Project Management in Research

Time-Tested Strategies

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April 24, 2013

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

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

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

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

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
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
Sustainable Energy Pathways

National Science Foundation: MPS/CHE - ENG/ECSS - 1230803
“SEP: Sustainable Forest-Based Biofuel Pathways to Hydrocarbon Transportation Fuels”
$1,800,000, 09/01/2012 - 08/31/2016
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
**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

**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

**Questions**