President’s Council

January 18, 2013
Legislative Update

Joe Murphy
January 18, 2013
85th General Assembly

- 110 days
- Senate 26-24, Democratic majority
- House 53-46, Republican majority
  - Special session on Tuesday
- Iowa’s economy strong and improving
Iowa State’s Priorities

- 2.6% Inflationary base increase, $4.4 million
- Bioeconomy Initiative, $7.5 million
- Biosciences Building, $5 million first year
- Regent Student Financial Aid, $39.5 million
- Regent Innovation Fund, $1.05
Governor’s Recommendation

- 2.6% increase for General University Fund
- $3.75 million for Bioeconomy, $7.5 million FY15
- $5 million for Student Financial Aid
- $1.05 million for Regent Innovative Fund
- No funds for Biosciences Building
Legislative Process

• Governor’s recommendation

• President Leath will present the budget in Feb

• House and Senate budget targets forthcoming

• Negotiations continue…
Contact info

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Faculty entrepreneur

Basil J. Nikolau
Frances M. Craig Professor
Department of Biochemistry, Biophysics and Molecular Biology
Center of Metabolic Biology (PSI)
Center of Biorenewable Chemicals (CBiRC)

PRESIDENT'S COUNCIL  January 18, 2013
Outline

• Personnel introduction
  – Intellectual/academic setting
    • Current and past
• What is the driver for faculty entrepreneurship?
• Our current examples
  – OmegaChea Biorenewables LLC
  – SoLysis LLC
  – High-throughput, non-destructive chemistry-based screening of plants for discovery of new chemistries and breeding
    • NSF award
    • Partnerships for Innovation (PFI)/Building Innovation Capacity (BIC)
Introduction

Intellectual/academic setting

• Trained as a biochemist/chemistry
• Integrated molecular biology/genetics during post-doc training
• Integrated genomics/bioinformatics as these sciences developed

Apply these disciplines to issues associated with METABOLISM

Center for Metabolic Biology (CMB)
  – Plant Sciences Institute

Center for Biorenewable Chemicals (CBiRC)
  – NSF funded Engineering Research Center
  – Bioeconomy Institute (BRL building)
Biomass - Lignocellulose
Depolymerize to simple sugars

CO₂

BIOFUEL
CH₃-(CH₂)ₙ-CH₃
Biological Hydrocarbons

BSF-EFRI
DOE-ARPA-E

Glucose

Industriall Chemicals
CH₃-(CH₂)ₙ-COOH

NSF-CBiRC

FOOD/FEED

Integrates Carbon and Energy Capture
Making sense of metabolic complexity in the face of the “messy” enzymes (promiscuity) and unknown functionality
The remarkable complexity of metabolic systems is based on a relatively small number of enzyme folds.
Discovering New Enzymes - New Metabolic Processes and Controlling Catalytic / Metabolic Promiscuity
The driver for faculty entrepreneurship

• We are making new discoveries in metabolism based on new enzymes/genes
  – These are new opportunities for innovations
  – These innovations can be targeted to meet societal needs
    • Food/feed
    • Biomaterials
    • Bioenergy

• Funding opportunities in translational research
  – Driven by budget constraints at the federal level
    • NSF, DOE, NIH
  – Translate fundamental research into innovations too address societal challenges
Three examples

• OmegaChea Biorenewables LLC
• SoLysis LLC
• High-throughput, non-destructive chemistry-based screening of plants for discovery of new chemistries and breeding
  • NSF award
  • Partnerships for Innovation (PFI)/Building Innovation Capacity (BIC)
Bio-based sustainable production of bi-functional chemicals for polymers, lubricants and surfactants

Novel KASIII enzymes

- Hydroxybutyryl-CoA
- Hydroxy, branched-fatty acid
- F/X
- Fatty acid synthase
- NH₂⁻
- Fatty acid synthase
- √
- Fatty acid synthase
- H244
- C112
- N274
- KAS III
- PKS III
- (plant) HMGC
OmegaChea Development

- CBiRC based technology
- Founded April, 2011
- May, 2012 - NSF planning award – i-Corps ($50,000)
- November, 2012 - i6-Green award from ISURF ($50,000)
- December, 2012 - Submitted NSF-STTR proposal ($225,000)
- January, 2013 – hired first employees
SoLysis LLC

Technical Team

Fuyuan Jin
CBiRC
Graduate Student

Marna Yandeau Nelson PhD
CBiRC
Associate Scientist

Basil Nikolau PhD

Business Team

Peter Keeling PhD

• CBiRC based technology
• Founded April, 2012
• November, 2012 - i6-Green award from ISURF ($50,000)
• Planning SBIR proposal – Summer, 2013
SoLysis Technology

Novel/Diverse thioesterase enzymes that terminate fatty acid biosynthesis early

C-6  C-8  C-12

C-16 and C-18 Fatty acids

Normal Thioesterase  Solyssis Thioesterases
SoLysis Technology

Novel/Diverse thioesterase enzymes that terminate fatty acid biosynthesis early

C-6
C-8
C-12

Normal Thioesterase

Solysis Thioesterases

C-16 and C-18 Fatty acids
High-throughput, non-destructive chemistry-based screening of plants

• NSF funded project from a recently implemented program for translational research
  – Partnerships for Innovation (PFI)
    • Building Innovation Capacity (BIC)
    • Accelerating Innovation Research (AIR)
  – In 2012 $15M were awarded
  – Seeks to couple existing NSF awardees with existing commercial entities
    • Address problems of the commercial entities with fundamental research from Universities
BIC Team

Iowa State University Technical Team

- Basil Nikolau
  Plant biochemistry
- John McClelland
  Ames Lab/ISU Spectroscopists
- Thomas Lubbersted
  Agronomy
  Plant Breeding
- Paul Scott
  Agronomy
  Plant Breeding/Physiology

Knowledge Enhancement Partnership – Commercial Entities

- MTEC BioAnalytics - ISU spin-off instrumentation company
- Genetic Enterprises International – bio-fortified grains
- Sustainable Oils, LLC - biofuel seed oils
- Brownseed Genetics, Inc - nutritionally enhanced maize
- Kemin Industries, Inc – antioxidants
- Schillinger Genetics, Inc - non-GMO food-grade soybeans
BIC-Team Technology

- Screening individual seeds via FTIR-NIR transmission spectroscopy
- Determine chemical differences among individual seeds
- Determine new “chemistries” indicating novel metabolic processes
Summary

• Motivations – New activities in entrepreneurial opportunities

• Engaging excellent students
  – Shivani Garg
  – Fuyuan Jin

• Overcoming challenges – mainly due to lack of institutional infrastructure
Questions?