

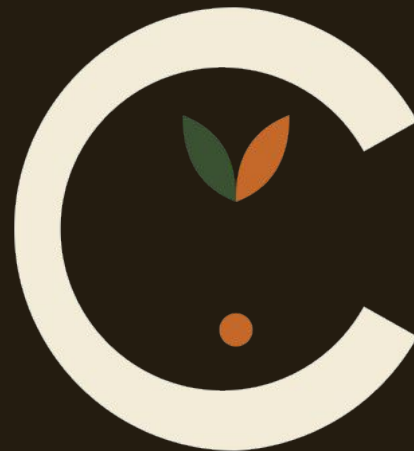


# The Missing Infrastructure of the Bioeconomy

Craft BioSolutions is doing for biomanufacturing what the PC did to computing, taking something large, fixed, expensive, and technical to operate and making it accessible, affordable, and easy to use anywhere.

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Contact [MITCHELL@CRAFTBIO SOLUTIONS.COM](mailto:MITCHELL@CRAFTBIO SOLUTIONS.COM)



*"We are standing on the edge of  
the Fifth Industrial Revolution."*

## Own the Rails

As AI/ML driven discovery and automated bioengineering workflows reduce R&D costs, the value of Biotech IP will decrease, shifting the critical leverage point to the physical biomanufacturing infrastructure.

## Scale Out not Up

The bioeconomy is scaling biomanufacturing the way we scaled chemistry and that is the wrong approach. Small, modular and mass produced will improve quality, enable product diversity and resilience, and will drive down costs through unit economics.

# The U.S. bioeconomy is worth \$950B and extremely diverse...

## Class 1

\$105.9 Billion -  
\$113.8 Billion



Microbes and fungi where biomass is the products (e.g., probiotics)

## Class 2

\$114.3 Billion -  
\$135 Billion



Microbial and fungal secreted products (e.g., enzymes & alcohol)

## Class 3

\$30.2 Billion -  
\$33.3 Billion



Microbial and fungal intercellular products (e.g., chemicals)

## Class 4

\$3.5 Billion - \$5 Billion



Plant and animal cells where biomass is the product (e.g., cultured meat)

## Class 5

\$530 Billion -  
\$700 Billion



Plant and animal cell-based products (e.g., pharma)

**Our Focus**

# Fermentation is becoming a new platform technology



**Probiotics**

**11.5%  
CAGR**



**Sustainable  
Protein**

**13.5%  
CAGR**



**Ag  
Biologics**

**13% CAGR**



**Alternative  
Dairy**

**12% CAGR**



**PrimaColl®**

for longevity inside & out  
use in haircare, skincare, &  
beauty from within applications

GELTOR

Low-Margin, High-Volume

## Ethanol and Bulk Chemical Production



Inexpensive but low-quality

Mid-Margin, Mid-Volume

## New Food, Industrial, and Agriculture Products



Require quality, low-cost production to scale

This does not exist in the U.S. today

High-Margin, Low-Volume

## Pharmaceutical Manufacturing



Expensive but high-quality

# Today's biomanufacturing is art, as much as science

*Engineers perform an improvised dance, constantly adjusting settings to provide the ideal environment for colonies of organisms to grow.*

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Each strain is unique and the organisms' needs evolve and change dynamically. These engineers function as inspired chefs as much as lab technicians.



## THE CRAFT CHALLENGE

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*Every strain is different.*

*Every run is a negotiation.*

*The system hasn't caught up to the science.*

# Infrastructure and labor are the innovation choke point creating stranded IP

EXPENSIVE

**~\$600K**

Companies often require multiple 3–5 day runs to develop a new product (~60% labor costs) for a strain that might not be commercialized.

SLOW

**3–5 yrs**

A new factory takes 3–5 years and costs over \$100 million to build.

RARE

**172**

There are only 172 pilot-scale facilities in the world.

CENTRALIZED

**90%**

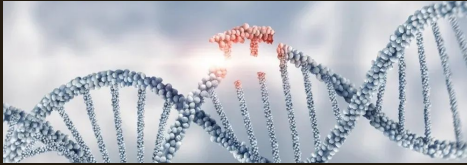
Of manufacturing capacity is concentrated in 10 countries.

# When 50–500L production becomes cheap, easy, and deployable the industry will take off



## New synbio companies

can commercialize more products



## Governments

can manage supply chains differently



## Farmers and rural communities

can produce key inputs locally



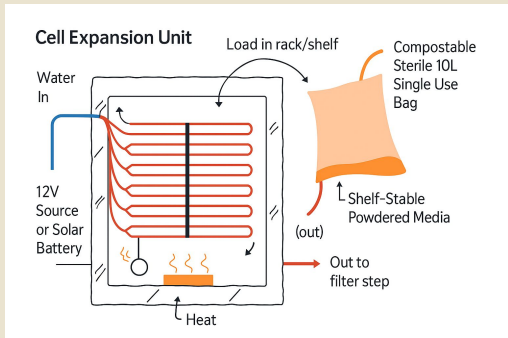
## Industry

can bring point-of-need production to the factory floor



## THE BODY

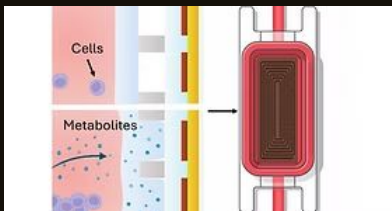
### The Reactor



An extremely low-cost reactor with compostable single use bags and tubing for sterility and quick product turnover.

## THE NERVES

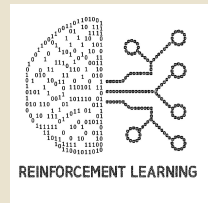
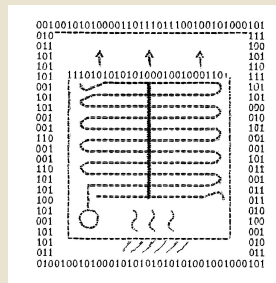
### The Sensor Stack



An integrated contact-free sensor stack that replaces constant manual sampling, closing the loop between hardware and software.

## THE BRAIN

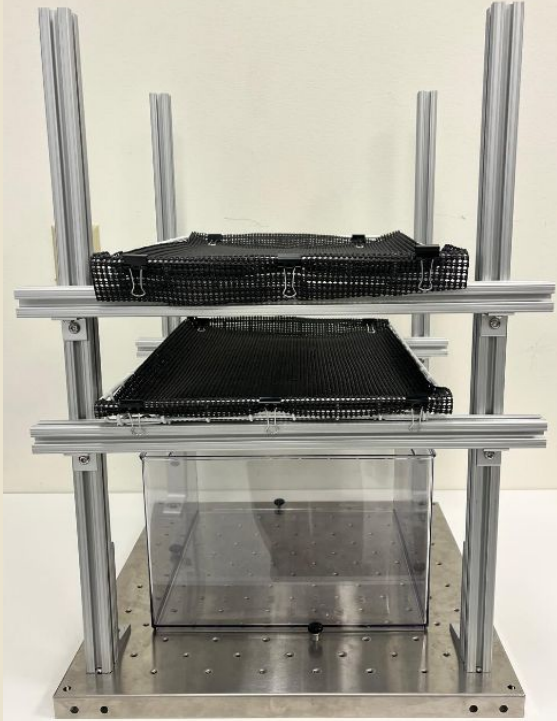
### The Digital Twin



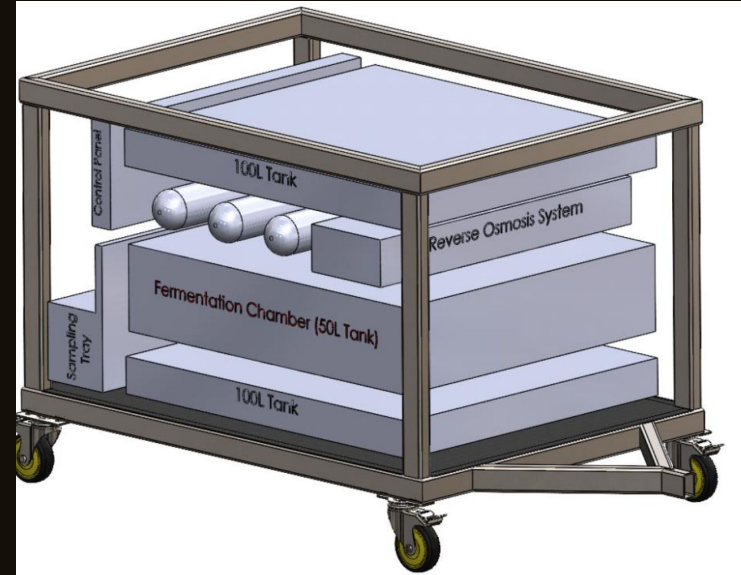
A digital twin architecture and control system to optimize bioprocess data collection and automate operations.

# Starting with the development of a low-cost single-use bioreactor

Currently conducting 4L feasibility studies



To inform our 50L prototype build



## 2nd critical tech area after AI

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U.S. DOD Classification

Strain developers own "stranded IP" — developed but too expensive to commercialize.

U.S. startups are reducing R&D headcount; pipelines have more products than they can test.

Major U.S. tech companies spinning biotech discovery out from their AI labs.

American academics regularly publish promising strains that are rarely developed into products.

China announced a national network of 43 new pilot-scale biomanufacturing facilities to become the global leader.

# A focused team of world-class experts and operators



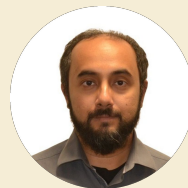
**Mitchell Craft**  
CEO

Leadership roles at Pivot Bio, PepsiCo, and USAID. Lawyer & expert in public policy communications, strategy, and thought leadership with connections in ag, food, synthetic biology, and biomanufacturing communities.



**Nigel Reuel**  
CTO

3X successful founder and Iowa State University Stanley Chair in Interdisciplinary Engineering. Expert in contact-free sensors, biomanufacturing automation, and measurement tool design.



**Sakib Ferdous**  
Head of Bioprocess Automation

Expert in digital twins for biological systems with a PhD in Chemical Engineering and MS in Artificial Intelligence. Pioneered an innovative approach to automated bioreactor control while in Dr. Reuel's lab.



**Amit Vas**  
Head of R&D

Experienced lead scientist and biotechnology executive with a distinguished history driving innovation in strain design and bioprocessing. Expertise in metabolic engineering, microbial quantification, bioreactor design, and fermentation coordination for industrial-relevant fungal and yeast cultures.

## ADVISORS

**Ed You**  
Senior Advisor for Policy and Biosecurity

Former FBI Supervisory Special Agent who led programs to protect US emerging biotechnology and counter biological threats.

**Allen Kuo**  
Legal Advisor

Start-up attorney with extensive experience overseeing R&D and IP portfolios. First in-house counsel at Pivot Bio.

# The market is begging for an economical, low-volume solution

## Dozens

conversations confirming lack of affordable contract bio capacity at 50L–1,000L

## 35%

angel investment tax credit secured from the State of Illinois

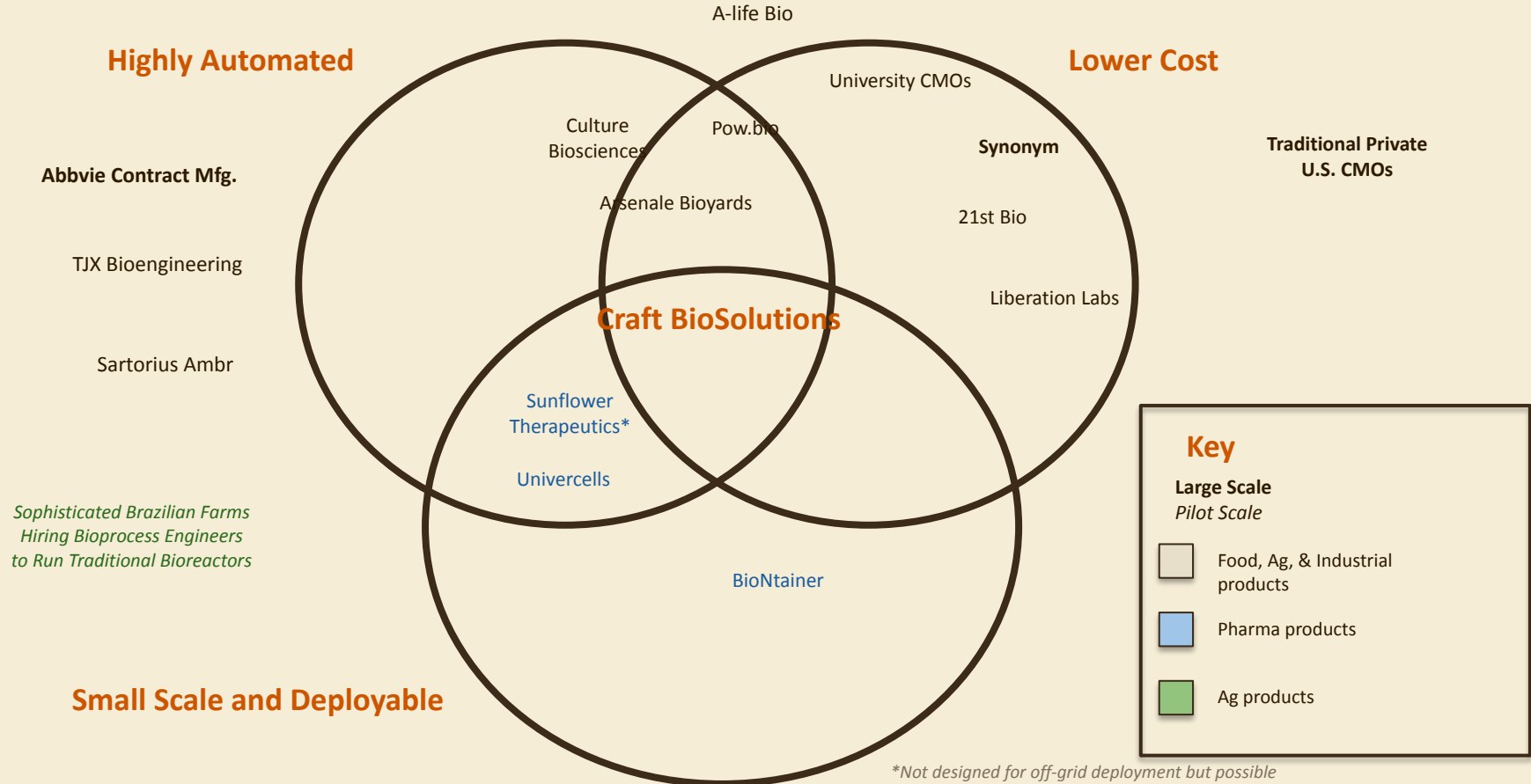
## Multiple

CMOs for ag, industrial & food-grade bio have asked to host our technology

Early support from the Integrated Bioprocess Research Laboratory at UIUC and Iowa State University

Commitments from synthetic biology companies to partner on system validation

# We are the only deployable, low-cost, automated system for food, ag, and industrial biomanufacturing



# Our hardware and software unlocks three reinforcing lines of business

## NEAR TERM

### Contract Manufacturing & Hardware Leasing



Generate immediate revenue and build R&D platform. Our hardware will be used for rapid prototyping and pilot runs for SynBio and ag-bio startups.

## MID TERM

### Keurig for Biologicals



Optimize proven hardware for off-grid deployment. Our hardware will be sold as a point-of-need manufacturing platform with ARR from consumables.

## LONG TERM

### Palantir for Bioprocessing



Our AI/ML stack unlocks "self driving" reactor. We expand our business model and offer networked data and software services.



**CRAFT**

BIOSOLUTIONS

**As biology becomes a manufacturing platform, whoever builds the infrastructure layer, hardware plus data, owns the next industrial stack.**

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Contact [Mitchell@CraftBioSolutions.com](mailto:Mitchell@CraftBioSolutions.com)

THE ASK

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**\$500,000**

on SAFEs to fund prototype development with an eye to 3-unit Beta deployment in 2027



# CRAFT

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BIOSOLUTIONS

Contact [Mitchell@CraftBioSolutions.com](mailto:Mitchell@CraftBioSolutions.com)

# Class 1 – Bioactive and Biomass Products

## Biofertilizers / Soil Amendments



## Mycelium Protein



## Baker's / Brewer's Yeast



## Biopesticides



## Probiotic Supplements



## Mycelium Materials



## Common Challenges

For products created with synthetic biology **genetic drift** can become a major issue

Bulk production of biomass requires **significant upfront capital investment**

Many of these are living products with **short shelf lives**



# Class 2 – Secreted Products

## Industrial Enzymes and Biofuels



novonosis

LanzaTech



We create chemistry

## Flavorings



evolva

## Fibers



## Cosmetics



amyris

## Pigments



## Animal-Free Dairy Protein



## Common Challenges

Bioprocess engineers are expensive and in short supply.

To be cost competitive, engineers have to manually optimize the growth environment across dozens of runs to maximize product yield.

# Class 3 – Intercellular Products

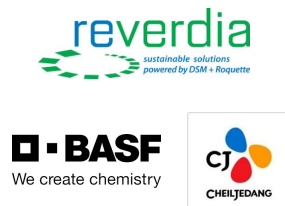
## L-Lactic Acid



## Amino Acids



## Bio-Succinic Acid



## Polyhydroxyalcanoates (PHAs)



## Poly(lactic Acid (PLA) Resin



## Myco-Protein Precursor



## Common Challenges

Class 3 products generally compete directly with low-cost petrochemicals or are otherwise bulk commodities.

Their challenge is **unit economics**.

# Our Addressable Market

**Bottom-up SAM:** ~\$350-\$550M reachable in year-5; **Current TAM:** \$3.6B global

Segment	Target Users	Potential Customer Spend	Est. Total Annual Spend
Bio startups	600 globally	\$250K-\$500K	\$180-\$300M
Ag-bio companies	120 globally	\$0.5-1M	\$60-\$120M
Government & Defense	15 entities	\$1-3M	\$15-\$40M
Global South producers (co-ops and large farms)	300-400 hubs	\$200K + \$100K consumables	\$90-\$120M

This sector will [need to grow by 20x](#)

# Long-Term R&D Priorities

## Stage 1

1. Low-cost reactor for **Class 1 products**
2. Digital twins for RL bioprocess control and optimization
3. Containerized reactor for off-grid deployment

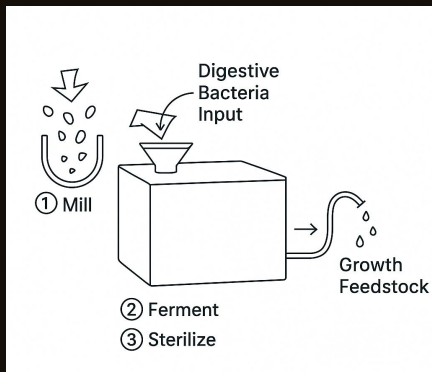
## Stage 2

4. Upstream feedstock conversion unit
5. Low-cost reactor for **Class 2 products**
6. Low-cost reactor for **Class 3 products**
7. **Downstream processing** units

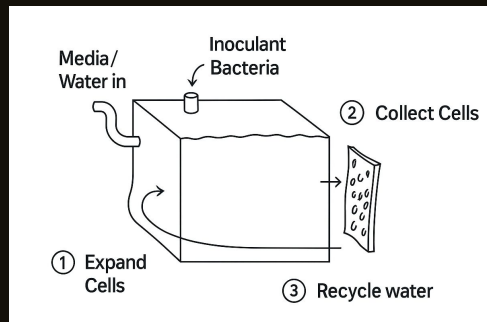
## Stage 3

8. Integrate automated synbio workflows
9. Hardened off-grid unit for military and emergency response
10. Low-cost unit for **Class 5 products**
11. Low-cost unit for Class 4 products

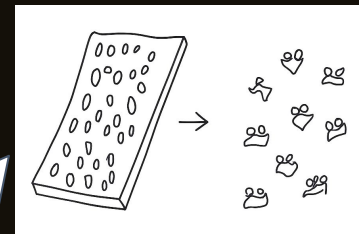
# Long-Term Tech Vision



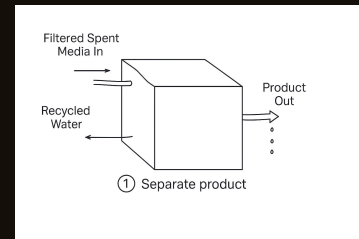
Upstream unit **converts** waste into useful feedstock



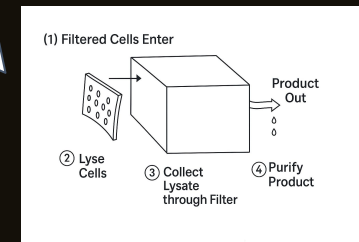
Midstream unit **operates** automated workflows to produce product



Product is harvested for **immediate use**



Downstream unit **processes** secreted product



Downstream unit **processes** intercellular product



## How this might look...

1

A local co-op meets to determine the community's need and select something to produce (nutrition, fertilizer, pesticide, fuel, etc.).

2

Community members bring crop, food, and animal waste to the co-op and it is added to the first unit, which converts it to the target feedstock.

3

The prepared media is transferred to the midstream unit and the sterilized consumables are installed including the cell starter module (shipped from CBS or local storage).

4

The midstream unit expands the cell starter using an intelligent feeding strategy dictated by the RL driven autonomous control.

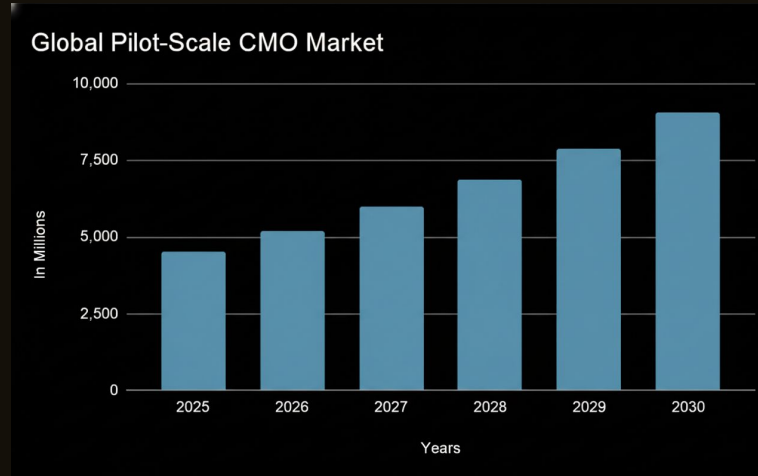
5

The cells are collected from the media/broth as final product or sent downstream for further processing of intracellular products. Water from media is recycled.

6

The final product is divided up and distributed to the community. The consumables are composted.

# The bioeconomy is an \$1.7B U.S. market opportunity today



- A \$1-1.7B pilot-scale market in the U.S. today; \$3-6 B globally, \$9 B by 2030 (14-19% Compounded Annual Growth Rate)
- There are currently about 172 pilot-scale biomanufacturing facilities globally
  - Public University-led, pilot-scale facilities charge \$1,500-\$2,000 / day. Commercial organizations are closer to \$7,500-\$20,000/day for white glove contract development and manufacturing services. ~60% of this fee is labor and these facilities are staffed 24/7 with PhDs