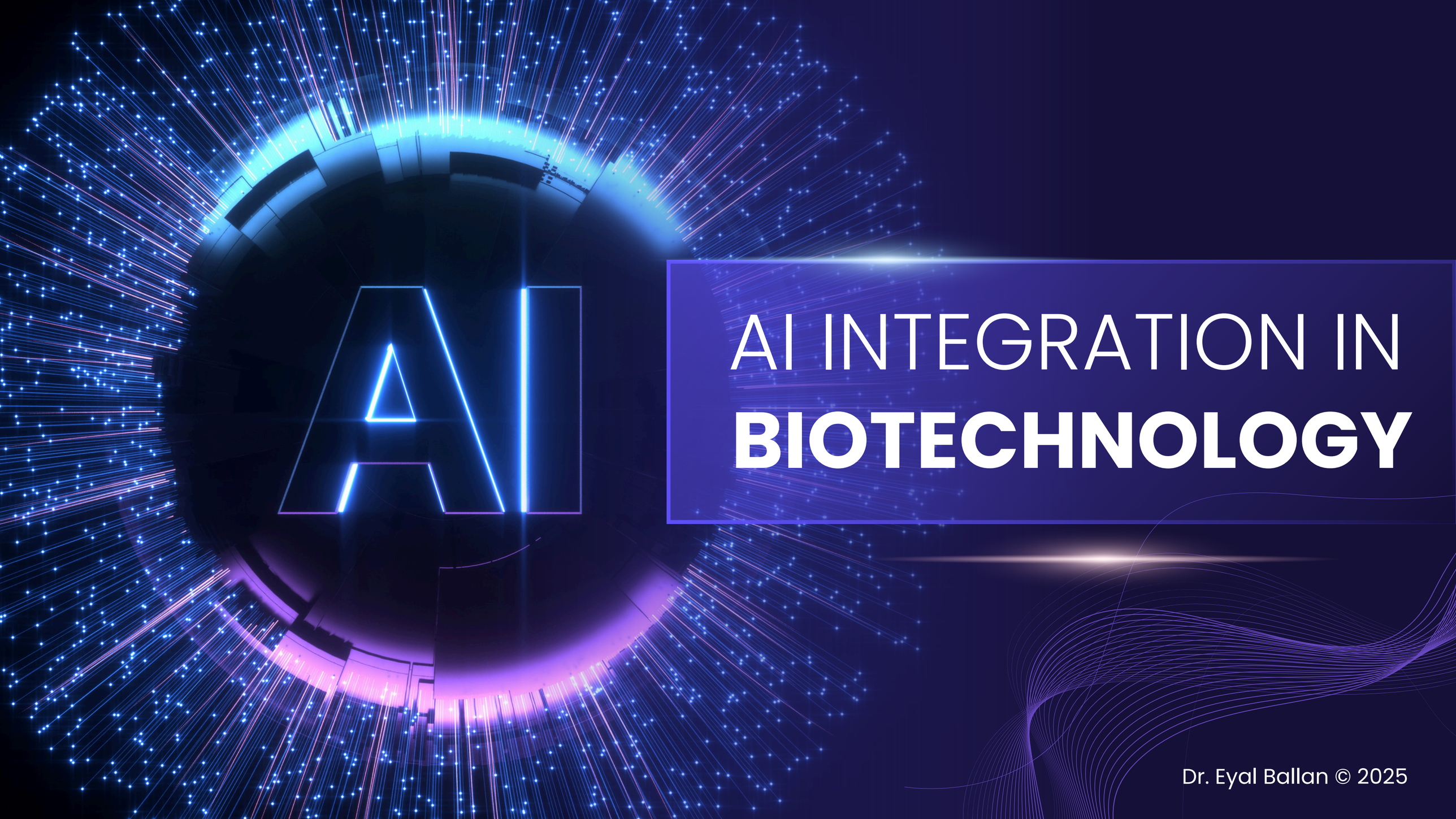


AI INTEGRATION IN **BIOTECHNOLOGY**

Key Points

Market Data

Development: 10+ years → 3-6 years. Costs cut 70%.

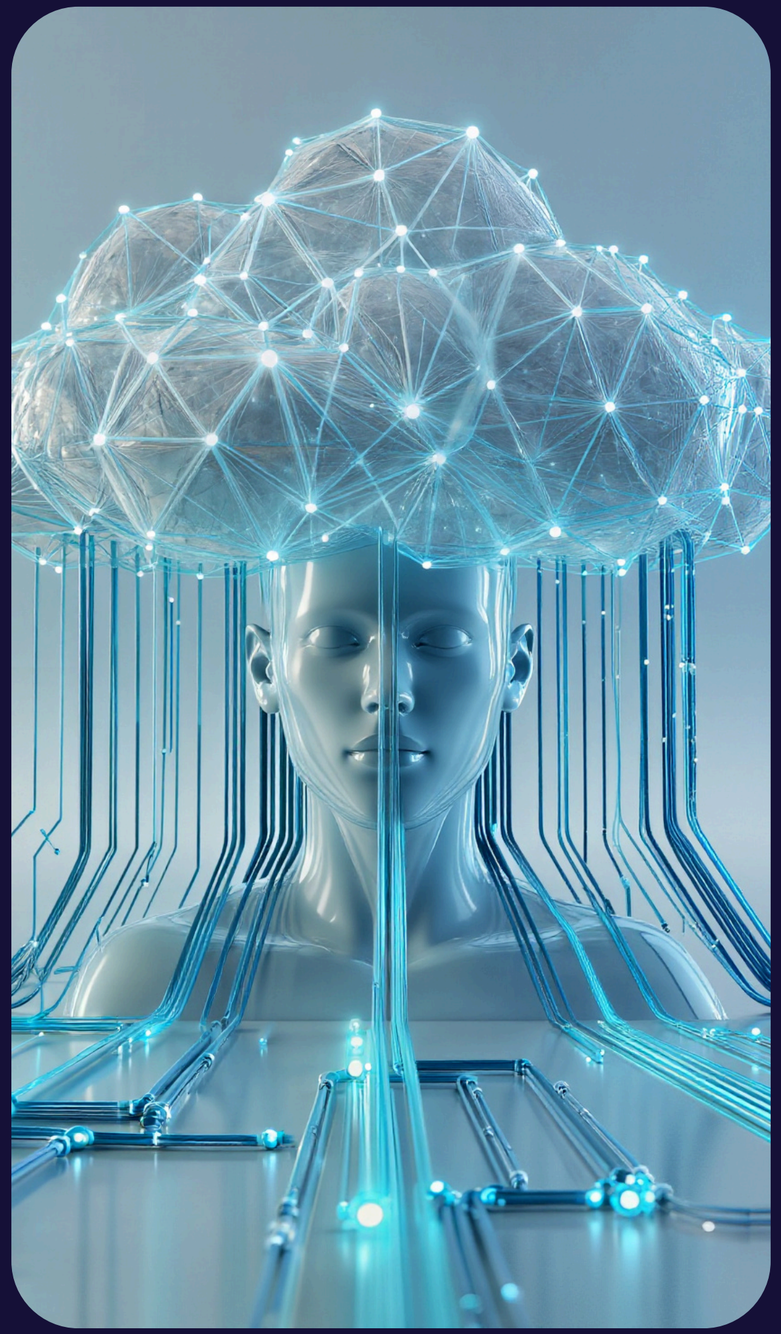
Economic impact of $350-410B annually for pharma in 2025.

19-20% CAGR

AI in biotech valued at $4B in 2024, reaching 27.43B by 2034

AI drugs show 80-90% Phase I success vs. 40-65% traditional.

15+ AI-designed drugs in trials.



The Biotech Challenge

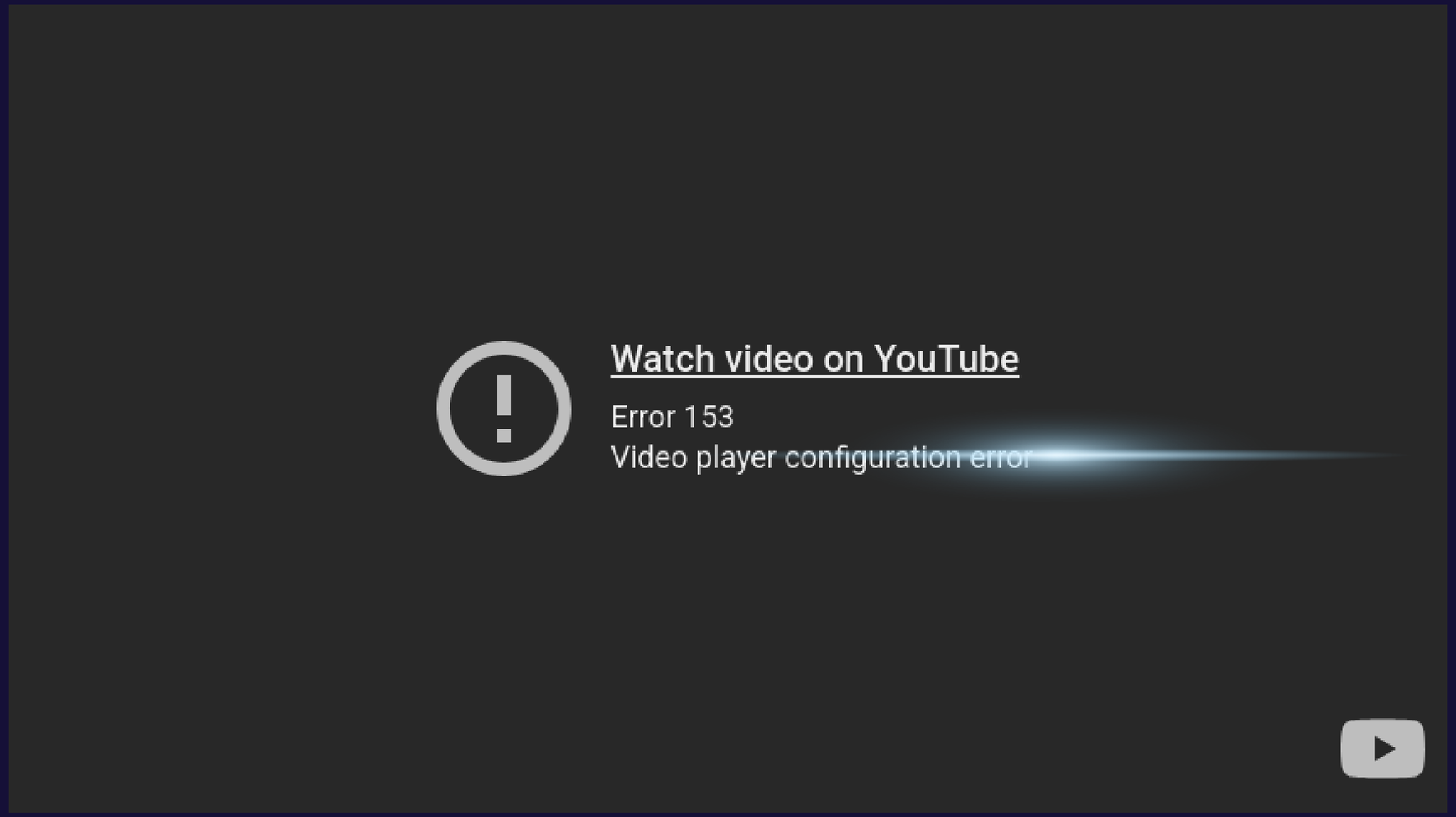
- $2.6B per approved drug
- 90% clinical trial failure rate
- 10-15 years average development time
- 40 exabytes genomic data by 2025

Exabyte - One billion gigabytes

Why AI Now?

- Computing Power: 1000x increase in decade.
- Big Data: 200M+ protein structures (AlphaFold), billions of genomic sequences.
- Deep Learning: AlphaFold solved 50-year problem. 2024 Nobel Prize to DeepMind.
- Cloud Access: AWS, Google Cloud democratizing supercomputing.

From DNA to Protein



Case Study: AlphaFold

The Achievement:

50-year protein folding problem solved.

200M+ structures predicted.

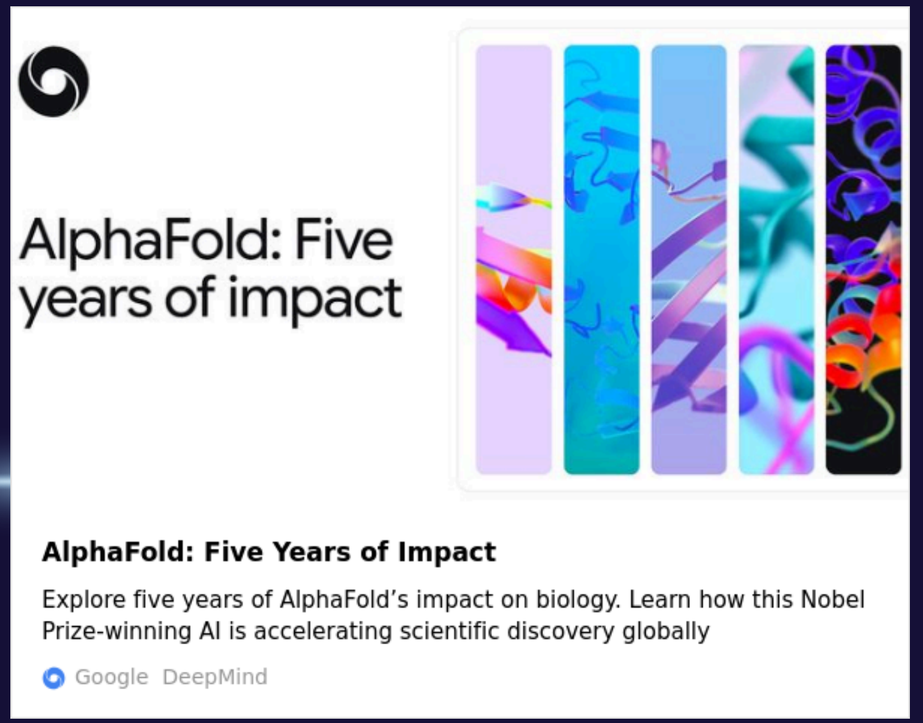
AlphaFold 3:

Predicts all biomolecular interactions (proteins, DNA, RNA, ligands). 50%+ accuracy improvement.

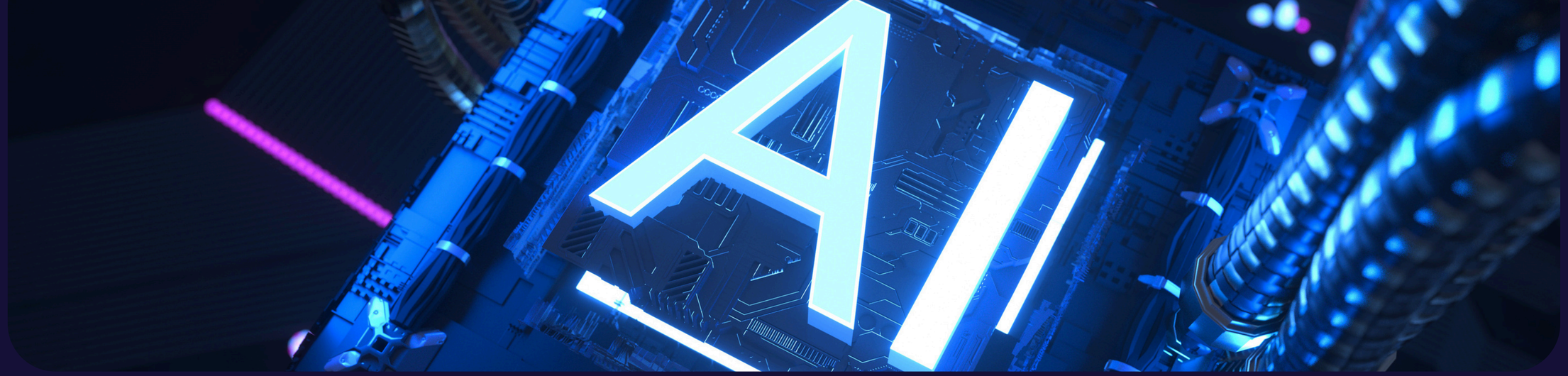
Impact:

2M+ researchers in 190 countries. 35,000+ citations.

Saved hundreds of millions of research years.



2024 Nobel Prize to Hassabis & Jumper for protein structure prediction.
Applications: Malaria vaccines, cancer treatment, COVID-19 research.



AI Technology Stack

- Machine Learning (40.9% of methods)
- NLP: Mining millions of papers, clinical notes, extracting insights.
- Computer Vision: 95%+ cancer detection accuracy. 950+ FDA-cleared AI devices (2024).
- Generative AI: AlphaFold 3 with 50% improvement over previous methods.

Drug Discovery Revolution

Target ID: Weeks vs. 3-5 years using ML on genomic data.
Virtual Screening: Atomwise screens 10M+ compounds daily, 750+ partnerships.
Lead Optimization: Insilico: 18-month timeline vs. 4-6 years.
Companies: 136 optimized compounds/year vs. 2,500 over 5 years traditionally.

Genomics & Precision Medicine

AI analyzing millions of genetic variants instantly for disease-causing mutations.

Patient Stratification: 50% improvement in trial enrollment.

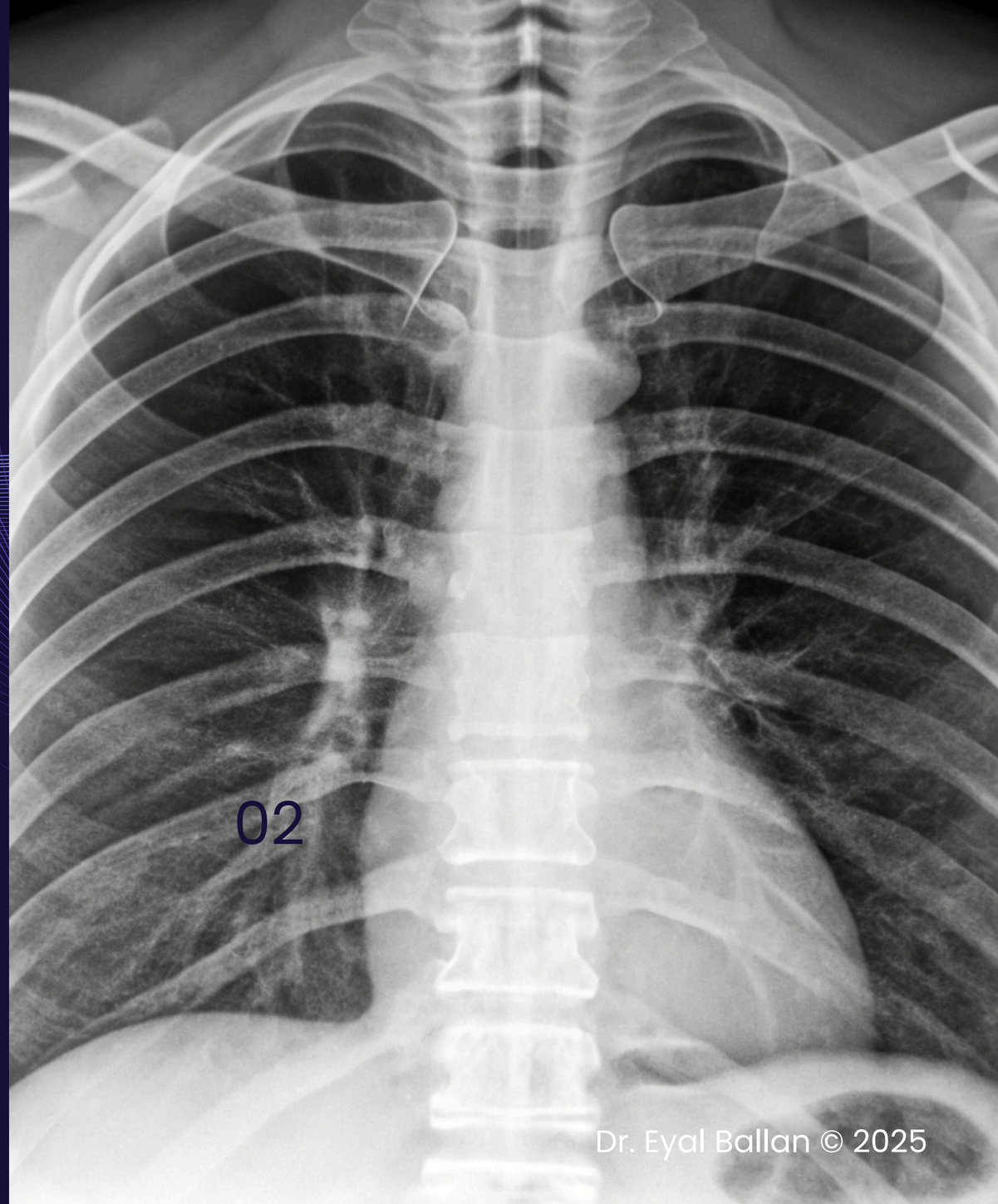
Biomarker Discovery: Multi-omics integration (genomics + proteomics + metabolomics).

Key Players: Tempus AI, Sophia Genetics, Deep Genomics.

AI in Clinical Diagnostics

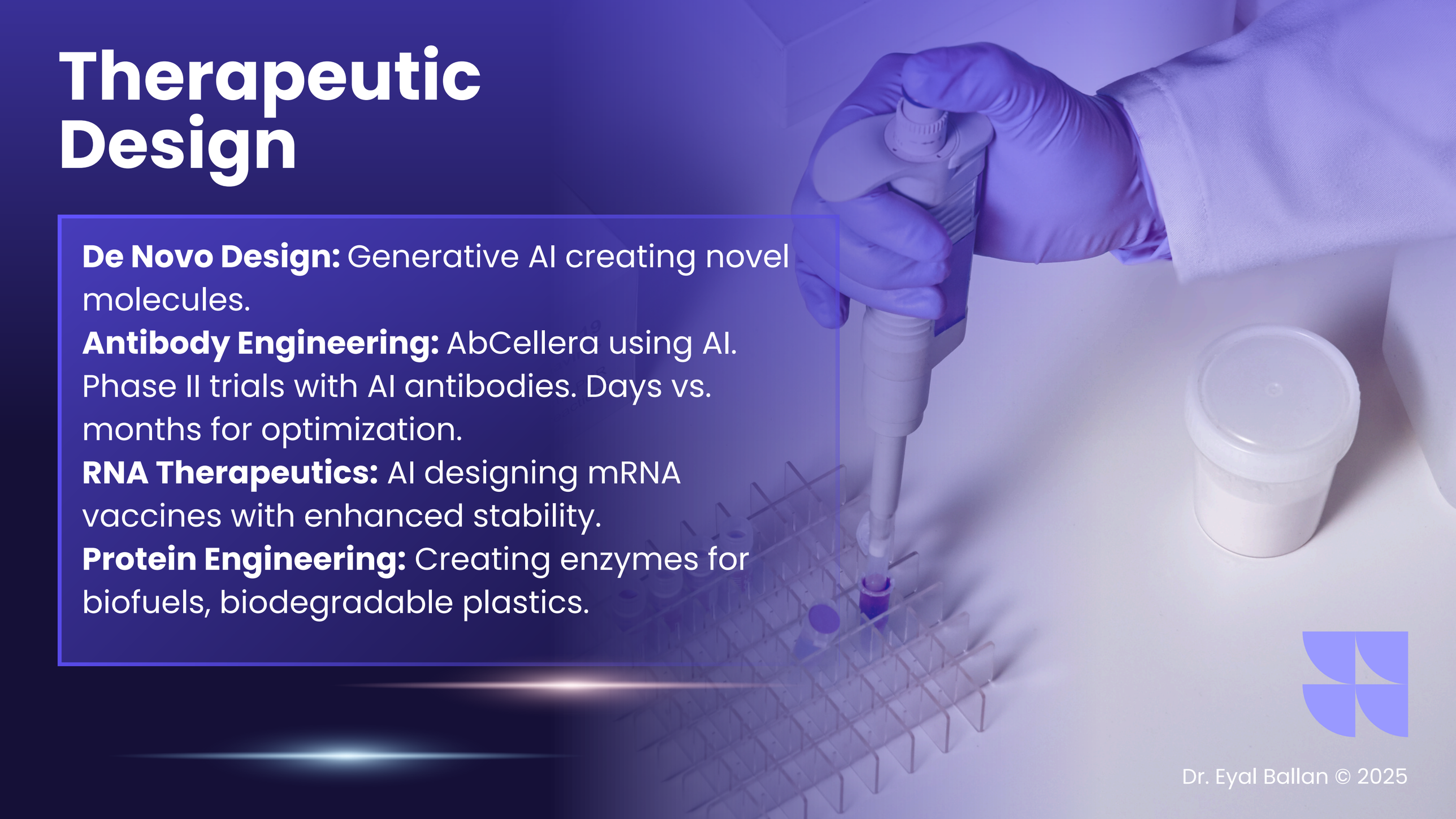
950+ FDA-cleared AI/ML devices (mid-2024). 956 radiology, 10+ ophthalmology.
PathAI: 20%+ diagnostic accuracy improvement. Images of biopsies.
Market: $13.7B (2024) → $255B by 2033.
Applications: 95%+ cancer detection accuracy, rare disease identification, real-time decision support.

🔗 AI Medical Devices 2025



Therapeutic Design

De Novo Design: Generative AI creating novel molecules.
Antibody Engineering: AbCellera using AI. Phase II trials with AI antibodies. Days vs. months for optimization.
RNA Therapeutics: AI designing mRNA vaccines with enhanced stability.
Protein Engineering: Creating enzymes for biofuels, biodegradable plastics.



Clinical Trial Optimization

Recruitment: AI matching algorithms cut timelines 50%+. NetraMark AI analytics.
Site Selection: Predictive models identifying best-performing sites.
Safety Monitoring: Beacon Biosignals raised $86M (Nov 2025) for AI brain health biomarkers.
Impact: 70%+ sites meet enrollment (vs. 30% traditional). 30-40% timeline reduction.

Real-World Success Stories

Atomwise
10M+ compounds screened daily. 750+ global partnerships. Deep learning for drug-target interactions.
Success: Multiple candidates in clinical development for Ebola, MS, rare diseases.
Insilico Medicine
Historic: ISM001-055 (Rentosertib) - first AI drug+target in Phase 2a trials. USAN approved March 2025.
Timeline: 18 months vs. 4-6 years traditional. Novel target discovered by AI.
Pipeline: ISM3312 (COVID-19), ISM3091 (cancer). $400M+ raised.
Schrödinger
NDI-034858: TYK2 inhibitor, best-in-class Phase II psoriasis results.
Acquired by Takeda for $4B (2022). Now Phase III - could be first approved AI drug.

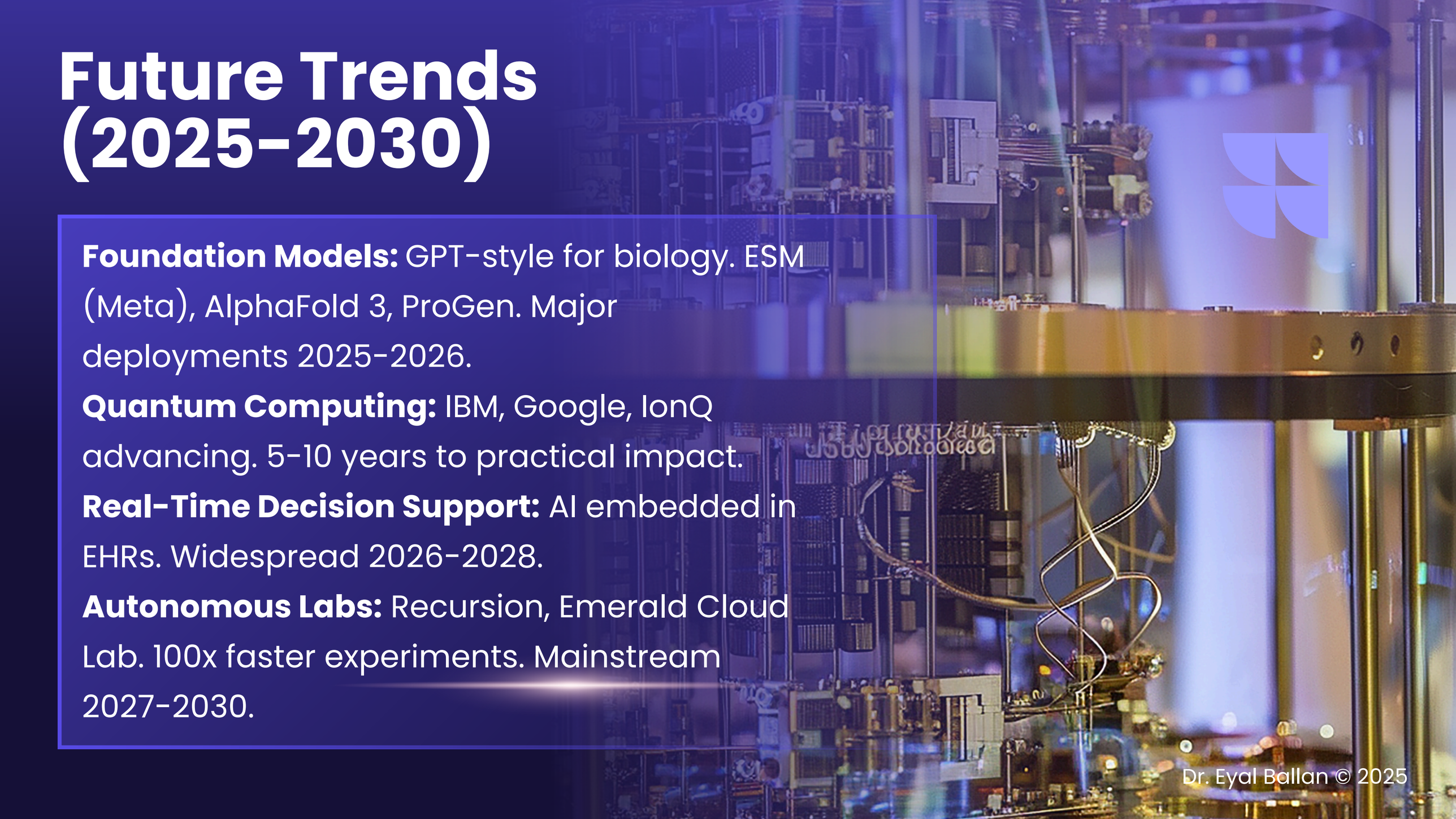
Future Trends (2025-2030)

Foundation Models: GPT-style for biology. ESM (Meta), AlphaFold 3, ProGen. Major deployments 2025-2026.

Quantum Computing: IBM, Google, IonQ advancing. 5-10 years to practical impact.

Real-Time Decision Support: AI embedded in EHRs. Widespread 2026-2028.

Autonomous Labs: Recursion, Emerald Cloud Lab. 100x faster experiments. Mainstream 2027-2030.



Investment Requirements

Technology ($2-5M): Cloud ($500K-1M), AI platforms ($500K-2M), data infrastructure ($500K-1M).

Talent ($1-3M annually): 10-15 hires. AI engineers $150-250K, data scientists $120-200K.

Partnerships ($500K-2M): Platform licenses, CROs, consulting.

Total Year 1: $5-10M

ROI: 2-3x by Year 3. 5-10x by Year 5. Break-even: 18-24 months.