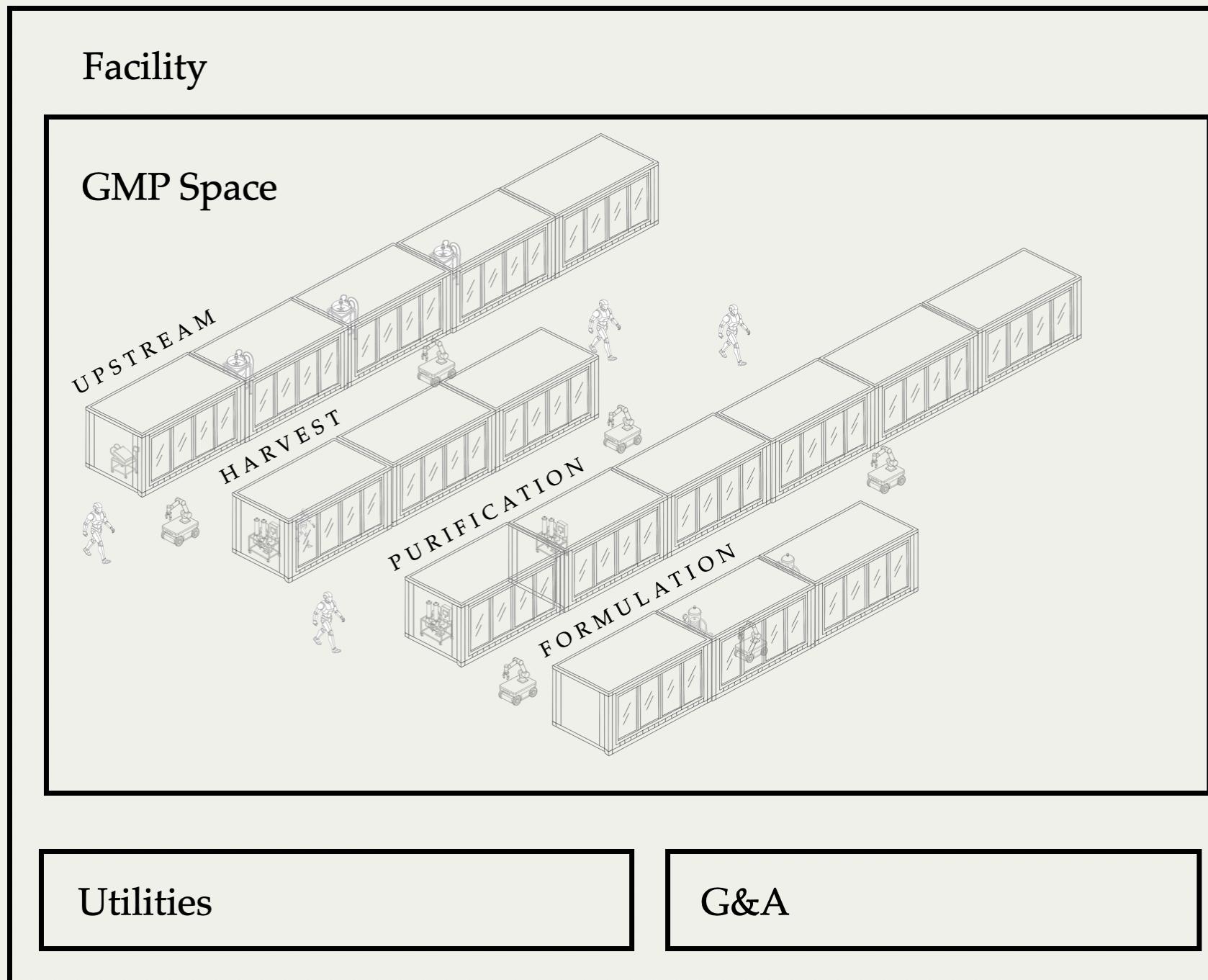
Much cheaper biologics production



[View Assumptions](#)

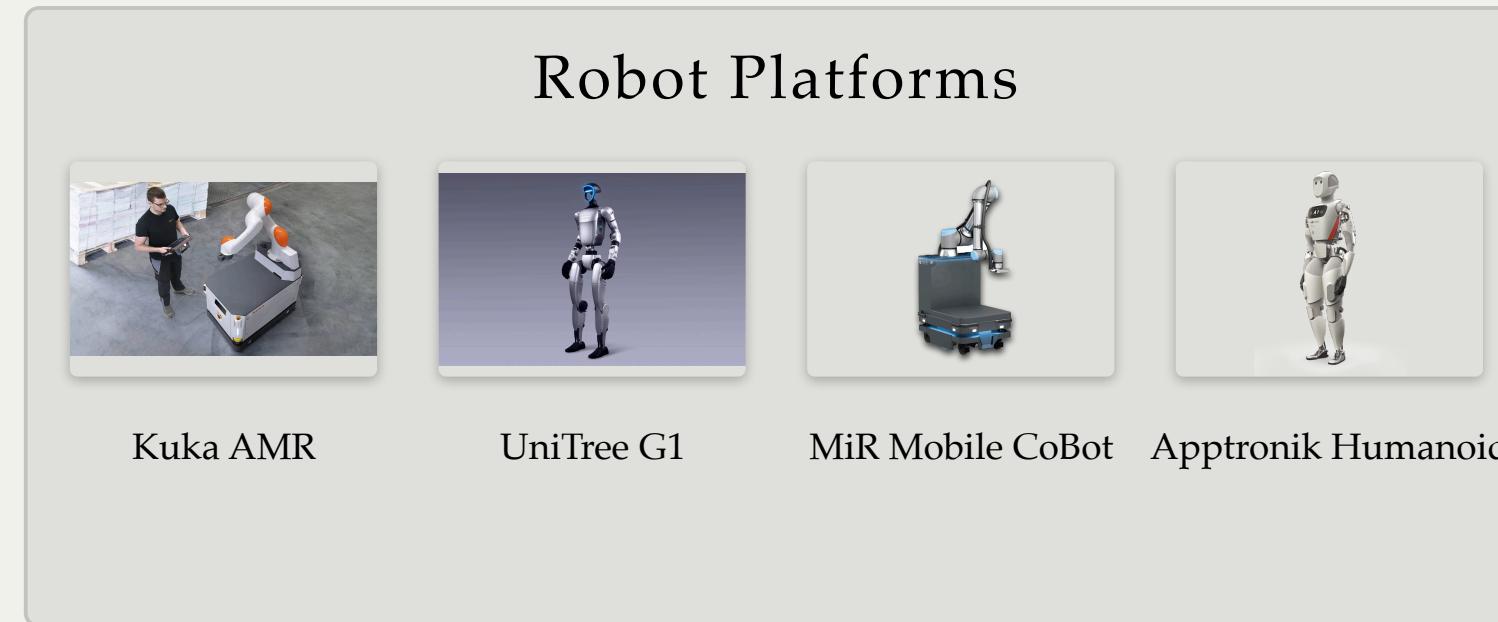
How it works

Robotics + Pre-Fab Pods + Autonomous Control



Breakthrough Tech

Automating all unit operations using mobile robots

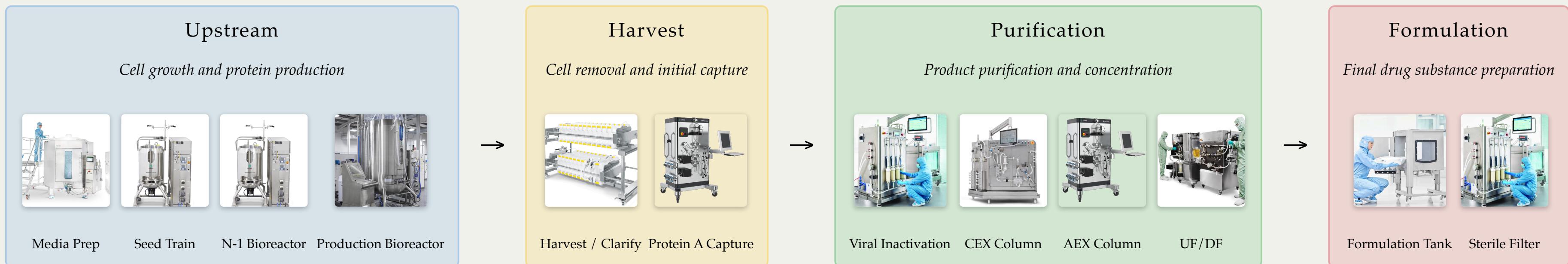


~10-15 unit operations

~10-100 unique "actions" required per unit operation

Unit operations & actions are different per process

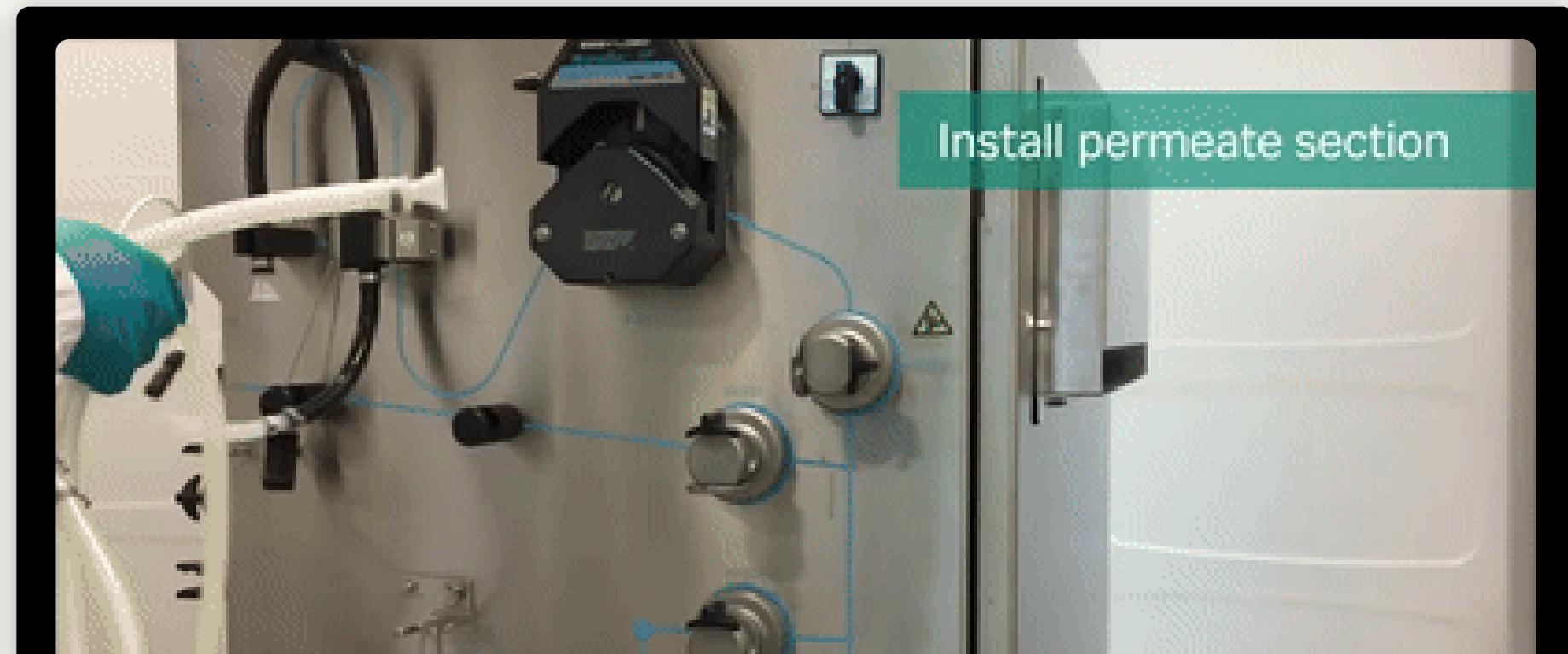
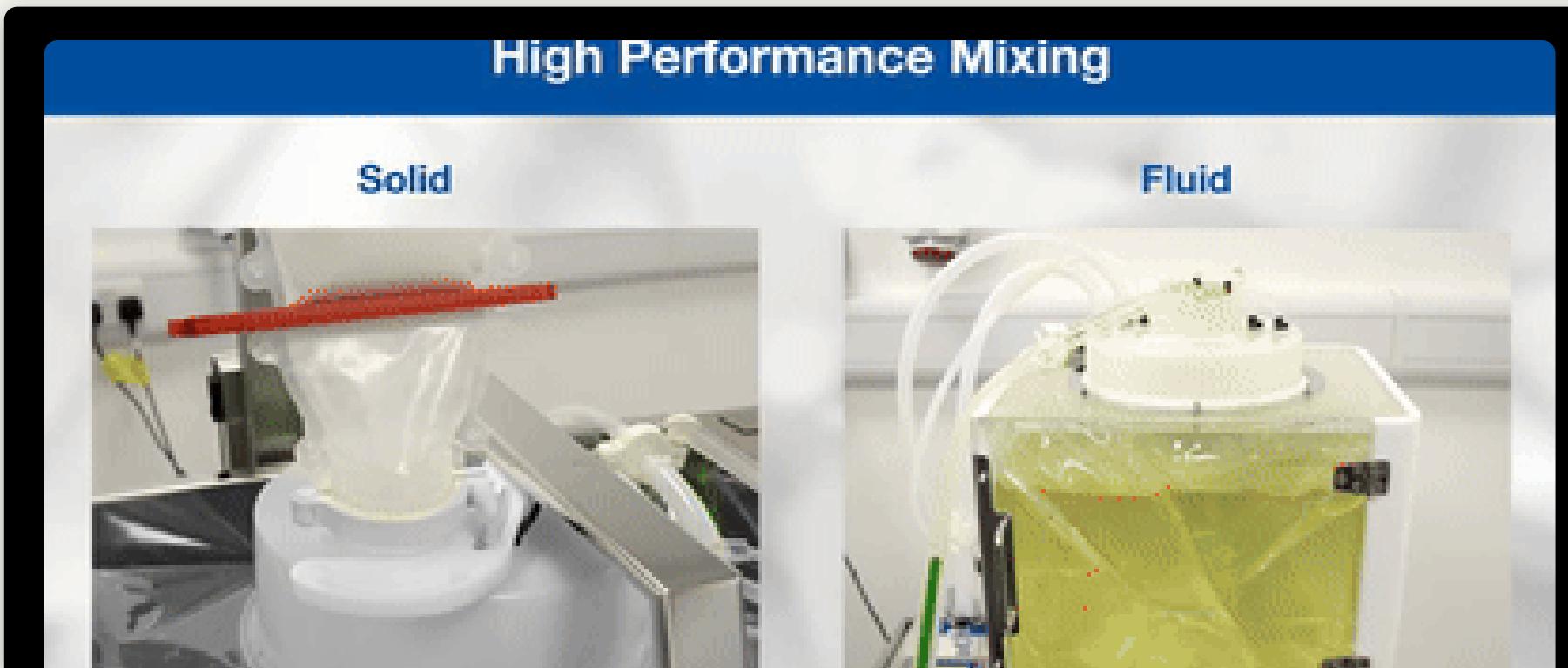
Execution must be responsive to live mfg process



Tasks

Each unit operation requires 25-100 individual robotic tasks

Example Tasks



Task Analysis

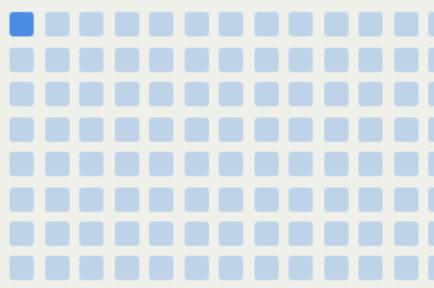
Tasks have different difficulty levels and can be grouped into similar categories

Show Difficulty

Show Types

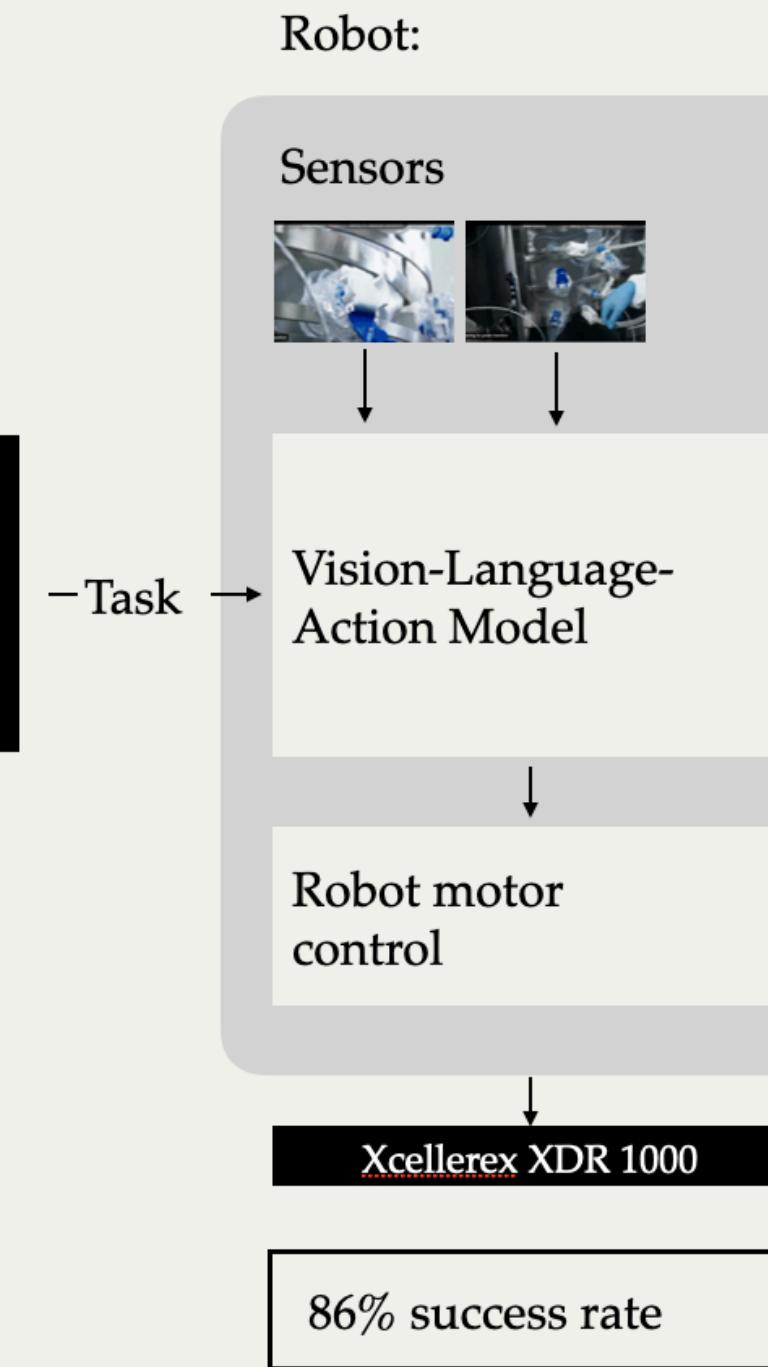
Model

For 1 of n tasks:



Connect the probe
into the single-use
reactor through
the port

Autonomous Factory
Control



Training:

Task-specific data:

1000s of demonstrations

Simulation-based data

Fine-tune model

Re-test on
specific task

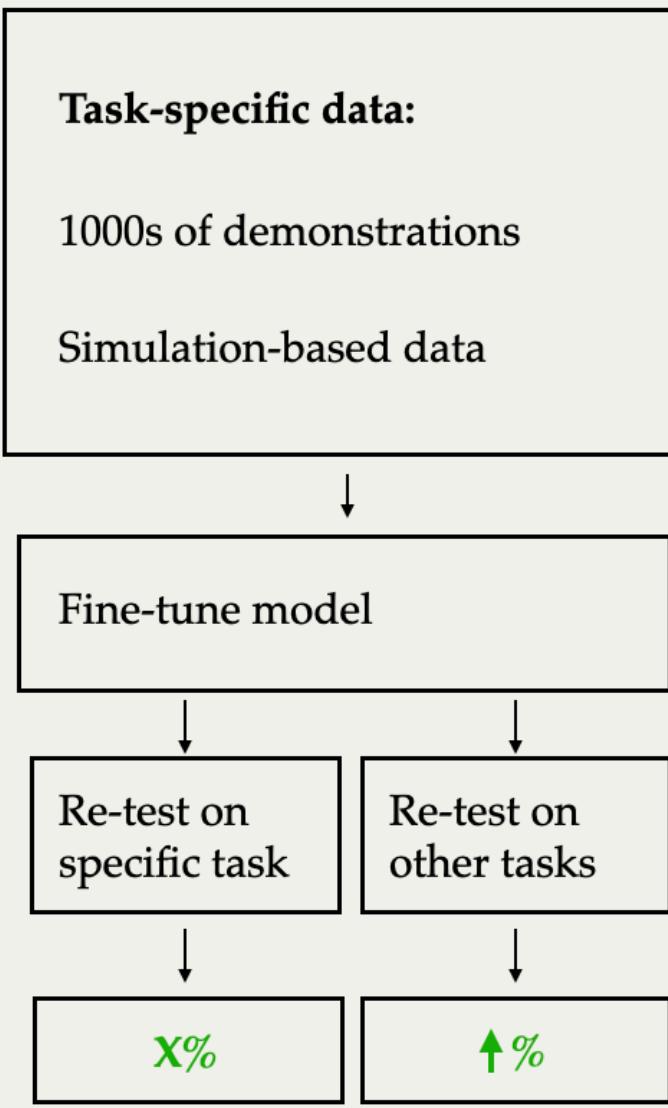
Re-test on
other tasks

99%

↑ %

Training

Training:



Example Approach:

Each month:

1. Real world data on subset of tasks (~25)
2. Collect simulation data on all tasks
3. Fine-tune model on data
4. Test on 25 tasks & 10 other tasks

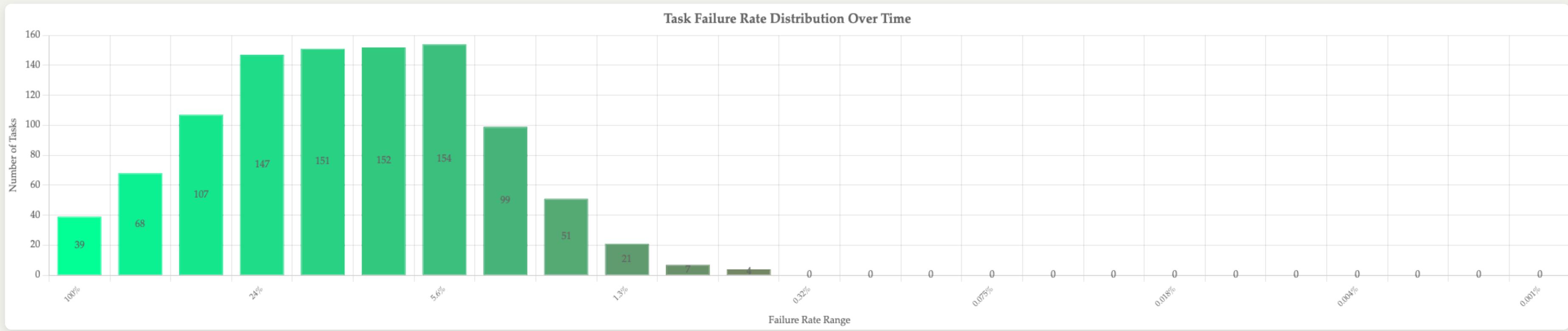
Questions:

1. Rate of learning from demonstrations? How different per task?
2. Rate of learning from simulation? Any way to improve?
3. How much transfer learning between tasks?

Once we better understand these questions, we can understand if this problem is tractable.

Simulation

Simulation Parameters



CURRENT DAY	MEAN FAILURE RATE	TASKS UNDER 0.5% FAILURE RATE	PROGRESS
Day 0	16.361%	4 (0.4%)	0.0%

Next Day

Run to End

Reset

Assumptions

So, you're saying there's a chance?

Why is this possible?

- Known, built environment
- Discrete, known tasks
- Tele-op should work for failing tasks
- Can build "automation-friendly" systems to make hard tasks easier

Why not?

- Tasks require too much dexterity
- Too many difficult tasks to learn
- Transfer learning doesn't work because tasks are highly varied

What's Next

Rapid Evaluation

Goal: Too early for this application? Or, just the right time?

Timeline: 0 - 3 months

Step	Description
Modeling	Forecast improvements to capex, opex, and margins
Customer Validation	Interview 5-10 potential customers to validate value prop and gauge partnership interest.
Automation Assessment	Build unit operation task list and assess difficulty
Task Forecasting	Consult literature/experts to forecast possibility & timeline to automate tasks
Simulation	Develop factory simulation to study feasibility and challenges
Team Development	Identify key talent and build initial pipeline.
Create Project Plan	Create phase 1 plan for first 12 months of project

Thank You

Q&A on Moonshot proposal

AI Mechanical Engineer

Mechanical design is 10-100x slower than software. What if it wasn't?

Current Reality

Weeks Requirements → CAD

Weeks CAD → Simulation/Testing

Weeks Analysis → Manufacturing

Total: 3-6 months per design iteration

AI Mechanical Engineer

Hours Natural language → CAD

Hours Automated simulation & analysis

Hours Manufacturing-ready outputs

Total: Days per design iteration

Market Opportunity

- \$30B+ CAD/CAE market
- 5M mechanical engineers globally
- "Cursor for mechanical engineers"

Breakthrough Required

- Spatial reasoning advances
- Engineering datasets & benchmarks
- Verifiable rewards for RL training

What Becomes Possible

- Mass customization
- Design democratization
- Rapid prototyping at scale

Sources

1. Dourado, E. (2020). www.elidourado.com
2. Bloom, N., Jones, C. I., Van Reenen, J., & Webb, M. (2017). Are Ideas Getting Harder to Find? NBER Working Paper No. 23782.
3. California Department of General Services. (2024). California Construction Cost Index.
4. U.S. Bureau of Labor Statistics. (2024). Consumer Price Index.
5. U.S. Department of Transportation. (2024). National Highway Construction Cost Index.
6. Cushman & Wakefield. (2025). Life Sciences U.S. Fit-Out Cost Guide 2025.