Proteins Are the Nanomachines of Life

Designing Protein Function = Engineering Life

DNA/Gene [STORAGE] → Folded Protein [FUNCTION] → Cell/Organism [EXECUTION]

- Biological Nanostructures
- Biological Sensing
- Chemical Biosynthesis
From Bits to Molecules
Software to Design and Produce Any Molecule, Biologically

Arzeda’s Proprietary Plateform

Cloud computing + DNA synthesis + Metagenomic data

Protein Design + Pathway Design

Designer Proteins & Enzymes
Designer Pathways
Designer Small Molecules
From Bits to Molecules
Computational Design, HT Screening & Data Science

Arzeda Computational Design Platform
- Pathway Design [Scylax™]
- Protein Design [Archytas™]
- Gene Writing [Scribe™]
- Burst™ Cloud Infrastructure [1000s CPU Cores in Production]

Arzeda Lab Screening
- Protein Validation
- Protein Optimization

Data Science
Arzeda’s Value Proposition

Key Applications

**Chemicals - Process Improvement, Sustainable Production and Performance**
- Improving key enzymes and pathways for fermentation processes
- Enabling sustainable production of petrochemicals not produced in nature
- New molecules, performance improvement

**Food & Feed - Focus on Natural Products & Performance Improving Additives**
- Improving key enzymes and pathways for existing natural products
- Enabling fermentation production of uncharacterized natural products

**Plant & Animal Health - Designer Biologics (protein, enzyme) solutions**
- Improving biologics already on the market (shelf stability, pH stability..etc)
- Create designer biologics (new specificities, activities...etc)
Case Study: Design of Novel Crop-Traits
Arzeda Designed Computationally New Enzyme-Based Traits

- Hit selected from well-expressed, no-regulatory concern protein scaffolds
- Initial hits have low catalytic activity but have been improved >1000-fold through iterative design
- Two unique traits were successfully delivered to DuPont Pioneer

Conversion Rate

Design 4

Design 5

Design 12

Samples

Controls
Case Study: Design of Novel Enzymes for Chemicals

Key, Designed Enzyme Enables Butadiene/Isoprene Production

- Arzeda used computational techniques to identify new enzyme with correct catalytic geometries
- Redesigned computationally the enzyme to achieve > 100x improvement in specific activity to this non-natural reaction, enabling isoprene/butadiene fermentation
Case Study: Improvement of Industrial Enzyme

Designed Enzyme Better in Boiling Conditions than Natural Thermophiles!

- Optimize an industrial enzyme for higher performance in industrial harsh conditions (boiling temperatures)
- Computational design able to improve even starting from a scaffold optimized by billion years of evolution to be active at high temperatures
**Case Study: Improvement of Industrial Expression**

**Arzeda Delivered >10x Increase**

- Heterologous industrial enzyme needs to be highly expressed to hit production cost
- Arzeda designed new sequences and yield a variant sequence that expressed functional enzyme with 10x improved yield in industrial host (Bacillus Subtilis)

Dotted Black Line is the natural sequence (WT)

Colored Lines are Arzeda Improved Sequences!
Protein and Pathway Design Impact on Chemicals

Enzyme capability

Pathway possibilities
(i.e., the number of reachable molecules)

1. Known pathways – native host
2. Known pathways – new host
3. New pathways – known reactions
4. New pathways – new reactions (based on known mechanisms)
5. New pathways – new reactions (based on new mechanisms)
Case Study: Production of Novel Specialty Chemicals
Designer Strain Able to Access Entirely New Molecule Classes

Core Intermediate produced with designed pathway
g/L quantities obtained directly out of computational design
Biotech-Driven Value-Chain Shake-up for Chemicals

Traditional Verticals (1890-2010)

Product (Molecule) Design/Discovery

Engineering and optimization

Pilot-scale production

Demo-scale production

Commercial-scale production marketing and sales

DuPont  BASF  Ashland  Monsanto

Arzeda
## Biotech-Driven Value-Chain Shake-up for Chemicals

Emerging Horizontals Driven By Technology Disruptions (2010-)

<table>
<thead>
<tr>
<th>DNA SYNTHESIS</th>
<th>DNA 2.0</th>
<th>Gen9</th>
<th>Twist</th>
<th>genScript</th>
<th>Agilent</th>
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<tr>
<td>PROTEIN &amp; PATHWAY DESIGN FOUNDRIES</td>
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<td>Arzeda</td>
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<td>STRAIN ENGINEERING AND OPT. FOUNDRIES</td>
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<td>CONTRACT MANUFACTURING ORGANIZATIONS (CMOs)</td>
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Arzeda’s Product Business Model

Leverage Technology Platform in Joint Development Agreements
  - JDAs to improve commercial enzymes products and processes (in or out of strains)
  - Performance improvement value creation

Proprietary Product Development and Licensing/Partnership Commercialization

  - **Licensing business model** - ’ARM’ strategy for synthetic biology
    - Internally develop concept and initial application
    - Manufacture with CMOs
    - Commercialize with strategic partners

  - **Portfolio approach**
    - Focused but diversified portfolio of products
    - Thoroughly validated
    - Earlier investment by partner possible
Arzeda Raises $12 Million in Series A Round of Funding Led by OS Fund

Technology scale-up will unlock production of proteins that create sustainable stain-resistant paint, stronger Plexiglas, next-generation sweeteners, and purpose-built molecules that don’t yet exist

SEATTLE, July 20, 2017 (GLOBE NEWSWIRE) -- Arzeda, The Protein Design Company, today announced that it had raised $12 million in a Series A round of funding led by OS Fund and including Bioeconomy Capital and Sustainable Conversion Ventures, as well as a follow-on investment from Arzeda’s seed investor, WRF Capital. Arzeda’s board will be expanded to include Jeff Klumzinger, Co-Founder at OS Fund.

The new investment will accelerate scale-up of Arzeda’s advanced protein design technology that can deliver revolutionary new production pathways for a wide range of valuable chemicals and materials, and serve more partners at greater scale. Arzeda has already successfully developed proteins for global manufacturers, including DuPont, Mitsubishi Rayon, INVISTA and others that improve crop yield and resilience, increase the performance and sustainability of nylon and reduce the cost of producing high-value food ingredients.

The funding will be used to scale-up Arzeda’s high-throughput computing and laboratory infrastructure, allowing additional partners to join with increased confidence in the technology's ability to

Arzeda.
The Protein Design Company™

Thank You
Alexandre Zanghellini, CEO
az@arzeda.com
@ArzedaCo
Arzeda’s Value Proposition

The global leader in industrial protein design & synthetic biology
Arzeda has developed the world-leading proprietary protein, pathway and DNA writing design software. The company core competency in protein design is transformative to all synthetic biology (pathways and strains are as good as the enzymes that make them!)

A proven track record of business execution and technical success
Arzeda’s team gathers the “founding fathers” of computational enzyme design (incl. Prof David Baker, UW) and 200+ years of experience in world-class academic and industrial synthetic bio. Arzeda’s team has delivered in technically challenging partnerships with Fortune 500 companies

A capital-lean trajectory with high ROI potential
Arzeda's has achieved a 50x revenues/investment since Seed investment. At term-sheet valuation, this corresponds to a >8x ROI for seed investor. Because of the capital lean approaches pioneered by Arzeda’s management team, similar ROI for A round is expected.

Partnership-centered commercialization of unique, high-value products
Potential to generate 100s of millions of dollars in licensing fee and royalties by enabling new biotechnological sustainable production routes. Lean, agile business model relying on outsourcing other techs and licensing/co-marketing with industrial partners
Arzeda’s Unique Approach

A *biological* drug, pesticide or enzyme is as good as the underlying protein
A strain is as good as the enzymes (protein catalysts) it expresses

*ergo*

Rapid, reliable design and engineering of new proteins is the key
This will transform entire industries!