Going for MRI:

The Good, The Bad and The Art of Persuasion

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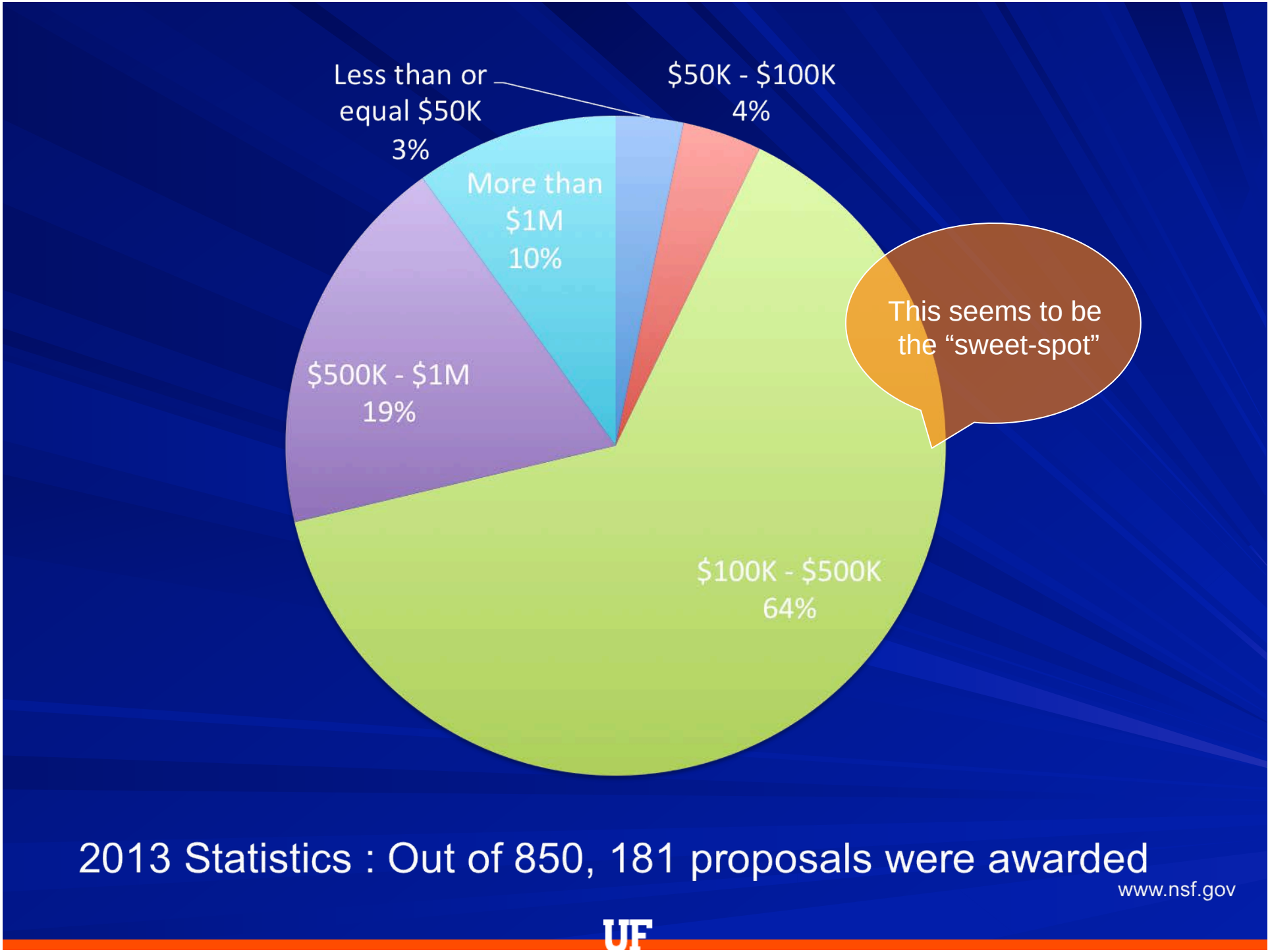
The Foundation for The Gator Nation

NSF Major Research Instrumentation (MRI) Facts

- Instrument acquisition or development proposals in the range of $100k - $4M
- Mandatory 30% cost share
- Our total budget: $1,292,200 with $387,660 cost share from the University of Florida



2013 Statistics : Out of 850, 181 proposals were awarded

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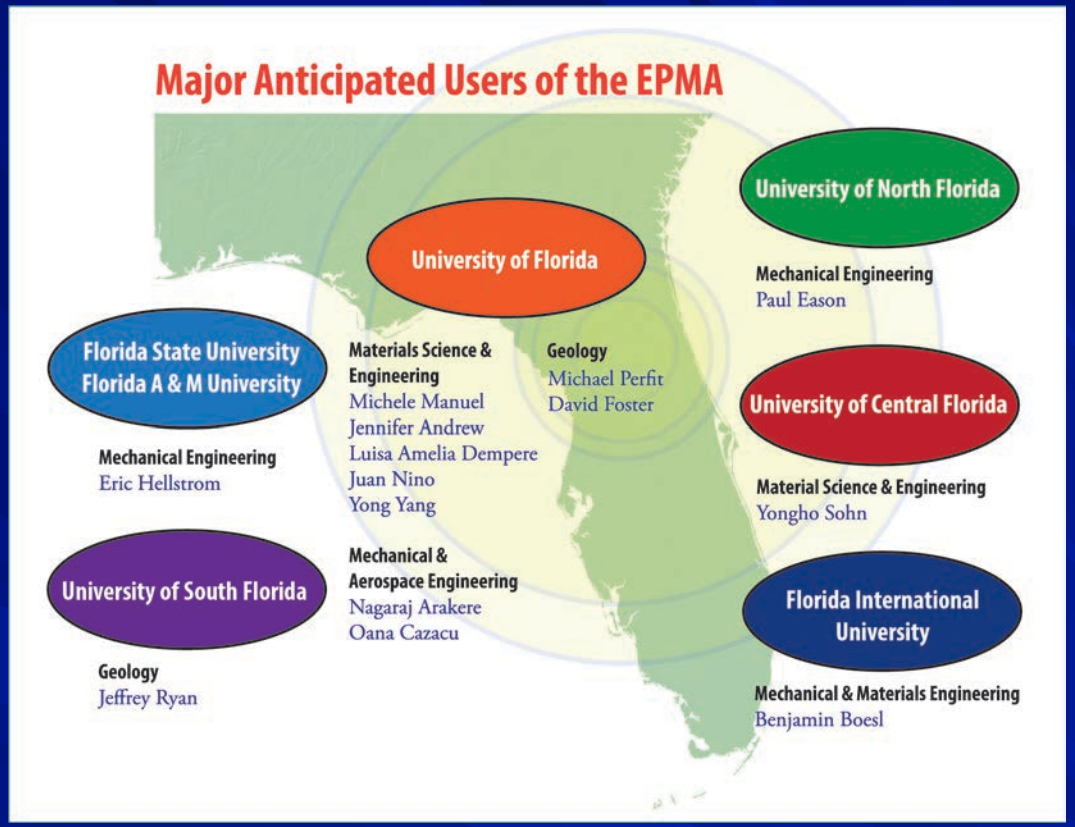
Key Features of Potential EPMA System

- System: JEOL Hyper Probe JXA-8530F
  - Fully capable Field Emission SEM with Secondary Electron, Backscatter, Energy Dispersive, and Wavelength Dispersive Spectrometry (EPMA)
- Advantages over current setup
  - *Superior spatial and chemical resolution (potential system vs. current system):*
    - Secondary electron: 3nm vs. 6nm spatial resolution; 5-50nm depth.
    - Backscatter: 4nm vs. 12nm spatial and 10X atomic number resolution; ~1µm depth.
    - WDS: 1% vs. 4% concentration resolution, 0.15µm vs. 1µm analytical volume diameter; 1-2µm depth.
    - EDS: slightly better energy resolution, but can detect atomic numbers down to beryllium (vs. sodium in current system), making the new system useful in analyzing oxides, carbides, nitrides, etc.; 1,000,000 vs. 10,000 max counts per second; 0.15µm vs. 1µm analytical volume diameter for better spatial resolution.
  - *Usability*
    - Automatic electron column: user friendly interface that facilitates training and a multiuser environment.
    - EPMA utilizes “point and click” functionality for easy analysis.
  - *Fast and more accurate data acquisition*
    - WDS 5X faster acquisition, lower beam currents can be used for sensitive samples.
    - “Set and forget:” Hundreds of WDS analysis points can be set to run automatically over the weekend.
  - *Modern data management:* Standard digital outputs of large datasets vs. analog in current system.
  - *Larger samples*: 4in dia, 2in tall vs. 1.25in dia, 1in tall; larger stage movement.
  - Cathodoluminescence detector can capture a full optical spectrum in addition to x-ray and electron signals.
  - Integrated Electron Backscatter Diffraction (EBSD) for simultaneous crystallography and trace chemical analysis.

Key Differentiators

- System configuration will be the *only one in the US and one of three in the world* with its capability
  - "This instrument will allow for the structural analysis and simultaneous elemental mapping of samples down to nanometer scale volumes, and will permit *trace elemental analysis* with superb accuracy in a user-friendly environment."
- Spoke on a platform of "lowering institutional barriers"
  - The instrument is can be completely controlled online so that the user does not have to be next to the instrument to perform analysis, you can use your iPad to control the instrument
  - Allow for 24/7 access to the instrument
  - Partnership with EDGE and REEF enables international accessibility



PI: Michele Manuel (MSE)

CoPI: Amelia Dempere (Director RSC)

CoPI: Michael Perfit (Geology)

CoPI: David Foster (Geology)

21 Senior Personnel

Tracking User Numbers

Status	Name	Department	University	PostDocs	Grad	Undergrad
PI	Michele Manuel	MSE	University of Florida	0	10	2
CoPI	Amelia Dempere	MAIC				
CoPI	David Foster	GEO		2	6	5
CoPI	Michael Perfit	GEO		1	2	2
Senior Per.	Gerhard Fuchs	MSE		0	4	2
	Ellen Martin	GEO		0	2	2
	Juan Nino	MSE				
	Hitomi Greenslet	MAE		0	3	0
	Curtis Taylor	MAE		1	2	2
	Nagaraj Arakere	MAE				
	Ghatu Subhash	MAE		0	8	0
	Oana Cazacu	MAE				
	Lisa McElwee-White	CHEM		0	2	0
	Wei David Wei	CHEM		1	3	1
	Daniel Talham			0	3	1
	Jennifer Andrew	MSE		1	2	2
	Mark Meisel	PHYS		1	4	1
	Yong Yang	MSE/NE		0	3	2
	Henry Sodano	MSE/MAE		0	9	0
Total						
Average						
	Paul Eason		UNF	0	1	2
	Jeffrey Ryan	Geology	USF			
	Yongho Sohn		UCF	1	4	2
	Eric Hellstrom		FSU	10	10	0
Total				18	78	26

Make sure the instrument is not over or under subscribed

Timeline

2013 February – 1st Submission

- Good, Very Good, Excellent

2014 January - 2nd Submission

- Excellent, Excellent, Excellent

Proposal Number: 1337915

Panel Summary:
Panel Summary

Intellectual Merit
Strength
A High Resolution Field Emission Electron Probe Microanalysis (EPMA) System was requested for a characterization and a research tool on its own. Research activities are scientifically diverse and relevant. topics will be investigated spanning from: light element structural alloys; Phase boundaries in nano precipitation; Trace element measurements in geological materials, and studies of interfaces at oxide electronic materials. The research team is very active in their respective fields and the new acquisition will replace an old system.

The proposal found common needs and effectiveness among 22 researchers from 5 University of Florida system. PIs are well funded and adequate to accomplish the proposed researches, most of which are on-going projects.

Weakness

The panel agrees the request adds to existing capability but does not provide unique, transformative outcomes.

Broader Impacts
Strength
A good training and education plan is proposed. Five Florida State Universities will be involved with great potential for training and attracting undergraduate and graduate students. The proposed remote instrument accessibility could encourage active involvement of remote student and research users. The presented training plan could benefit over 40 undergraduate (including REU program) and 150 graduate students. Additionally, a K-12 education and training is also described and with a very good approach.

Weakness
The involvement of partnership with collaborating schools was not quite elaborated.

Management Plan
Strength
The instrument maintenance and operations plans are well addressed. The proposed instrument will be maintained and operated by experienced MAIC staff. They have discussed the training plan of users including external users. Identification of funding sources and plan for long-term operations and maintenance are considered. The PIs have evaluated the anticipated costs and technical expertise to maintain and operate the instrument. The user fee policy was proposed to cover the partial cost.

Data management plans including sharing and dissemination of results are adequate.

Weakness
There is a limited discussion on the procedure for allocating the instrument time including plans for attracting and supporting new users. Issues related to site requirement and day-to-day operation should be more elaborated.

Summary

Overall this is a good proposal. However, based on the above strengths and weakness in Intellectual Merits, Broader Impacts and Management plans, the Panel does not recommend this proposal for funding.

The summary was read by/to the panel are the panel concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Do Not Fund

Analysis of Panel Comments

Reviewer #1: Good
Reviewer #2: Very Good
Reviewer #3: Very Good/Excellent

Notes/Observations:

It was observed that Reviewer #2 did not note any weaknesses, Reviewer #3 only had one minor concern. Reviewer #1, whose comments can be found mirrored in the panel summary, listed the majority of the weaknesses that were noted. *(Thus, this person was likely the lead reviewer)*

2013 Panel Summary: The Nails in the Coffin

- ***Panel Summary**: The panel agrees the request adds to existing capability but does not provide unique, transformative outcomes.*
  - **Reviewer #3:** The PIs should involve more researchers to show that there is a direct need of the requested EPMA… This proposal does not adequately address the need of the proposed instrument… how it will lead to overcome the current challenges for transformative research and its applications.
  - **Reviewer #3:** This proposal provides limited discussion on the use of the proposed instrument for a wide range of materials…

2013 Panel Summary: The Nails in the Coffin

- ***Panel Summary:*** *The involvement of partnership with collaborating schools was not quite elaborated*

2013 Panel Summary: The Nails in the Coffin

- ***Panel Summary:*** *There is limited discussion on the procedure for allocating the instrument time including plans for attracting and supporting new users. Issues related to site requirement and day-to-day operation should be more elaborated.*
  - **Reviewer #2:** It would be a challenge to meet the expectation of each users for a given period of time…

Round 2: Addressing The Weaknesses

- ***Panel Summary**: The panel agrees the request adds to existing capability but does not provide unique, transformative outcomes.*

- **ACTION ITEMS:**

The PI's will personally meet with **ALL** senior personnel (via one-on-one meetings for UF collaborators and teleconferences for partnering instructions) to clearly identify transformative outcomes of the proposed instrument. These meetings will serve to better educate collaborators on the uniqueness of the instrument, specifically its differences in its ability to perform bulk analysis at the 40-50 ppm level. During this meeting, the PI's will not only educate collaborators but also will discuss and pinpoint how the EMPA will help them perform "transformative research." This will then be systematically integrated into the proposal to demonstrate uniqueness. Thus the research theme will only discuss how the instrument will enable "transformative research."

Round 2: Addressing The Weaknesses

- ***Panel Summary**: The involvement of partnership with collaborating schools was not quite elaborated*

- **ACTION ITEMS:**

A major institutional partner that was missing from the 2013 proposal was Florida International University, who currently runs the only EPMA in the southeast (which has been deemed to be off-line for the foreseeable future). Brining in FIU would strengthen the proposal by: 1) Completing a ring of partnerships across the state of Florida, 2) Bring in an underrepresented institution, 3) Bring in a partner with significant years of experience with successful remote operation of the EMPA to help alleviate instrument time concerns. Prof. Benjamin Bessel has been identified as the point of contact for this proposal due to his background in electron microscopy and characterization, in addition to his familiarity of the MAIC facility during his graduate work at UF.

We will propose that the advisory board will have meeting twice a year to specifically address the any needs or concerns of the partnering institutions.

The partnership terms will be clarified to show that all institutions involve will benefit. A schematic will be added for reviewers to help visualize the importance of all of the collaborating schools involved.

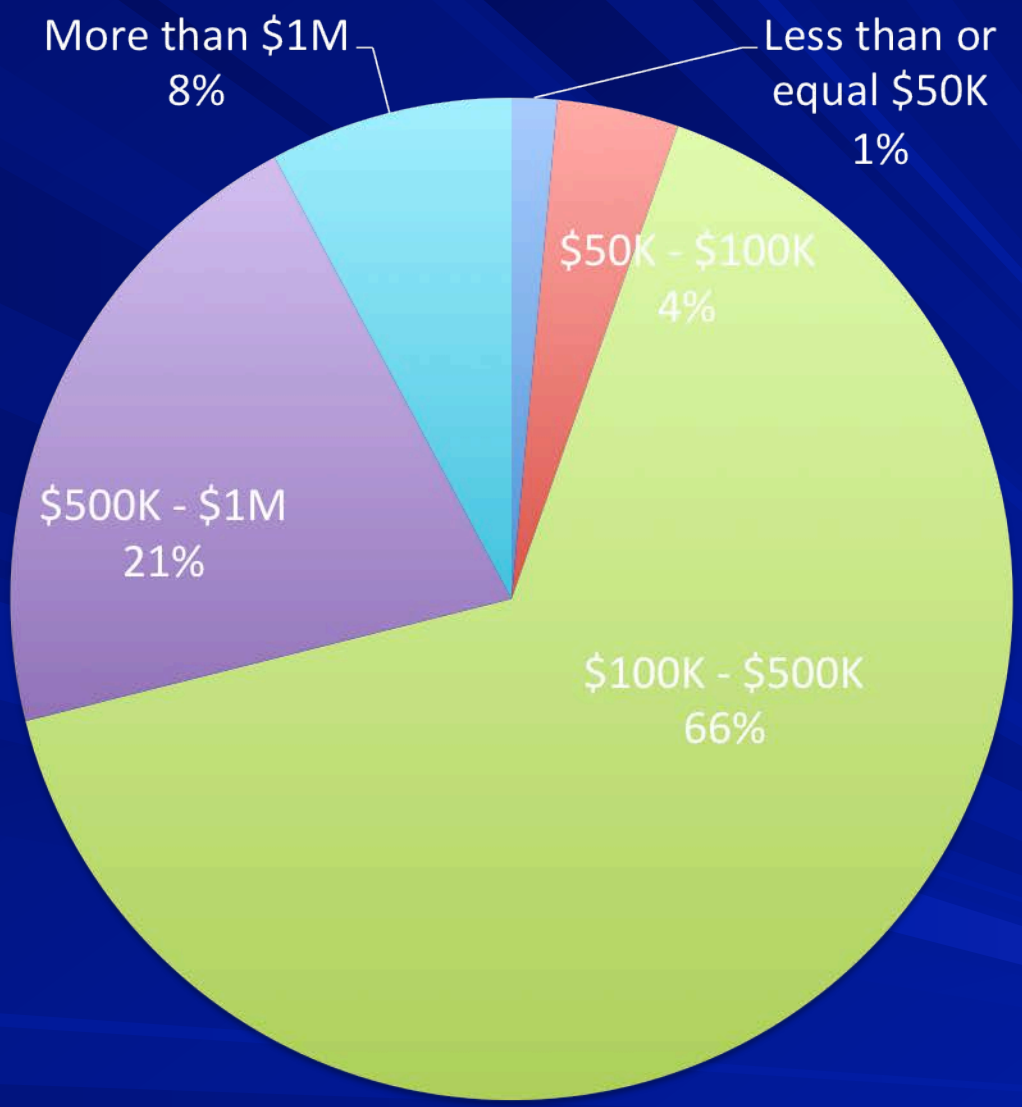
Round 2: Addressing The Weaknesses

- ***Panel Summary****: There is limited discussion on the procedure for allocating the instrument time including plans for attracting and supporting new users. Issues related to site requirement and day-to-day operation should be more elaborated.*

- **ACTION ITEMS:**

Day-to-day operation will be addressed by adding the following language: 1) a gas handling plan will be discussed, 2) highlight that the service technician lives 45 minutes from campus and is readily accessible, 3) emphasize that the instrument will always be under a service contract, 4) discuss that the operator has 35 years of experience with EMPA's and thus the experience to handle any day-to-day operation problems.

Emphasize that the projects described are long-term. Therefore, the need will be averaged over the life of the instrument, not just over the 3-year funding period. Additionally, the following language will be added: "We are aware that there are many users with critical needs that are interested in working on the instrument, in addition to the fact that UF and the partnering institutions on the proposal are all large universities. Thus, to satisfy the needs of the large anticipated user base, the PIs have constructed a system that will address the time allocation needs over the life of the instrument, not just the life of the funding period. This includes running the instrument 24 hours a day and 7 days a week. This *triples* the availability to the user base. Furthermore, the remote operation capability is congruent with this protocol and enables the use of the instrument during what would otherwise be non-peak hours for a traditional instrument schedule."



2014 Statistics : Out of 826, 204 proposals were awarded

www.nsf.gov

Panel Summary #1

Proposal Number: 1429265

Panel Summary:
Panel Summary

Intellectual Merit (IM)

Strengths: Acquisition proposal for off the shelf instrument; however, this instrument will be only one of its kind in the U.S. Instrument will offer chemical composition and crystallographic information from the same spot on a sample. Light elements important for the research will also be able to be studied. PI's have tremendous record. Located at a multi user facility with a broad range of materials to study.

Weaknesses: Other professors indicated in the proposal do not appear on the PI list but rather a staff engineer is listed.

Broader Impact (BI)

Strengths: The classes that will be impacted are good. K-12 involvement is good with microscopy module. Workshops and AVS meetings will be used to broadcast capabilities of instrument. Sister institutions will be able to send in samples utilizing remote access and facility will run in a 24/7 operation mode.

Weaknesses: None identified by panel.

Management Plan

Strengths: Cost recovery is clear for the future with good user fee approach; i.e., deferred charge structure.

Weaknesses: None identified by panel.

This will be a unique instrument in the U.S. benefiting several users at a multi user facility. The PI's have a tremendous track record. Therefore this proposal is highly recommended for funding.

The summary was read by/to the panel and the panel concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Fund

Words of Advice

Be Genuinely Interested in Other People's Work

Find Common Ground

- Proposal must be written in “ONE” voice
- Avoid a hodge-podge of cut-and-paste paragraphs from collaborators

Reciprocity

- If there is anytime you need to ask for a favor, this is a good time to do it

Scarcity

- Don’t point out what they will gain
  - “We will gain a new instrument X”, panel will think “so what, everyone has instrument X, why should UF get one?”
- Tell them about the benefits that they will gain
- What is unique about the proposition

Authority

- Show what makes you a credible authority
  - Show your credentials and expertise
  - Awards

Put Words in Their Mouth

- If you could imagine what the panel summary would say, what would it say?

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