Proposal Writing

MIKE MITCHELL
PROPOSAL DEVELOPMENT COORDINATOR

My Background

- Former Program Manager for Florida Office of Energy
- ~$17 million funding from US Department of Energy and Department of Agriculture
- Sustainability/Climate Change Policy and Communications
- Electric Vehicle Enthusiast

Before We Begin

- Grants=Fellowships=Awards
- No single method
- The best people to talk to:
  1. The person in charge of the program
  2. Someone who has been funded by the program you are applying to
- You (yes YOU) can get a grant

Persuasive

vs

Expository

- Expository Writing
  - "I have conducted this experiment, it is based on the theory of science, and here is what I found…"
  - Reports, Articles
  - Past tense

- Persuasive Writing
  - "I want to conduct this experiment, it is based on the theory of science, and here is why you should give me money to do it…"
  - Grants, Fellowships, Awards
  - Future tense

Funding Agencies and Foundations

- "Select projects that will enable us to achieve our goals"
- Your project must be a good fit for the funder's priorities.
- You must understand these priorities BEFORE you start writing a proposal.
- Look at:
  - Funder's Website (About Us, Priorities, History, etc.)
  - Strategic or Annual Reports
  - Speeches/Presentations by Top Officials
  - Previous Awards or Awardees
  - The Funding Opportunity Announcement

A proposal is more like a (written) job interview than a journal article

Do Your Homework

- Understand the priorities of the funding agency
- Read some successful proposals to that agency
- Talk to people who have been funded by them
- Look at recent awards
  - Who, and where?
- If possible, check out who the reviewers are

Read the Funding Opportunity Announcement

- **Are you eligible?**
- When is it due?
- Who is the Program Officer?
  - Do you know them, or have you talked to them before?
- How many awards will be made?
- What is the maximum award amount?
- Is cost-share required?
- **Is it a limited submissions program?**
- **Read the description specifically for the kinds of projects they are looking for**

Understand the Review Criteria

- Will be listed either in the funding opportunity, or on the funder's website
- Can't write a proposal until you know what you'll be graded on
- **Write with the intention of providing certain lines that can specifically fulfill certain criteria**

Reviewers

- Two Types of Reviewers:
  - Works for the Funder
    - Motivation: Select projects that have a high likelihood of achieving the funding agency's priorities, and make their organization look good.
  - Volunteer
    - Motivation: Select quality projects, provide a service to their field, keep up with latest research, etc.

Reviewers

Reviewers (usually):

- Are not experts in your *specific* area of research
- Have to read a lot of proposals in a relatively short time
- May be in a windowless conference room, in a city far from home
- Are either not paid, or not paid enough
- At some point are regretting their decision to be a reviewer

Reduce your reviewers' cognitive burden

How to Write a Proposal

- Heilmeier's Catechism
- SMART Goals
- Do's and Do Not's

QUESTION #1

What are you trying to do?

"This project will demonstrate that the law of gravity is applicable to oranges"

QUESTION #2

How is it done today, and what are the limits of current practice?

"Currently, the law of gravity has been demonstrated as applying to apples. While apples are an important fruit, gravity has not been shown to be applicable to other fruits, specifically the orange."

QUESTION #3

What's new in your approach and why do you think it will be successful?

“While based upon the law of gravity, our approach differs in its use of oranges rather than the traditional apple”

“We believe oranges will be successful, as they have been observed falling from trees similarly to the apple.”

QUESTION #4

Who cares? If you're successful, what difference will it make?

“Demonstrating the law of gravity with oranges is important because…”

“Successful completion of this research will revolutionize orange farming by…”

“This is why you should give me money to drop oranges off of buildings:…..”

QUESTION #5

What are the risks and the payoffs?

“This project depends heavily upon the availability of oranges. If adequate supplies of oranges cannot be obtained, grapefruits will suffice, but with less impressive splatter”

“The risk of inadequate supplies of oranges is offset by their greater splatter potential”

QUESTION #7

What are the midterm and final "exams" to check for success?

“By then end of year 1, we expect to have dropped 1000 oranges off a building”

“When the project is completed, we will evaluate our results upon whether we have successfully demonstrated gravity’s applicability to oranges.”

SMART Goals

- **Specific:** Clear and focused to avoid misinterpretation. Should include assumptions and definitions and be easily interpreted.
- **Measurable:** Can be quantified and compared to other data. It should allow for meaningful analysis of progress.
- **Attainable:** Achievable, reasonable, and possible under conditions expected (i.e. budget and timeframe).
- **Relevant:** Fits with the project's overall theme.
- **Timely:** The work is doable within the performance period of the award

NOT SMART

This project will examine teachers to see how they learn, what influences their teaching, and will use the results to help them be better at their jobs.

SMART

This project will conduct a statewide survey of 1,047 mathematics teachers and 35,304 students in 6th through 8th grades in 201 middle schools, and case studies of eight middle schools in Missouri to address the following research and educational objectives: 1) examine the nature of mathematics teachers' opportunity to learn for instructional improvement, 2) examine how work contexts influence the quality of teacher learning opportunities, 3) examine the impact of teacher learning opportunities on changes in student mathematics achievement over four years, and 4) work with district and school administrators to promote instructional improvement and student achievement by effectively providing learning opportunities to mathematics teachers. Survey of students in County A will occur in Year 1, and County B in Year 2 of the project. The information collected in the survey will allow us to evaluate the influence of factors such as those stated in our project summary….

Do Not Do These Things

NO

- “Big” words (unless you have to)
- Grandiose language
- Run-on sentences
- Walls of Text

Do Not Use

“Big Words”*

*Unnecessarily “Big Words”:

- “ This project will elucidate the theory of science”
- “The broader impact activities will allow students to experience visual impressions of a working lab”
- “Hitherto, the theory of science was driven by….”
- …”web-based tool called Visual AnaLysis Tool for REstRictive Eligibility CriterIA (VALERIA), which will allow…”
- “This project will metamorphosize the field of science…”

Do Not Use

Grandiose Language

Examples of Grandiose Language:

- “The proposed project will revolutionize the field of science”
- “The proposed research represents a total paradigm shift”
- “This research will solve climate change and end world hunger”
- “This project will be the most important work in physics since the days of Einstein”
- “No one in the world has ever done research even similar to this”
- “With this single $100k grant, I will…(lists tasks that would require $1M)”

Avoid

Run-on sentences

- Acquaintance with ongoing research projects at FSU related to electric ship technologies, superconducting power systems, and cryogenic systems, as well as the development efforts in collaboration with many Navy contractors provide opportunities for the students in NEEC Program to connect their individual research efforts to powerful future superconducting ship technologies, and prepare them for future engineering careers in these fields which are rapidly expanding due to the needs of a 21st century Navy which is faced with evolving geopolitical threats.

- This book takes as its point of departure the simple thesis that surveillance as we know it in contemporary American culture is both unimaginable and unintelligible without a critical appreciation of the work of a network of corporate leaders, moral crusaders, and ideological policemen, motivated by preserving a specifically Protestant way of life, who helped build the machinery of private and public surveillance that simultaneously sustains and challenges the public sphere as we understand it today.

Avoid

Walls of Text

BAD

The Florida Department of Agriculture and Consumer Services (FDACS), Office of Energy, and Office of Agricultural Water Policy, will establish the Farm Renewable and Efficiency Development (FRED) program, an innovative approach/incentive program to promote the adoption of technologies and practices that increase energy and water efficiency, as well as renewable energy use in Floridian agriculture. Florida's 47,500 farms produce nearly 300 different commodities on more than 9 million acres of land. Florida's agriculture industry employs 2 million people and contributes more than $104 billion to the state's economy each year. Currently, FDACS (in a partnership with NRCS, the University of Florida, the Florida Farm Bureau, and numerous Florida counties and private partners) operates the Mobile Irrigation Lab (MIL) program, which provides to farmers free, site specific, evaluations of irrigation systems and opportunities for water conservation. MILs are made up of one or more trained irrigation specialists who evaluate the performance of a farm's irrigation system through measurement and observation. MIL teams use these observations to develop site specific irrigation water management plans. 16 MILs operate in 66 Florida counties, and have proven to be highly successful; since 2004, MILs have conducted 6,300 evaluations on 247,000 acres of land saving an estimated 10 billion gallons of water per year, with the potential to save 24 billion gallons per year if all recommendations were implemented. The proposed program will expand the capabilities of the MILs and create Mobile Efficiency Labs (MEL) that will conduct on-farm evaluations of the potential for energy and water efficiency as well as renewable energy upgrades. After participating in an evaluation, farmers will immediately be eligible for financial assistance for the implementation of the MELs recommendations. Outreach to farmers fitting the criteria for historically underserved producers (as defined by 7 CFR 1466) will be a priority. Finally, FDACS will conduct a study on the effectiveness of the program, and the future energy and water needs of agricultural producers in Florida. To promote the adoption of energy and water efficiency best management practices in the Florida agricultural industry, particularly amongst historically underserved producers, through the use of the Mobile Efficiency Labs. To stimulate the implementation of energy/water efficiency and renewable energy technology that will benefit individual farmers by decreasing energy and water costs and increasing productivity and efficient use of resources. To study the impact of the FRED program on participating agricultural producers, and to identify future energy/water needs and areas for improvement. The FRED program will be comprised of three phases: MEL teams of trained energy and water specialists will target EQIP eligible farmers to conduct an evaluation of their energy and water usage through observation and measurement. Based on this evaluation, the team will provide a report recommending ways to improve the performance and efficiency of the farm's energy and water systems. This report will consist of best management practices for water and energy, as well as recommendations for specific infrastructure upgrades intended to maximize efficiency, which may include the utilization of on-farm renewable energy generation (solar, wind, biomass, etc.). Whether or not the farmer chooses to make the recommended upgrades, the increased knowledge of their energy and water usage, combined with the best management practices, will likely result in a change of behavior resulting in greater efficiency. This benefits the farmer, in terms of costs reduced and production increased, and the environment, in terms of reduced water usage and reduction of environmental pollutants. After receiving their evaluation report, farmers will be eligible to immediately apply for up to $25,000 (with 20% cost share) in funding to implement recommended energy/water efficiency and renewable energy upgrades. Applications will be accepted on a rolling basis until funds designated for implementation are expended. The immediate eligibility will result in a dramatic reduction in the lag time between when a farmer

Avoid

Walls of Text

Good

A. Project Background:

The Florida Department of Agriculture and Consumer Services (FDACS), Office of Energy, and Office of Agricultural Water Policy, will establish the Farm Renewable and Efficiency Development (FRED) program, an innovative approach/incentive program to promote the adoption of technologies and practices that increase energy and water efficiency, as well as renewable energy use in Floridian agriculture. Florida's 47,500 farms produce nearly 300 different commodities on more than 9 million acres of land. Florida's agriculture industry employs 2 million people and contributes more than $104 billion to the state's economy each year. Currently, FDACS (in a partnership with NRCS, the University of Florida, the Florida Farm Bureau, and numerous Florida counties and private partners) operates the Mobile Irrigation Lab (MIL) program, which provides to farmers free, site specific, evaluations of irrigation systems and opportunities for water conservation. MILs are made up of one or more trained irrigation specialists who evaluate the performance of a farm's irrigation system through measurement and observation. MIL teams use these observations to develop site specific irrigation water management plans. 16 MILs operate in 66 Florida counties, and have proven to be highly successful; since 2004, MILs have conducted 6,300 evaluations on 247,000 acres of land saving an estimated 10 billion gallons of water per year, with the potential to save 24 billion gallons per year if all recommendations were implemented. The proposed program will expand the capabilities of the MILs and create Mobile Efficiency Labs (MEL) that will conduct on-farm evaluations of the potential for energy and water efficiency as well as renewable energy upgrades. After participating in an evaluation, farmers will immediately be eligible for financial assistance for the implementation of the MELs recommendations. Outreach to farmers fitting the criteria for historically underserved producers (as defined by 7 CFR 1466) will be a priority. Finally, FDACS will conduct a study on the effectiveness of the program, and the future energy and water needs of agricultural producers in Florida.

B. Project Objectives:

Objective One: To promote the adoption of energy and water efficiency best management practices in the Florida agricultural industry, particularly amongst historically underserved producers, through the use of the Mobile Efficiency Labs.

Objective Two: To stimulate the implementation of energy/water efficiency and renewable energy technology that will benefit individual farmers by decreasing energy and water costs and increasing productivity and efficient use of resources.

Objective Three: To study the impact of the FRED program on participating agricultural producers, and to identify future energy/water needs and areas for improvement.

C. Project Methods:

The FRED program will be comprised of three phases:

Phase One: MEL On-Farm Evaluations
MEL teams of trained energy and water specialists will target EQIP eligible farmers to conduct an evaluation of their energy and water usage through observation and measurement. Based on this evaluation, the team will provide a report recommending ways to improve the performance and efficiency of the farm's energy and water systems. This report will consist of best management practices for water and energy, as well as recommendations for specific infrastructure upgrades intended to maximize efficiency, which may include the utilization of on-farm renewable energy generation (solar, wind, biomass, etc.). Whether or not the farmer chooses to make the recommended upgrades, the increased knowledge of their energy and water usage, combined with the best management practices, will likely result in a change of behavior resulting in greater efficiency. This benefits the farmer, in terms of costs reduced and production increased, and the environment, in terms of reduced water usage and reduction of environmental pollutants.

Phase Two: Farm Renewable and Efficiency Development (FRED) Grant Program
After receiving their evaluation report, farmers will be eligible to immediately apply for up to $25,000 (with 20% cost share) in funding to implement recommended energy/water efficiency and renewable energy upgrades. Applications will be accepted on a rolling basis until funds designated for implementation are expended. The immediate eligibility will result in a dramatic reduction in the lag time between when a farmer has an evaluation conducted, and the installation of their chosen upgrades, leading to greater enthusiasm for the adoption of the recommended efficient and renewable technologies. MEL teams will provide assistance to applicants in the development of their proposals, and FDACS will review and approve applications. The choice of which, if any, technologies to adopt will be left up to the individual farmer.

Phase Three: Economic Impact Study
The Office of Energy will procure a qualified contractor to perform an economic analysis of the impacts of the FRED program. Emphasis will be placed on the evaluation/ upgrades effect on the net revenue, net cost, yield variability, and other measures of economic risk and impact. The study will consist of data collection and evaluation, as well as case studies of the individual projects. All recipients of funds will be required to provide information on the impact of the project on their farms. The study will aid FDACS and other stakeholders in the development of future programs and policies. Information from the study will also be used to produce pamphlets promoting water and energy best management practices, citing real world examples.

Do Not

Make the Reviewer Infer Meaning

- NO
  - "Based on this prior research, the next step is obvious."
  - "Once Process A has been completed, we will then begin work on Process C"
  - "The results of Process A are shown in Table 1."
  - "We expect our work to yield important results…"
  - "We will work with our partners to complete the project"

- Yes
  - "Based on this prior research the next step is (state the next step)"
  - "Once Process A is complete, we will begin Process B, which leads to Process C."
  - "The results of Process A are shown in Table 1. These results mean…"
  - "We expect our work to yield important results. (specifically state the important results)."
  - "We will work with our partners to complete the project. Specifically, we will conduct process A, they will conduct process B, and we will collaborate on Process C."

Do These Things

Yes

- Clear, Concise Title
- **Bold**, *italicize,* underline key points
- Graphics/Tables
- Summarize long sections
- Have a clearly defined structure
- Write specifically to the review criteria

Title

  - Clear
  - Concise
  - “Active”
  - Interesting

- A good title makes the proposal more memorable
- Especially important for proposals to private foundations
  - Think about what would “look good in the news”
- **Does not have to be “academic” sounding**

A general presentation on the mechanics of proposal preparation with a secondary specific focus on the National Science Foundation

vs.

The Basics of Grant Writing- NSF

Bold, *italicize*, underline key points

Project Description

I. Overview and Significance of the Proposed Project

Research: The development of solid electrolytes for all solid-state rechargeable Li/Na-ion batteries faces a few major challenges, including high interfacial resistance, low electrochemical and thermal stability, microstructure-induced short-circuit, and poor mechanical properties. Glass-ceramics, with significant advantages over conventional glass or ceramic alkaline-ion electrolytes (Fig. 1), have emerged recently as a new solution to address these challenges[1-6]. Glass-ceramics combine the benefits of high ionic conductivity, absence of inter-particle transfer resistance, and good stability. However, the properties of glass-ceramics are highly dependent on structures, phase compositions, and ion dynamics in these two-phase composites. The optimization of these parameters largely relies on the trial-and-error approach at this stage. In addition, current glass-ceramic electrolytes are limited to Na superionic conductor (NASICON)-based structures. **This proposed work aims to understand the dynamic structure -property-performance relationships of glass-ceramic electrolytes with in situ synthesis and in operando characterizations**. The objective of the *in situ* synthesis is to achieve predictive and controlled synthesis of glass-ceramics with high Li/Na ion mobility and to expand the variety of suitable glass-ceramics beyond NASICON-based structures. The tools for *in situ* synthesis include the high-temperature high-resolution NMR facility set up by the PI's group at the National High Magnetic Field Laboratory (NHMFL), complemented by *in situ* synchrotron-based X-ray and neutron diffraction at national user facilities. The combination of NMR and diffraction techniques allows probing both long- and short-range structures, which is particularly useful for glass-ceramics containing both ordered ceramic particles and amorphous glass phase. NMR is capable of determining both structure and ion dynamics simultaneously, which permits real-time structure-ion mobility correlation and fast screening of kinetically stable phases for good ion conductors. In addition, first principles calculations will be carried out, in conjunction with experiments, to ensure accurate structure determination with property prediction of ion conduction. The objective of the proposed *in operando* characterizations is to determine suitable structural and compositional characteristics of glass-ceramics for fast ion conduction, low interfacial resistance, and good stability when they are used in all-solid-state batteries. *In operando* characterizations will be mainly performed at the NHMFL with NMR/MRI, complemented by high-resolution transmission electron microscopy (TEM) and X-ray photoelectron spectroscopy (XPS). With these tools, the structure, composition, and homogeneity will be non-invasively probed in the bulk of the glass-ceramic electrolytes and the electrolyte/electrode interface during battery operation and will be correlated with the changing interfacial resistance and long-term stability. The new knowledge in the real-time relationships between structure/composition/homogeneity and conductivity/stability, obtained from *in situ* and *in operando* characterizations, will facilitate the development of high-performance Li/Na glass-ceramic electrolytes for the next-generation all-solid-state Li/Na rechargeable batteries.

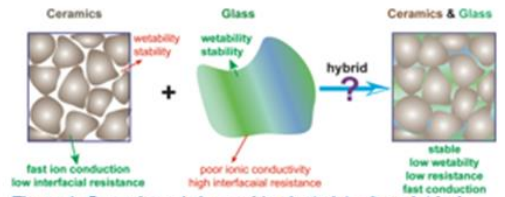

Figure 1. Ceramic and glass oxide electrolytes have intrinsic limitations to fulfill the requirements for all-solid-state batteries. Glass-ceramic composites are a promising solution, but fundamental research is critical to gain necessary knowledge regarding their synthesis, processing, and in device performance.

Education: The proposed educational activities are derived from the proposed research component and the outcomes of the educational plan will in turn support the research. The objectives of the educational component are to engender self-sufficiency, to promote broad participation in scientific research, and to enhance critical thinking skills of the participants. The first proposed activity is to train young scientists national wide how to make, modify, and repair probes for NMR/MRI. This activity is motivated by two realities: i) almost every institution has at least one NMR facility or is in the processing of acquiring one; ii) the monopoly of the NMR probe market by a single vendor, the limited permission from the NMR vendor for modifying the probe, and the high-cost, long waiting time for repair. Probe workshops will be organized

CREST Center for Complex Materials Design (*CoManD*) for Multidimensional Additive Processing

Project Description

A. Rationale for Center: The aim of the *CREST Center for Composite Materials Design* (*CoManD*) *for Multidimensional Additive Processing* is to promote additive manufacturing of conventional and novel device structures, with an effort towards ab-initio fundamental understanding of material-property relationships that govern the working forces behind high-rate applications for bio, energy and production of light-weight structures. Additive processing holds great promise towards reduction of costs and will help solve key manufacturing challenges to fabricate materials of interest [1-6]. The PI's at **Florida Agricultural & Mechanical University (FAMU)** individually are experts in their fields, and are funded to investigate the chemistry, physics, and engineering of soft materials in the areas of organized structures at the mesoscale (Ramakrishnan, Mateeva), energy and electronic devices (Dickens) and biomedical research (Sachdeva, Dev). It is our goal in *CoManD* to combine the expertise of the faculty at FAMU to develop an integrated research and education program on additive manufacturing which not only meets the technological demands of the 21st century but also trains the next generation of minority scientists and engineers. ***As a result of the CoManD we expect to produce 15-20 African American PhD's, directly impact 30-40 undergraduates and have an influence on ~ 100 graduate students and ~ 300 undergraduates through research collaborations and coursework***. This would be a significant increase in FAMU PhD's and would help to assist them in exceeding expectations of the Florida University System. Collaborations with Florida State University (FSU), the National High Magnetic Lab (NHMFL), Harvard, MIT, Argonne National Lab (ANL), and the Air Force Research Labs (AFRL), will allow *CoManD* scholars to benefit from the opportunity to carry out research and be educated by leaders in their fields, thus building a sustainable education and mentoring network for FAMU faculty and students.

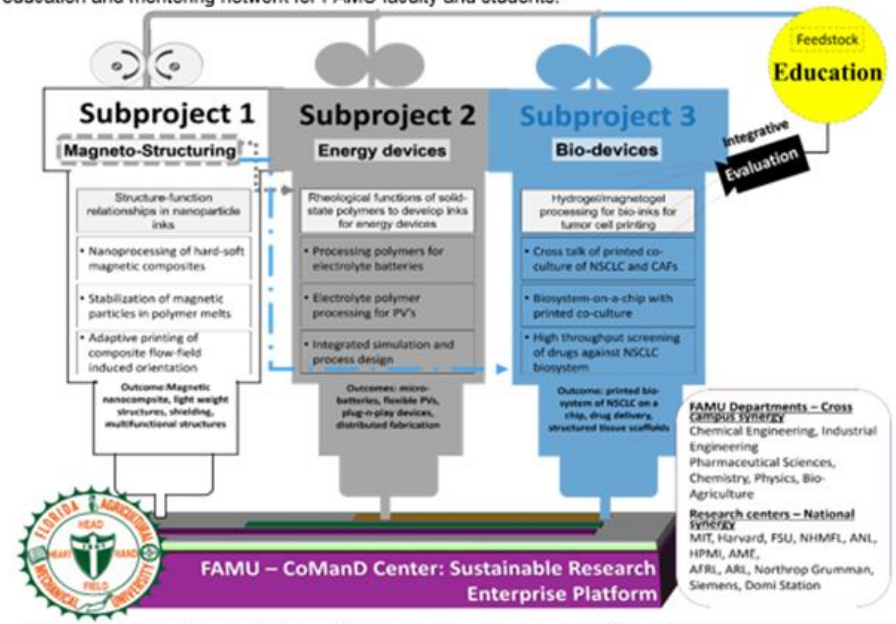

Figure 1: Schematic for CREST center *CoManD*– The aim is to integrate research and education to produce novel materials/devices for different applications using additive processing and at the same time get a fundamental understanding of the manufacturing process.

B. Description of the Research Objectives of the Center: The ability to pattern multiple materials (on micrometer length scales) in three dimensions is critical for several technological applications including composites, microfluidics, photonics, and tissue engineering, which are of interest to the different federal directorates and technology areas. Several challenges occur in the processing of these structures that inhibit overall performance, which will ultimately decide the direction of future applications[2,7,8]. One key challenge is to combine different materials and to control the minimum feature size down to the submicrometer lengths scales (e.g. feature sizes down to 1-10μm are critical for creating interdigitated microbattery architectures or biocompatible scaffolds). ***It is our aim in the CoManD Center to assemble novel materials (by self-assembly) and further control assembly from the micro to macro scale by field induced (flow, electric and mag fields) assembly and additive manufacturing***. In addition to manufacturing it is also of interest to address fundamental issues of how different materials are assembled into useful structures resulting in interesting macroscopic properties. Such fundamental studies will result in novel design rules for materials processing. A schematic of our center is given in Figure 1. Through the CREST center we will: a) continue to strengthen our collaborations with NSF funded centers/programs at NHFML/FSU, Harvard University (MRSEC), MIT, ANL and AFRL to further integrate research and education for STEM minorities and women and b) enhance investment in the research and educational infrastructure at FAMU, a historically black college/university (*HBCU*) with 90% African-American students. We intend to recruit, retain and train a highly skilled and prepared female demographic workforce for skills essential to re-stocking America's academic, federal research and scientific institutions. The demographics of FAMU is predominantly 65% female, however, the population of STEM is only ~5%. The *CoManD Center* is committed to a strong concerted effort to attract this minority pool as the feedstock for a successful educational research and training program at FAMU.

The proposed research of CoManD will be greatly aided by the recent **securing of a Department of Defense Equipment (Defense University Research Instrumentation Program – DURIP) grant (~ 340K) for a high end 3D printer for manufacture of materials** of interest to the department of defense (Air Force). The nScrypt 3Dn series is a digital manufacturing platform with the ability to host up to five printing heads or devices to print on curved surfaces, build 3D structures, pick and place a component, and micro-milling/drilling. Performance is achievable with a motion control accuracy of ±5 microns and repeatability of ±2 microns in XY. The 3Dn-HP series uses a high precision platform with motion control accuracy of ±1.5 microns and repeatability of ±0.5 microns. This enhanced precision of the 3Dn-HP series provides the capability for high precision/accuracy material placement when very fine feature size and spacing as needed. The patented SmartPump™100 is a micro-dispensing pump manufactured by nScrypt that has a volume control of dispensed materials of 100 picoliters, this includes low viscosity (a few cP) to high viscosity (more than 1,000,000 cP) materials. In addition, the patented pen tip shape allows extreme viscosities to be dispensed utilizing small orifices (as small as 12.5um) at significantly lower pressures. The patent pending nFD™ has the ability to print thermoplastics and composite thermoplastics with temperatures ranging from room temperature up to 400C. The compact designed process view camera system provides close up real time viewing of the printing process. **It is our aim in the CREST center to *leverage* this equipment grant and use the printer to fabricate materials of technological interest and in answering fundamental science questions.** In addition to the equipment grant, *PI S. Ramakrishnan spent his NSF funded sabbatical (spring 2016) at Harvard University (MRSEC) and MIT in developing materials of interest related to bio-, structural material and energy related devices.* This equipment however does not come with a biosafety hood and other accessories to do biological work and hence for subproject 3, a request for an additional Bioprinter has been made.

Targeted AIMs/ Center Research Subprojects (CRS): ***Our aim in all three subproject areas*** is to (1) gain a fundamental understanding of the materials assembly and processing through a combination of experiments, simulations and theory. (2) Develop and use novel characterization tools for the proposed materials/devices and (3) use additive manufacturing to make these structures/devices. ***It is our goal to develop this framework for the three different subprojects mentioned in this wor***k. We feel such an integrated effort will help in developing design rules for processing of a wide variety of materials. In fact, the fundamental experiments/simulations developed for energy materials will help build better biomaterials and even structural magnetic materials (synergistic efforts). There is significant synergy in the projects proposed since synthesis, characterization and processing tools developed in one subproject will be used in the others for defined end points. For example, a fundamental understanding of nanoparticle/polymer

Graphics

Good Use of Graphics

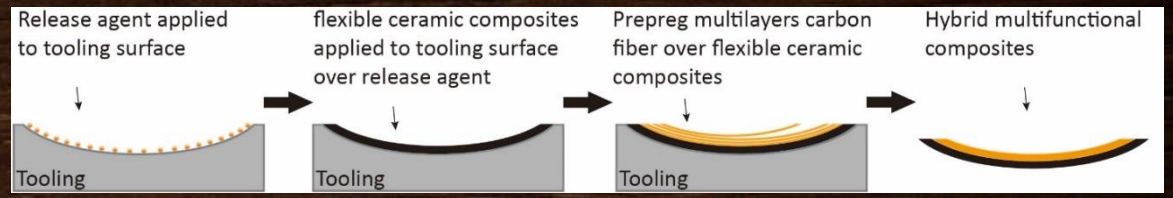

Figure 1. Co-curing lay-up procedure to bond a ceramic composite layer on the outside surface of CFRP composites for use in advanced aeronautical applications

Bad Use of Graphics

Figure 1. Advanced Aeronautical Applications

Graphics

Good Use of Graphics

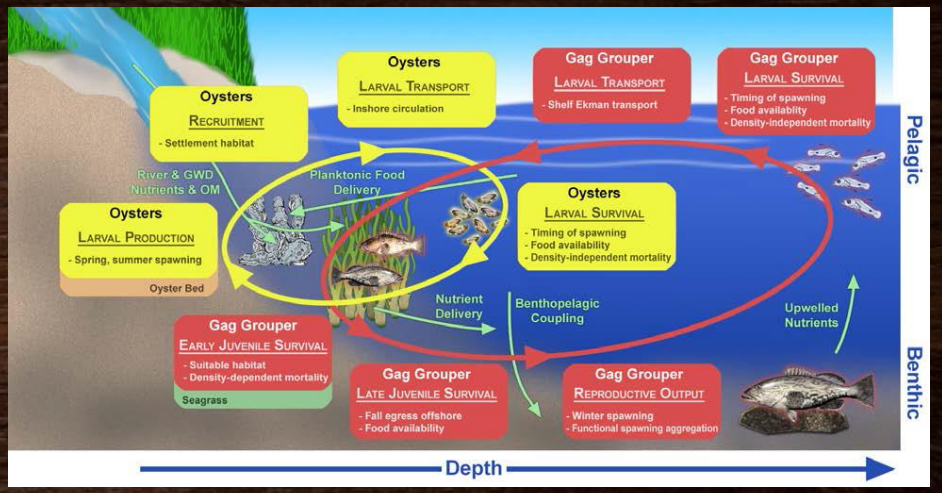

Figure 1. Schematic of interactive pathways of abiotic and biotic factors of fish in the Gulf of Mexico

Bad Use of Graphics

Figure 1. The Gulf of Mexico

Graphics

Good Use of Graphics

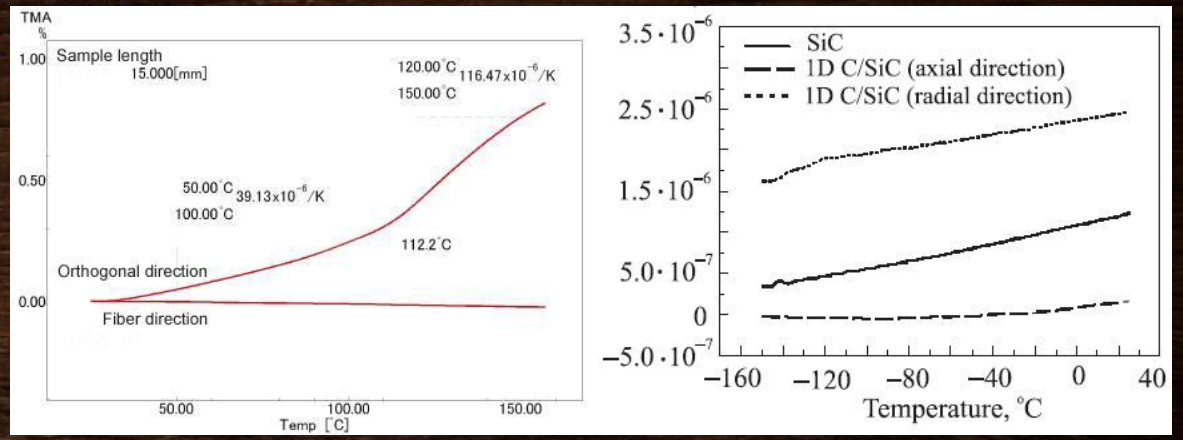

Figure 1. Coefficient of thermal expansion for CFRP Composites (left) vs SiC composites (right)

Bad Use of Graphics

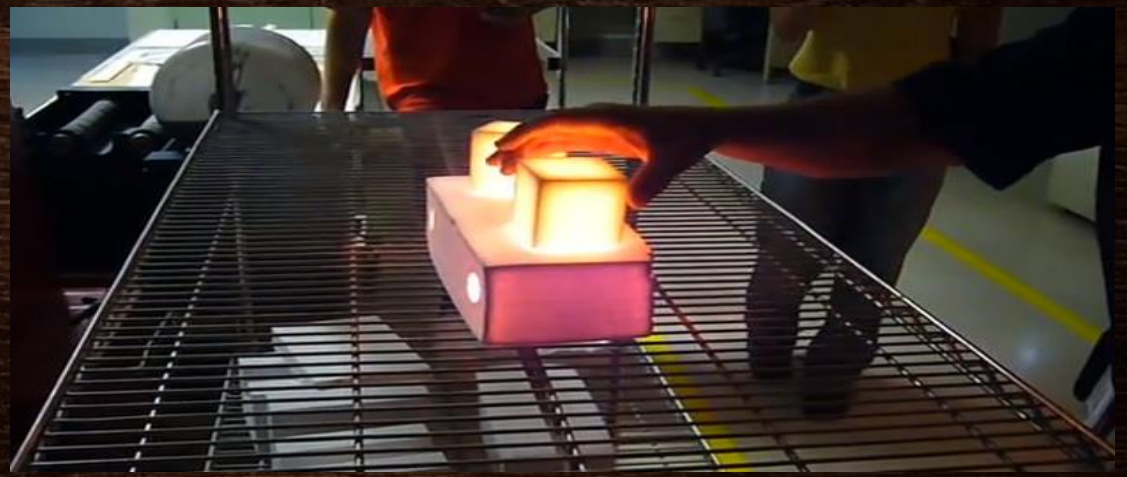

Figure 1. Thermal Expansion

Proposal Structure

A. Project Background:

The Florida Department of Agriculture and Consumer Services (FDACS), Office of Energy, and Office of Agricultural Water Policy, will establish the Farm Renewable and Efficiency Development (FRED) program, an innovative approach/incentive program to promote the adoption of technologies and practices that increase energy and water efficiency, as well as renewable energy use in Floridian agriculture. Florida's 47,500 farms produce nearly 300 different commodities on more than 9 million acres of land. Florida's agriculture industry employs 2 million people and contributes more than $104 billion to the state's economy each year. Currently, FDACS (in a partnership with NRCS, the University of Florida, the Florida Farm Bureau, and numerous Florida counties and private partners) operates the Mobile Irrigation Lab (MIL) program, which provides to farmers free, site specific, evaluations of irrigation systems and opportunities for water conservation. MILs are made up of one or more trained irrigation specialists who evaluate the performance of a farm's irrigation system through measurement and observation. MIL teams use these observations to develop site specific irrigation water management plans. 16 MILs operate in 66 Florida counties, and have proven to be highly successful; since 2004, MILs have conducted 6,300 evaluations on 247,000 acres of land saving an estimated 10 billion gallons of water per year, with the potential to save 24 billion gallons per year if all recommendations were implemented. The proposed program will expand the capabilities of the MILs and create Mobile Efficiency Labs (MEL) that will conduct on-farm evaluations of the potential for energy and water efficiency as well as renewable energy upgrades. After participating in an evaluation, farmers will immediately be eligible for financial assistance for the implementation of the MELs recommendations. Outreach to farmers fitting the criteria for historically underserved producers (as defined by 7 CFR 1466) will be a priority. Finally, FDACS will conduct a study on the effectiveness of the program, and the future energy and water needs of agricultural producers in Florida.

B. Project Objectives:

Objective One: To promote the adoption of energy and water efficiency best management practices in the Florida agricultural industry, particularly amongst historically underserved producers, through the use of the Mobile Efficiency Labs.

Objective Two: To stimulate the implementation of energy/water efficiency and renewable energy technology that will benefit individual farmers by decreasing energy and water costs and increasing productivity and efficient use of resources.

Objective Three: To study the impact of the FRED program on participating agricultural producers, and to identify future energy/water needs and areas for improvement.

C. Project Methods:

The FRED program will be comprised of three phases:

Phase One: MEL On-Farm Evaluations
MEL teams of trained energy and water specialists will target EQIP eligible farmers to conduct an evaluation of their energy and water usage through observation and measurement. Based on this evaluation, the team will provide a report recommending ways to improve the performance and efficiency of the farm's energy and water systems. This report will consist of best management practices for water and energy, as well as recommendations for specific infrastructure upgrades intended to maximize efficiency, which may include the utilization of on-farm renewable energy generation (solar, wind, biomass, etc.). Whether or not the farmer chooses to make the recommended upgrades, the increased knowledge of their energy and water usage, combined with the best management practices, will likely result in a change of behavior resulting in greater efficiency. This benefits the farmer, in terms of costs reduced and production increased, and the environment, in terms of reduced water usage and reduction of environmental pollutants.

Phase Two: Farm Renewable and Efficiency Development (FRED) Grant Program
After receiving their evaluation report, farmers will be eligible to immediately apply for up to $25,000 (with 20% cost share) in funding to implement recommended energy/water efficiency and renewable energy upgrades. Applications will be accepted on a rolling basis until funds designated for implementation are expended. The immediate eligibility will result in a dramatic reduction in the lag time between when a farmer has an evaluation conducted, and the installation of their chosen upgrades, leading to greater enthusiasm for the adoption of the recommended efficient and renewable technologies. MEL teams will provide assistance to applicants in the development of their proposals, and FDACS will review and approve applications. The choice of which, if any, technologies to adopt will be left up to the individual farmer.

Phase Three: Economic Impact Study
The Office of Energy will procure a qualified contractor to perform an economic analysis of the impacts of the FRED program. Emphasis will be placed on the evaluation/ upgrades effect on the net revenue, net cost, yield variability, and other measures of economic risk and impact. The study will consist of data collection and evaluation, as well as case studies of the individual projects. All recipients of funds will be required to provide information on the impact of the project on their farms. The study will aid FDACS and other stakeholders in the development of future programs and policies. Information from the study will also be used to produce pamphlets promoting water and energy best management practices, citing real world examples.

Just tell me what you want to do

- The proposal should state within the first paragraph exactly what you are proposing to do
- Many people give in-depth backgrounds of the problem which build up to the reveal of their proposed solution
  - Good for novels, bad for proposals
- Lead with the solution, then explain why the problem is important

BAD

Science was first studied by the Ancient Greeks, and since then has evolved to……

(long explanation of the field of science with many citations)

The proposed project will add to the field of science by….

GOOD

The proposed project will add to the field of science by….

This is an important advancement in the field of science because…

Science was first studied by the Ancient Greeks, and since then has evolved to……

(**Concise*** explanation of the field of science with most important and relevant citations)

(*enough to let them know that you know what you are talking about, and that what you are proposing to do is supported by prior research)

Write Specifically to Review Criteria

- " The proposed project has the potential to advance the field of science by…."
- "The intellectual merit of the proposed project is based on…"
- "The proposed project fulfills the Department of Science's long-term goal of advancing science by…"
- "I believe I have the potential to be an impactful recipient of the NSF GRFP because…"
- "This project will benefit the local community through its use of …"
- "The broader impacts of this project include…"

A Complete Proposal

- Proposals also require additional documentation beyond the project narrative
- Biosketches/CV's, letters of support, equipment and facilities descriptions, data management plans, post-doc mentoring plans, etc.
- These will take longer than you think to collect and format
- **Not completing these as instructed can get you rejected without review**

Budget

- Ask for exactly what you need
  - If you "pad" the budget with extra expenses, reviewers will call you on it
  - If you ask for too little, reviewers will question if you can accomplish your tasks
- Make sure to budget for all tasks
  - "How are they going to do it if they don't have any money?"
- Work with your department/college financial staff to complete the budget according to the funding opportunity's instructions.

Questions?

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