

Project Management in Research *Time-Tested Strategies*

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My Research Background

❖ Ph.D.: University of California-Davis

- 1991, Department of Chemical Engineering
- Measurement of Modeling of Emissions of Volatile Organic Compounds from Contaminated Soils

❖ Postdoctoral Researcher: LLNL

- 1990-1992, Biology and Biotechnology Division
- Attachment of Methanotrophic Bacteria to Aquifer Solids for *In-Situ* Groundwater Remediation



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Current Research Interests

- ❖ Conversion of Woody Biomass to Biofuels
 - Hydrolysis Reaction Experiments and Modeling
 - Fast Pyrolysis Reaction Experiments and Modeling
- ❖ Environmental Life Cycle Assessment
 - Biofuel Pathway Greenhouse Gas Emissions
 - Dairy Crops Greenhouse Gas Emissions
 - Renewable Power Greenhouse Gas Emissions
 - Forest Feedstock Supply Chain Impacts
 - Recycle within Silicon-Based Solar Photovoltaics



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Sustainable Futures Institute

❖ A. Mission

The mission of the Sustainable Futures Institute (SFI) is to enhance knowledge, develop technologies, and expand capabilities to achieve sustainability

❖ B. Vision

The Sustainable Futures Institute (SFI) will have an international impact through its teaching, research, and outreach contributions to the field of sustainable systems



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SFI Objectives from 2008 Strategic Plan

- ❖ Objective 1: Grow the level of external funding
- ❖ Objective 2: Increase the engagement of all stakeholders with SFI
- ❖ Objective 3: Support multidisciplinary research to advance sustainability
- ❖ Objective 4: Produce well-educated, globally aware, diverse student population



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SFI Focus Areas

❖ Sustainability Focus Areas

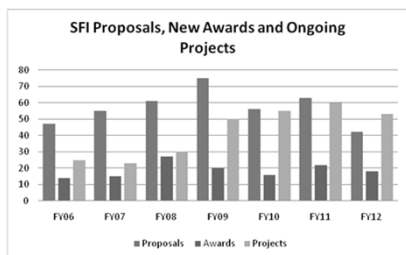
- Sustainable Energy
- D80: Developing World Sustainability
- Sustainability Education
- Modeling of Complex Systems for Sustainability
- Materials, Design and Manufacturing Sustainability



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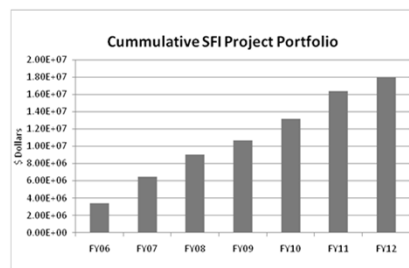
SFI Metrics (Annual Report)



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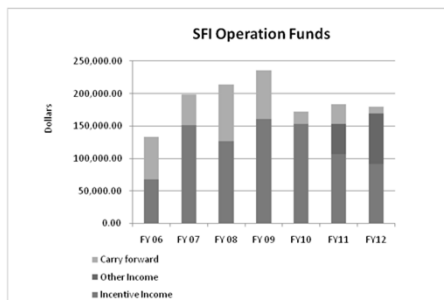
SFI Metrics (Annual Report)



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SFI Metrics (Annual Report)



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Project Management Now

- ❖ Large Multidisciplinary Research Projects
 - Many simultaneous research tasks involving faculty and students from several colleges and schools at MTU
 - Communication among diverse research groups and management of research tasks and data
 - Annual reporting of research progress to sponsoring agencies
 - Publication of research results in peer-reviewed journals and presentations at conferences
 - Education component: Translation of research results into graduate and undergraduate courses

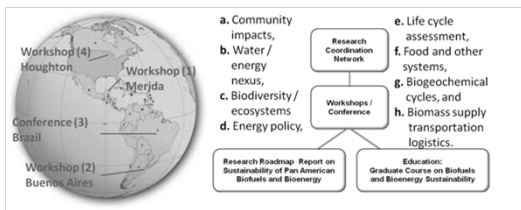


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Research Coordination Network

National Science Foundation: CBET-1140152
 "RCN-SEES: A Research Coordination Network on Pan American Biofuels and Bioenergy Sustainability"
 \$749,996 + \$8,000 supplement; 01/01/12 - 12/31/15.
 Principal Investigator (Shonnard), Co-PI (Solomon, Halvorsen, Sweitz, Donovan), 3 Ph.D. students
 Participants: 50 US and Pan American faculty and industry research professionals



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Research Experience for Teachers

National Science Foundation: EEC-1009617
 "RET Site: "Wood-to-Wheels" – Research Experiences for High School Teachers in Sustainable Transportation Technologies"
 \$358,942 + \$45,000 supplement; 04/01/11 – 03/31/14.
 Principal Investigator (Shonnard), Co-PIs (Baltensperger, Naber, Joshi, Hungwe), 21 high school and middle school teachers, 6 high school students, laboratory kits for high schools



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Sustainable Energy Pathways

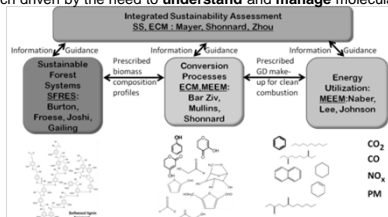
National Science Foundation: MPS/CHE - ENG/ECCS - 1230803

"SEP: Sustainable Forest-Based Biofuel Pathways to Hydrocarbon Transportation Fuels:"

\$1,800,000, 09/01/2012 - 8/31/2016

Principal Investigator (Shonnard), CoPIs (Burton, Bar Ziv, Naber, Mayer), Senior Personnel (7 more), 6 graduate students, 1 postdoc

Research driven by the need to **understand** and **manage** molecular identity



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Time-Tested Methods

A complex endeavor, a simple approach

❖ Plan Your Work

- There is an infinite amount of knowledge out there, to be able to function you need a plan!

❖ Work Your Plan

- A healthy amount of discipline is needed to stick to the plan, not give up, and follow through to completion.



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Plan Your Work

❖ Aim High in Your Plans

- Your objective should be to grow into a world-class expert in your chosen field.

❖ Research is Collaborative

- There is a community of scholars available to learn from and contribute to, so pay attention to the literature, and learn the most advanced methods.

❖ Project Definition

- Define achievable project objectives clearly, but allow some time to explore unexpected areas of knowledge.



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Work Your Plan

❖ Aim High on Outcomes

- Publications are the main measure of success
- Publish your research in high impact journals
- Publish at a rate of 1-2 per year

❖ Role of Research Advisor

- Delicate balance between micro-managing at one extreme and not providing enough guidance on the other.
- Be proactive, not reactive



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Work Your Plan (cont.)

❖ Chase Murphy out of the Lab

- You **must** have confidence in your data, but Murphy's Law is always working against you. Spend a lot of time getting to know your data, repeating results, and interpreting your instrument outputs.
- 90/10 rule: You may spend 90% of your effort and time in taking measurements that never make it into your thesis, dissertation, or publications. But the 10% remaining may hold the truth and the path forward.



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Work Your Plan (cont.)

❖ Life Balance

- You need counterweights to the intense mental tasks that a research program demands
- Stress Relief:
 - Exercise: physical activity will activate and involve other mental and body processes that are both healthful and refreshing, mentally.
 - Socializing: Fit in time for relaxation and companionship with colleagues in your department and in other departments.
 - Family: Spend the time required for a happy family situation



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Work Your Plan (cont.)

- ❖ **Take Satisfaction with Small Victories**
 - A graduate degree is a long road, so don't wait until the finish to feel the satisfaction of accomplishments
- ❖ **Interpret as you go**
 - Continuously interpret the results from your work to understand significance and decide when to stop
- ❖ **Sometimes Miracles Happen**
 - Don't give up even when you don't have anything to show, or you won't have anything to show



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Concluding Thoughts

- ❖ **Graduate Study may be the Best Time of Your Life**
 - Freedom to pursue new knowledge in a relatively unconstrained setting
 - Make lasting friendships and collaborations
 - Open new career paths
 - Make a positive difference in the world



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Questions



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