

# **AI-Powered R&D Final Report - COMPLETE WITH IMAGES**

## **Executive Summary: The Cognitive Industrial Revolution**

AI is re-engineering Research & Development, unlocking \$360-560B annual economic value across industries.

Key Breakthroughs:

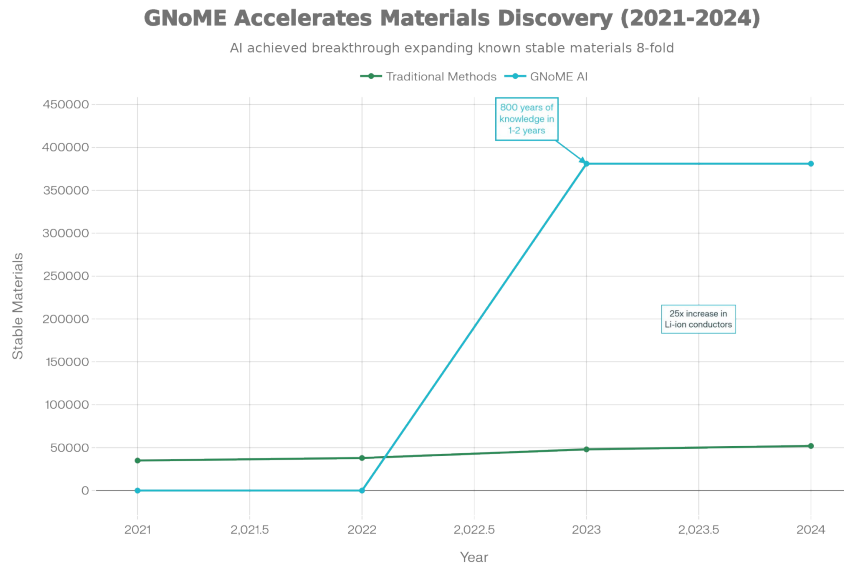
- Pharma: 4-5 years → 12-18 months (72% faster)
- Materials: 381K stable crystals (800 years equivalent)

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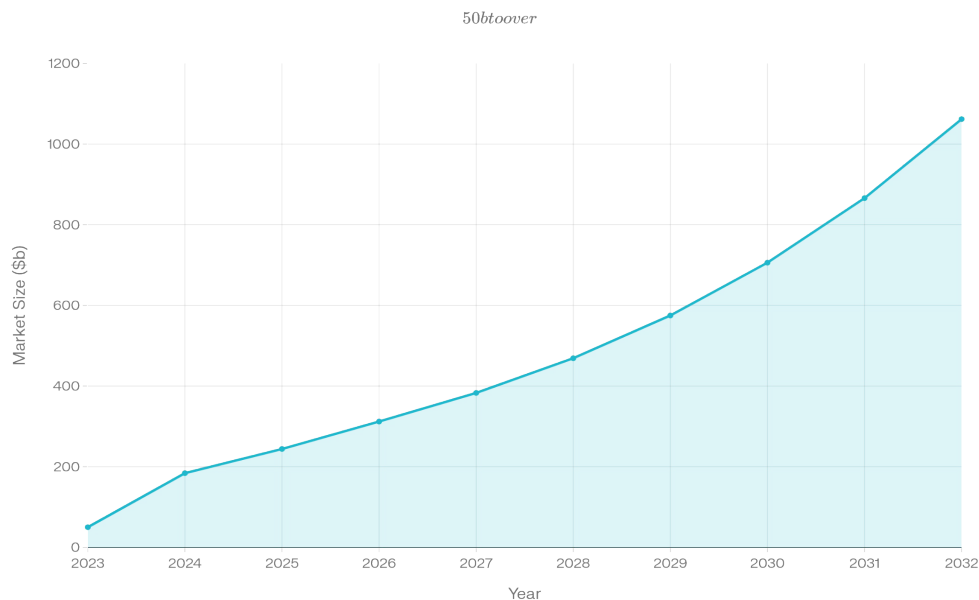
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## Materials Discovery Revolution: GNoME vs. Traditional Methods (2021-2024)

- Market: \$244B (2025) → \$1.1T (2032)



Global AI Market Growth Projection (2023-2032): From \$50B to \$1.1T

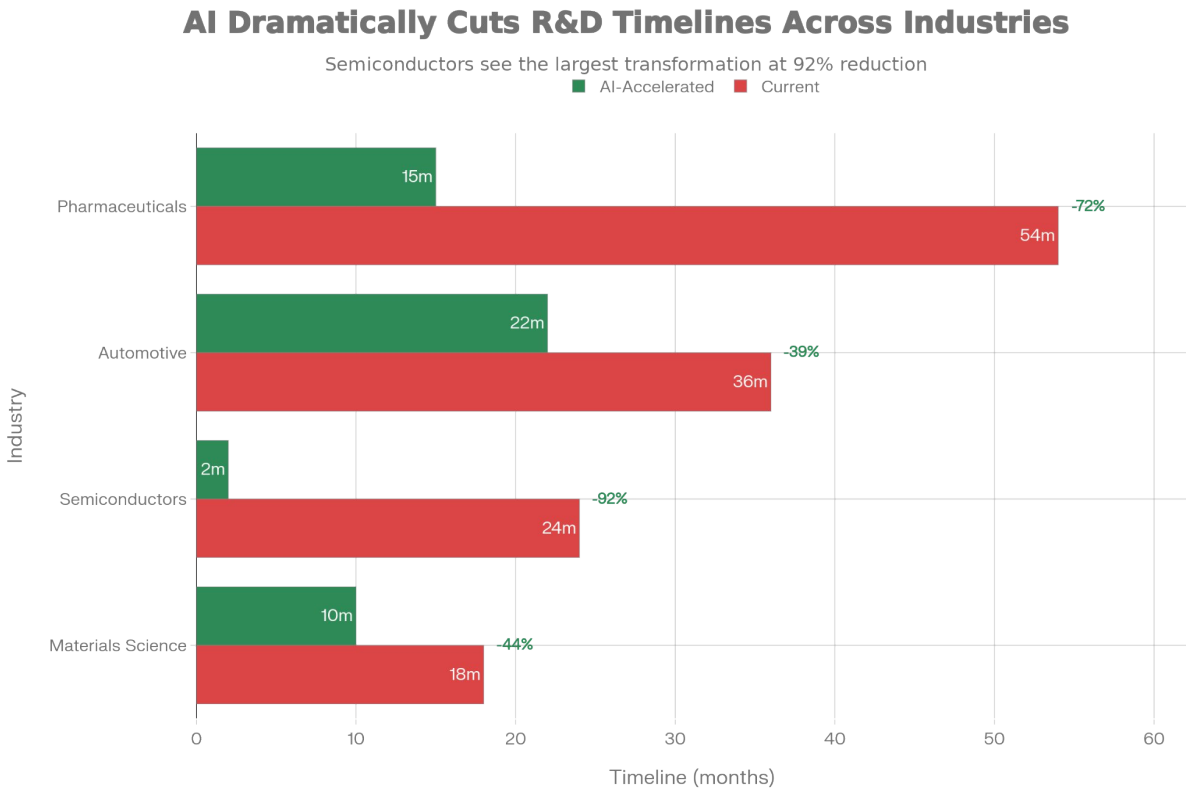
## 1. The Innovation Crisis

Eroom's Law: Drug development costs double every 9 years (\$2.6B average).

AI Solution: Shift from physical (atoms) → virtual (bits) experimentation.

## 2. R&D Timeline Acceleration

! [R&D Timeline Compression]



R&D Timeline Acceleration Across Key Industries: AI Impact Comparison

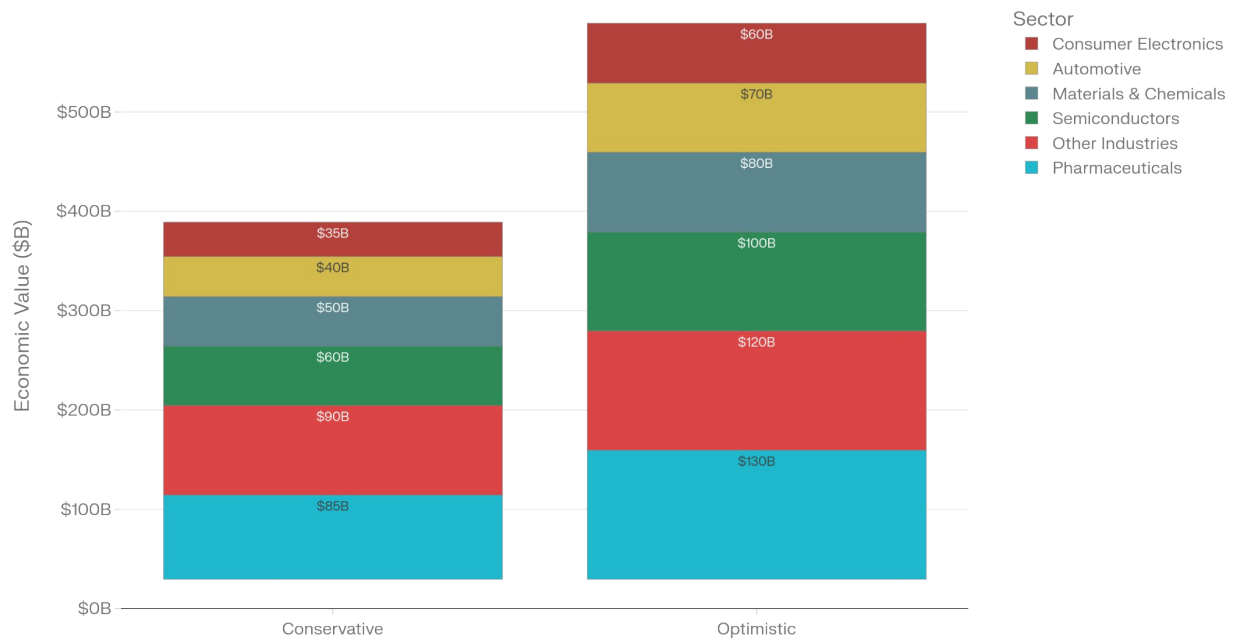
Pharma: 72% reduction | Semiconductors: 92% faster

## 3. Economic Value by Sector

! [Economic Impact by Industry]

## AI R&D Economic Value by Sector (\$360-560B)

Pharmaceuticals and Other Industries lead value creation



Annual Economic Value from AI-Powered R&D by Sector: \$360-560 Billion Potential

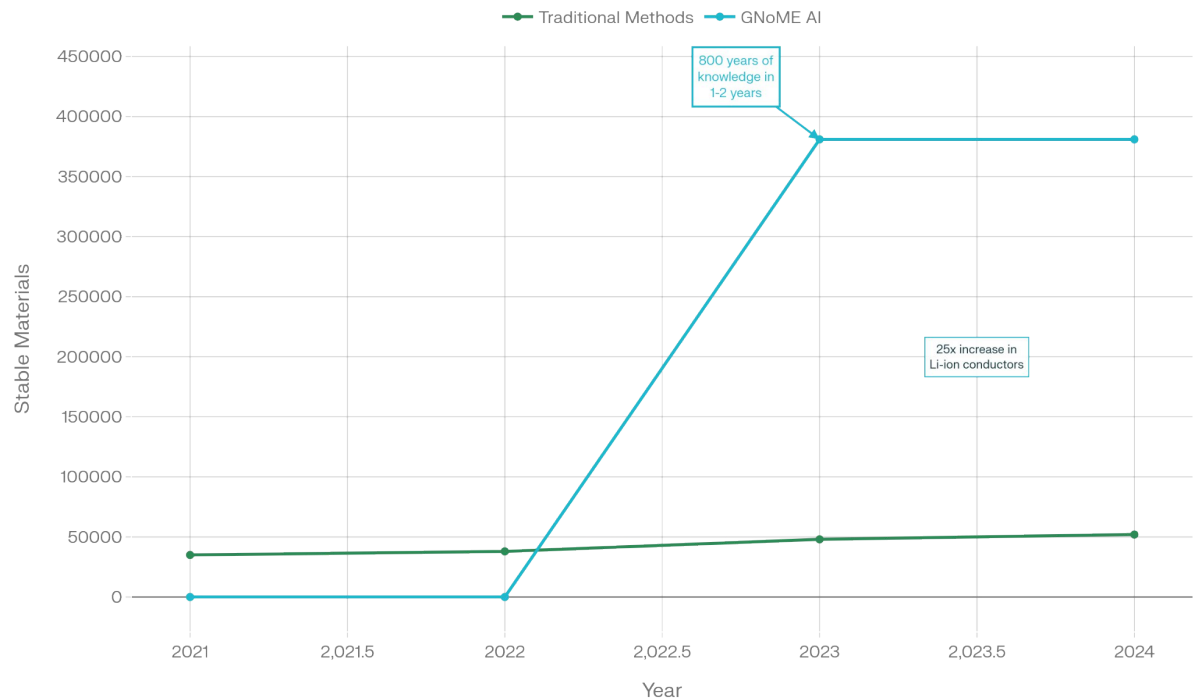
Pharma: \$85-130B | Semiconductors: \$60-100B | Materials: \$50-80B

## 4. Materials Discovery Revolution

! [GNoME vs Traditional Discovery]

## GNoME Accelerates Materials Discovery (2021-2024)

AI achieved breakthrough expanding known stable materials 8-fold



Materials Discovery Revolution: GNoME vs. Traditional Methods (2021-2024)

GNoME Impact: 381K stable materials in 1 year vs 48K over 800 years

Breakthrough Stats:

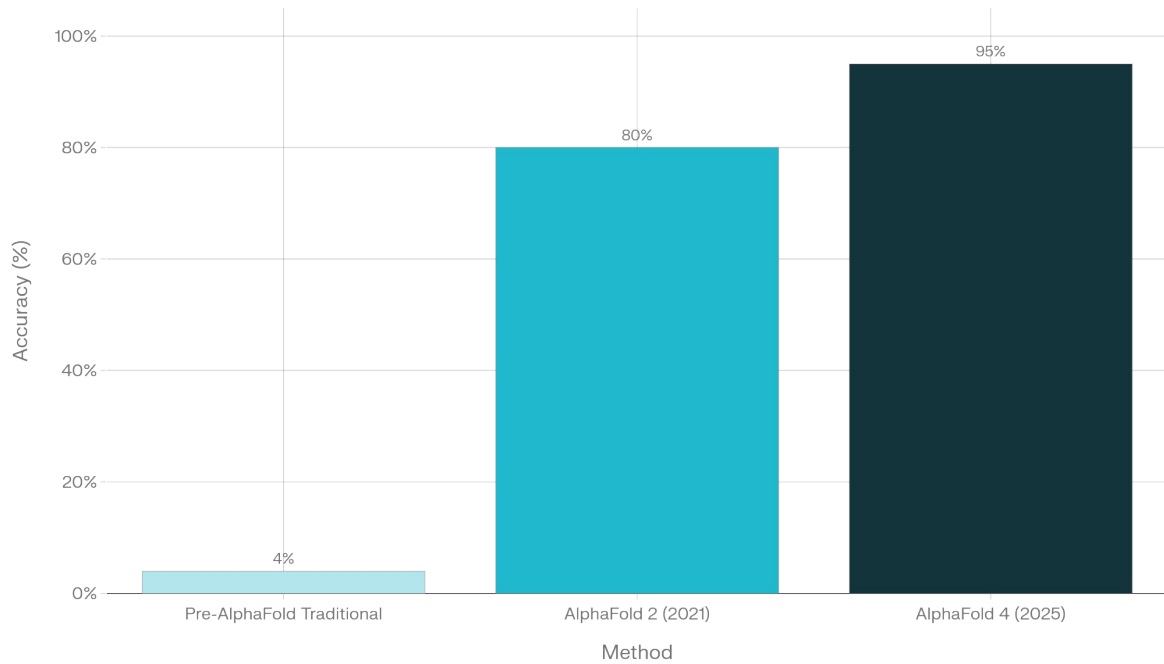
- 25x more lithium-ion conductors
- 52K graphene-like materials
- A-Lab: 71% autonomous synthesis success

## 5. Protein Structure Prediction

! [AlphaFold Accuracy Evolution]

## Protein Structure Prediction Accuracy Rising (Pre-2020 to 2025)

AI breakthrough achieves near-perfect structural biology predictions



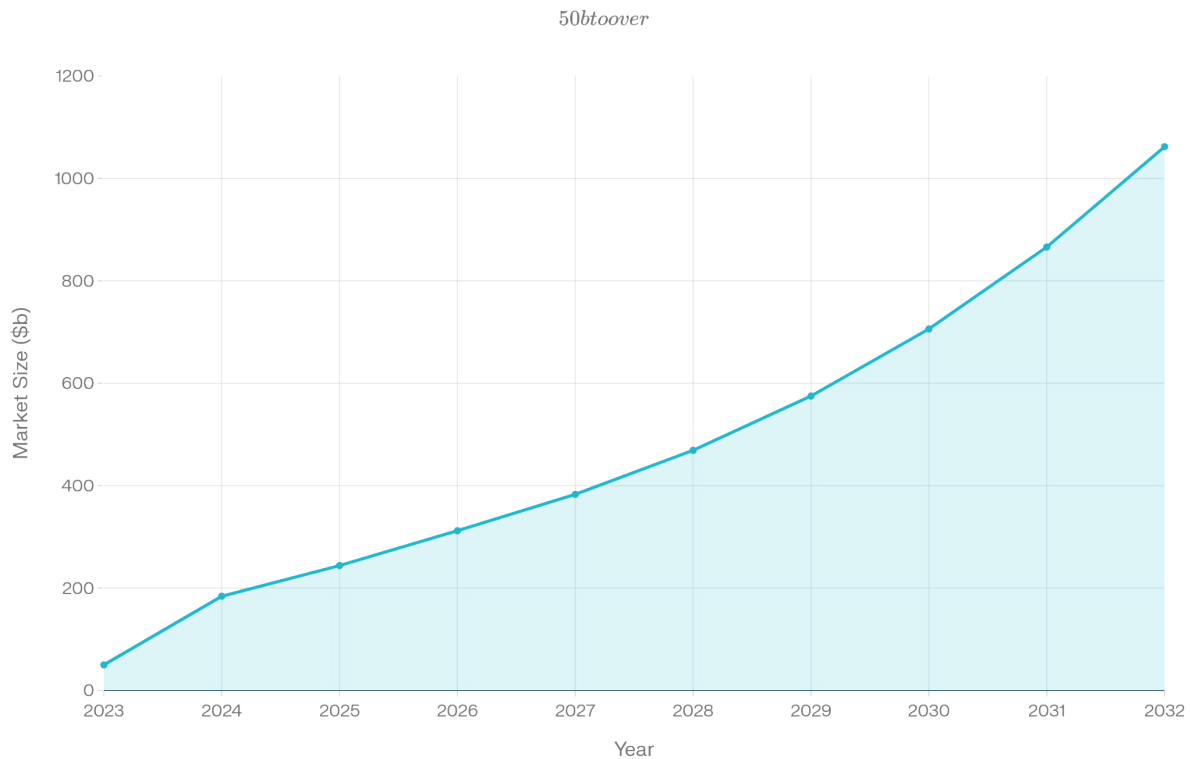
Protein Structure Prediction Accuracy: AlphaFold Evolution (Pre-2020 to 2025)

AlphaFold Journey:

- Pre-2020: <5% accuracy
- AlphaFold 2 (2021): 80%
- AlphaFold 4 (2025): >95%

## 6. Global AI Market Growth

! [AI Market Exponential Growth]



Global AI Market Growth Projection (2023-2032): From \$50B to \$1.1T

Projections:

- 2025: \$244B
- 2032: \$1.1T (19.2% CAGR)

## 7. Industry Case Studies

### Pharmaceuticals

Insilico Medicine: IPF drug → Phase 2a in 18 months

Iambic Therapeutics: HER2 inhibitor → human trials <2 years

### Automotive

Czinger 21C: Bone-like chassis via generative design + 3D printing

## Semiconductors

Nvidia cuLitho: 40-60x lithography speedup for 2nm chips

## 8. Key Technologies

Technology	Impact	Leader
GNoME	381K materials	DeepMind
AlphaFold	95% protein accuracy	DeepMind
A-Lab	71% autonomous synthesis	Berkeley
Coscientist	Autonomous chemistry	Carnegie Mellon

## 9. Regulatory Framework

DABUS Patent Ruling (2025):

- ✓ US/UK/EU: Human must be inventor
- ⚠ Switzerland: More lenient with documentation

FDA: Synthetic Control Arms approved for oncology/rare diseases



## 10. Strategic Roadmap 2025-2030

### Immediate (2025)

1. GPU clusters as "new lab benches"
2. Retrain R&D for AI orchestration
3. Traceability protocols

### 2026-2028

End-to-end AI integration across discovery → manufacturing

### 2028+

AI-Quantum hybrid workflows

## 11. Companies to Watch (2025)

Company	Sector	Status
DeepMind	AI/Biology	AlphaFold/GNoME deployed
Insilico	Pharma	Phase 2 trials
Nvidia	Hardware	cuLitho production
Synopsys	Semiconductors	AI-EDA deployed

## **Conclusion: Hyper-Innovation Era**

Constraints shift: Feasibility → Desirability

AI unlocks entire chemical space, unrestricted geometries, infinite market simulation.

Winners master: AI speed + human wisdom + ethical oversight