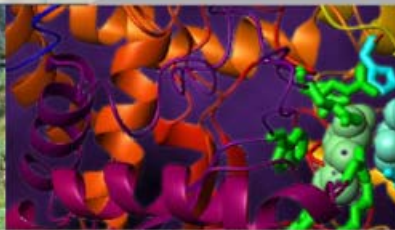




DIVERSA

Bugs Providing Breakthrough Technology for Cellulosic Ethanol Production

Enzymes Produced in Microbes and Termite Guts Accelerate the Production of Biofuels



The Diversa Process

DISCOVER



OPTIMIZE



>200 Issued patents
>500 Pending patents

MARKET



BIOFUELS

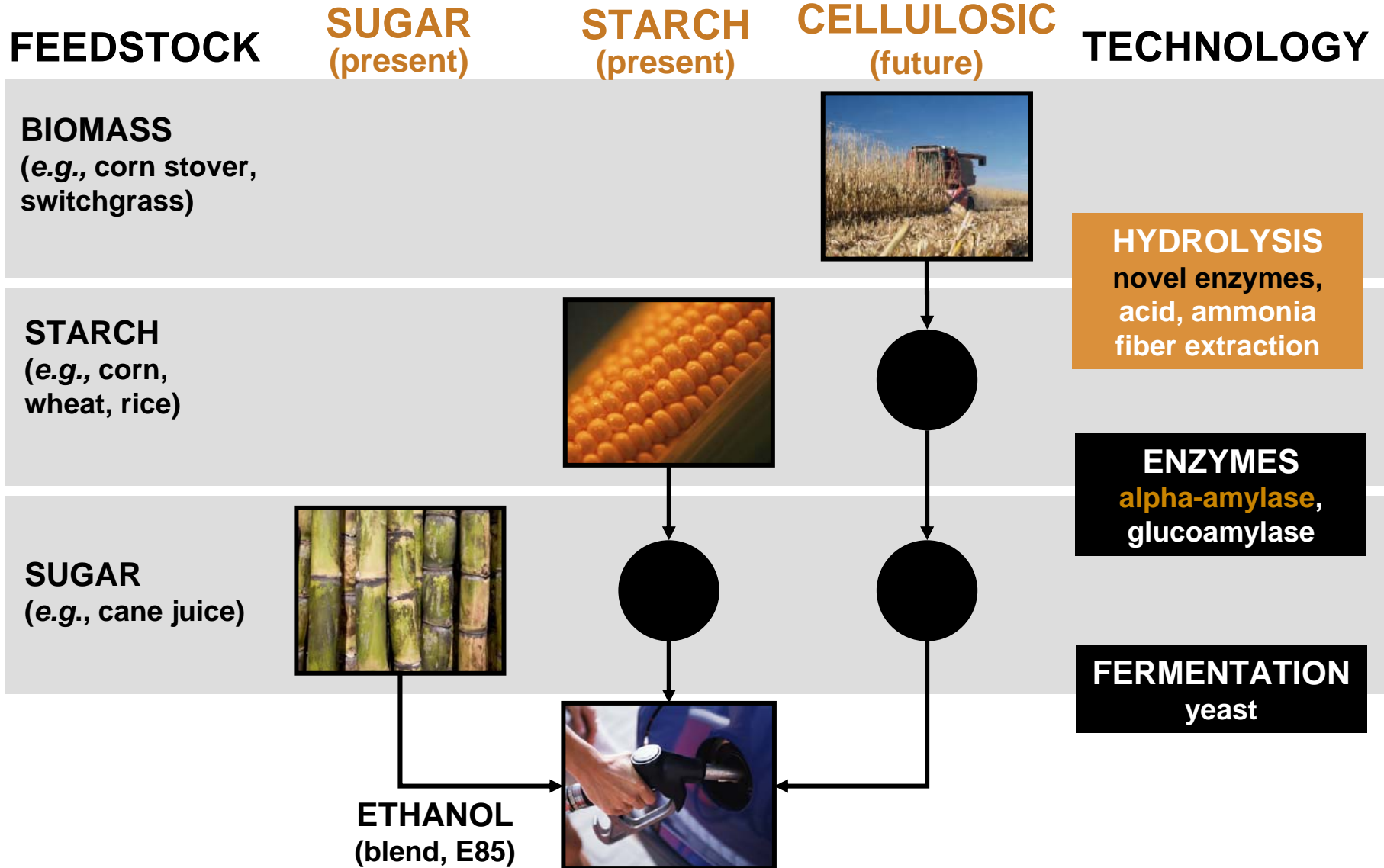


**SPECIALTY
INDUSTRIAL
PROCESSES**



**HEALTH
& NUTRITION**

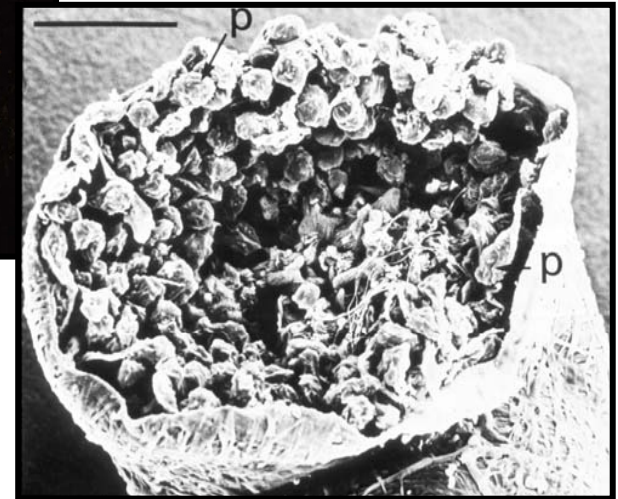
Generating Ethanol



Turning to a Pest for a Process



- **Termites eat wood and convert it to sugar by exploiting the metabolic capabilities of microbes inhabiting their hindguts**
- **Conversion is fast and efficient (95% in 24 hours or less)**



Images courtesy of Leadbetter & Salmassi, CalTech, Pasadena, CA

U.S. Cellulosic Biomass Potential

“Billion Ton Annual Supply”

*Oak Ridge Nat'l Laboratory (4/05)**

- Potential Resources by 2043
 - 1.36 billion tons of cellulosic biomass can yield at least 100 billion gallons of ethanol
- No major shift in land utilization
 - 50% of land mass in US can support cellulosic biomass growth

1.36 BILLION TONS

FOREST



368 MT

AGRICULTURAL



998 MT

(perennial crops,
corn stover, wheat
straw, other crops)

*Biomass as Feedstock for Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply, Oak Ridge National Laboratory (ORNL) April 2005

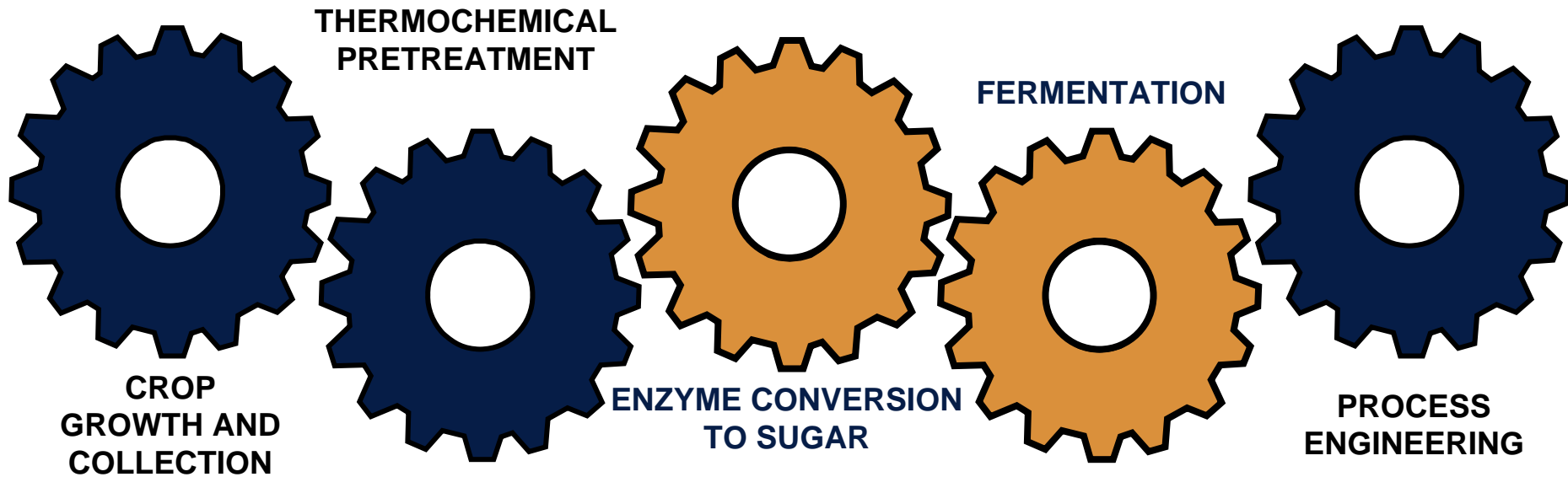
Enzyme Hydrolysis

Converting Cellulosic Biomass to Sugars

- Although cellulosic biomass is plentiful, cost-effective conversion to fermentable sugars is essential
- Key is to identify **large numbers** of novel, robust enzymes
- New enzyme **discovery** and **optimization** technologies are important to enable broad commercial success of the cellulosic biomass to ethanol process



Success Requires Synergy



Integrated Corn-Based Biorefinery (ICBR)

Biorefinery Advantages

- Multiple feedstocks lower average cost
- Multiple output streams
 - Fuel ethanol
 - 1,3 – propanediol for new commercial fibers
- Higher value co-products improve overall economics

Collaboration

- 5 Yr., \$39MM DOE Program



MICHIGAN STATE
UNIVERSITY



Biorefinery Concept

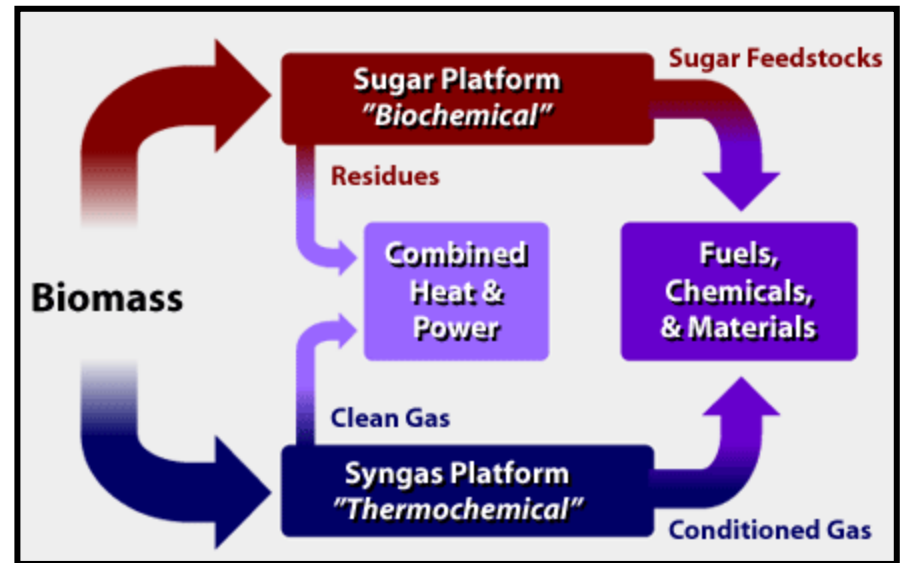


Image: National Renewable Energy Laboratory

Cellulase Enzymes from Termite Guts

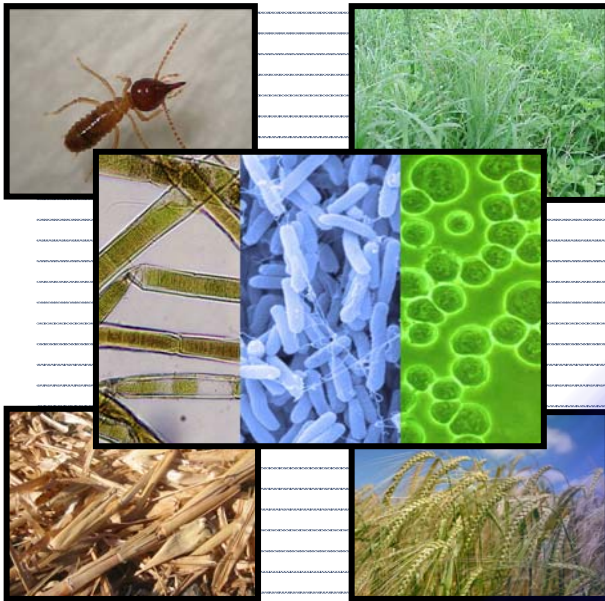
Turning to a Pest for a Process

- Termites eat wood and convert it to sugar by exploiting the metabolic capabilities of microbes inhabiting their hindguts
- Conversion is fast and efficient
 - 95% in 24 hours or less
- Mining these systems should provide a remarkable number of new enzymes that can then be optimized through Diversa's DirectEvolution™ tools to perform on specific cellulosic biomass feedstocks and in specific industrial conditions



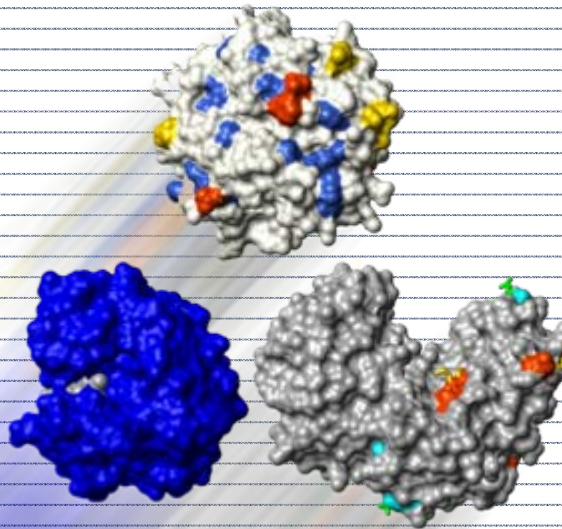
From Microbe to Commercial Process

**ENZYME DISCOVERY
FROM WIDE POOL OF
NATURAL SOLUTIONS**



**Vast Microbial
Diversity**

**IMPLEMENTATION OF
ENZYME OPTIMIZING
TECHNOLOGY**



**Enzyme Cocktail
Targeting Cellulose**

**EFFICIENT
PRODUCTION OF
CELLULOSIC ETHANOL**



**Present and Future
Fuel Resource**

Thank You

