Equipment Funding Opportunities and Strategies for Success (Part 3)

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Editor's Note: *This series of edited transcripts is from Symposium A-14 at the Nashville M&M meeting on August 10, 2011, organized on behalf of the Facility Operation and Management Focused Interest Group, co-chaired by Owen Mills and Christopher Gilpin. This is the third of six talks on this topic; the remaining articles will be published in future issues.*

I originally submitted a proposal to talk about physically constructing our new facility at Miami University. Owen Mills contacted me and asked me to talk about how we got to the point of building a new facility. In their presentations, Debby and Reza both talked about preparing and submitting an equipment proposal. Some key factors they brought out in their presentations were: "institutional commitment," "broader impacts," "other opportunities," and to not simply focus on the quality of the research. These are the areas that I would like to talk about.

To clarify, Miami University is in Oxford, Ohio, just north of Cincinnati; it is not in Florida. We have been there for the last 202 years. Miami University is a 16,000-student institution, medium-sized, with 3,000 graduate students. A few months ago one of the rotating images on the university's home page was of the microscopy facility. These are the kinds of things you want to see happen for your facility and the kind of position you want to be in at your institution. How do you get there? A lot of facilities started out with one or two labs having microscopes, just like we did at Miami. They get merged together into a "pseudo facility" that serves multiple departments. By 1995, just before I got there, the microscopy facility was a biological facility, with less than 24 users from 5 laboratories: two labs from botany, two labs from zoology, and one lab from biochemistry. That size is just not viable. It may have worked in the past, but it will not work today. Funding monies are nonexistent, at both the federal and institutional levels. You have to do more than that.

I came to Miami in the year 1995 and had to change those numbers. I centralized the facility, moving it administratively out of the departments and into the college level at the university. I struggled to force doors open to all labs on campus. In 2001, I became the director. I was hired originally as a non-faculty member Facility Supervisor. Traditionally, at many institutions, the directors of the microscope facility are faculty members. What is the job of a faculty member? Number one, their own research projects; number two, their students; and, if you're lucky, number three, the care of the facility. I want you to go and tell your administration, "Sorry, that's not the way to do it." You need someone who will take on the role of director whose #1, #2, and #3 priorities are to run the facility for all of their users.

Today I have over 290 users from 72 different laboratories in 13 departments, representing 3 of the 5 colleges at Miami. I don't have the business school—*yet*—but I have just started working with users from the School of Education. I want to point something else out: the first department on my list of user departments is *Art*. A year and a half ago, I started getting some of the art people in the facility. As microscopists we all say, "Oh, microscopic images are beautiful!" and often think "Art, who cares? They don't do research." You are right, they don't, but they do make pretty pictures. This fall we're having a display in the University Art Museum at Miami. Who goes to university art museums? Administrators and donors to universities do. If they go, they may see science in the museum for the first time. They see the microscope facility outside of its normal context. And yes, they have the money and now they will recognize microscopy.

We have a lot of users, and we do teaching. We do a lot of teaching, at the undergraduate and graduate level, hands-on teaching. We teach a theory class, both SEM and TEM labs with intensive hands-on teaching, as well as light microscopy, both wide-field and confocal; and we cover both biological and materials science topics. Nobody is excluded from our facility. The one thing we do not do is that we are not a service facility; we do not have the staff, and it is not needed at Miami University. We are a *teaching* and research institution. We have no beam charges. That way we can actually train an undergraduate how to use a TEM, and it doesn't cost $5,000, and you don't have to worry if the student will still be there after the training costs are spent. We recognize the fact that we have students who are going to leave the institution. These are the students who are going to set up science and technology for the future. They need to have the skills for scientific research when they leave. This is what I present to my administration; they believe it and understand it. As service contract costs have gone up in the last 15 years, I have gone to them four times and asked, "Perhaps, we need user fees?" Four different deans have said, "No user fees!" They see that we are doing our job in teaching, and they take it as an advantage for research, because the researchers can go back to federal granting agencies and say, "I have these resources, it's not going to cost anything, and I can have students trained to do the work." Treating a microscopy facility like a library is another way of looking at it: it is a resource that needs to be there.

How do we get users in to the facility? We take users from new laboratories, users who have never done microscopy work, but they may have seen microscopy in a talk or paper somewhere. We hold their hands and take them through the process. They may come in with some ideas of what they think they need to do, but in reality they often have the wrong techniques in mind.

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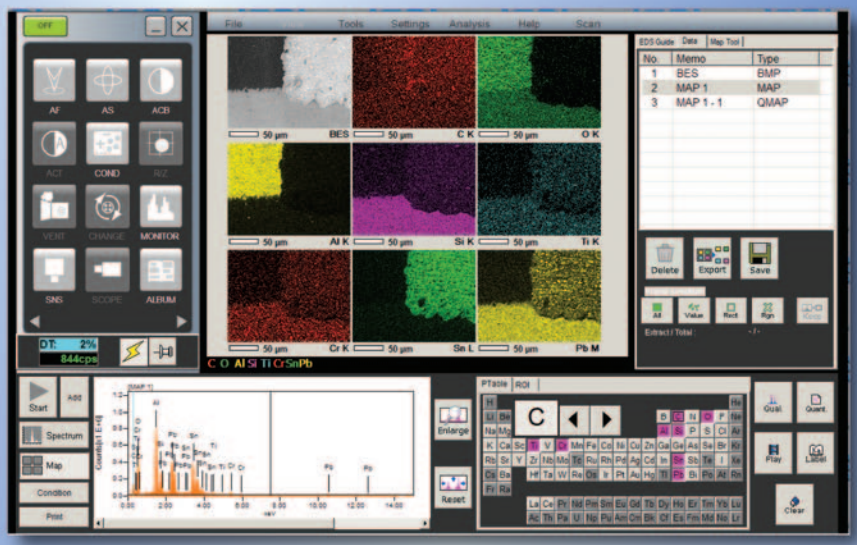

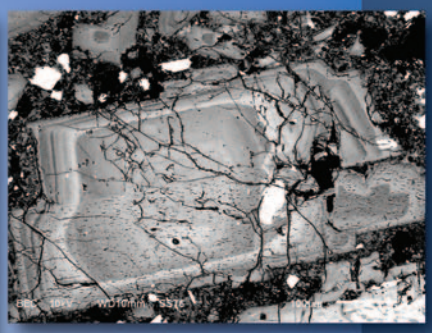

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For example, everybody in biofilm research was doing confocal microscopy on the biofilms. We had a biofilm lab come to us, and they insisted on doing confocal microscopy. Finally, I said, we aren't getting anything, and we need to try SEM. They had never thought of EM because nobody out working on biofilms was doing it. Why? Because of what happened in the 1980s. Everybody switched to light microscopy because of all the molecular work going on and the pretty fluorescent images looked cool. As a result universities then lost their "self-funding" EM facilities. Suddenly, you bring the biologists back to the EM world, and things open up because the 500 nm light microscopy limits are gone.

Be helpful—make things work. We had a couple laboratories that needed to collect confocal imaging data, but they couldn't have their samples in the normal horizontal plane because they needed to deal with the gravity gradient (vertical orientation). Oh, a tremendously difficult problem! Using cinder blocks, and bags of rice, we mounted one of our confocals on its side. Problem solved. But for whom? We had a plant group looking at gravitropic effects and needed the gravity gradient to see how it would affect things that were going on in sub-cellular levels. Secondly, we had a materials science group developing synthetic bone matrices. They needed to watch osteocytes migrate vertically through these synthetic bone matrices. Biological research and materials science: not very hard to help them both out that way.

Interdisciplinary: this is a key word. You want to be *really* interdisciplinary. This does not mean getting the chemical engineers and the chemists together; that is not "interdisciplinary." Here is an example: (1) We have a group of biofilm biologists from microbiology who have been looking at biomedical biofilms. (2) From geology we have some geo-microbiologists who have been studying the effects of bacteria on geological-physical world samples (weathering, chemotropism, etc.). And, (3) also from geology we have some apatite mineral specialists, looking at crystal growth patterns in apatite crystals. Well, apatite is the same thing that makes up tooth enamel. We brought these three groups together and introduced the use of EBSD to a biological problem—not a biological tool is it?—specifically, to look at how bacteria are modifying the crystal structure of tooth enamel. This developed into an NIH-funded proposal. NIH funding to geologists!

Think outside the box when it comes to interdisciplinary topics. As core facilities, you deal with people in wide ranges that don't normally meet or interact with each other. They go to different national meetings and different seminars; bring them together. Here is another group we brought together: (1) a group of neurobiologists looking at neural regeneration and growth, and (2) a group of materials chemists constructing nano-array patterns of nanoparticles. Nerves will respond to these nano-arrays and have specific directed growth. Now we have another funded proposal for nerve growth following these nano-constructs. Materials scientists and biologists are different groups that are coming together more and more frequently. Microscopy facilities can help foster these relationships.

On the screen is our most recently funded confocal MRI proposal, and yes, you don't always get funded. I have been lucky enough to have 3 funded MRI proposals in the last 10 years (and 3 that were not funded). The areas that are always stressed in these proposals are ongoing funded research projects and having a strong PI. However, there are things that are even more important than just having a strong proposal. *Be interdisciplinary.* All of my proposals have at least 5 different departments involved with them. For this confocal proposal, we had a problem: our two exisiting confocals had users on them 16 to 19 hours a day. The scopes were packed full. We had a lot of labs using them to make up these 19 hours a day, 7 days a week. Think of this another way: a lot of labs equals a big *impact factor.* We also have a lot of undergraduates that make up these users. That's a *teaching* component—38% of my users are undergraduates. We do not just serve graduate students or post-docs. This results in our instruments being used for a lot of bachelors' and masters' theses, as well as dissertations. In grant proposals, that translates into "research and *dissemination of research*." These are the items that we tend to ignore when writing proposals that we stick at the back end of proposals. These key items need to be highlighted and well supported.

So where have these efforts gotten my lab? In 1995 we had 2 TEMs, 2 SEMs, a bunch of dark rooms, one Intel 286 PC, and a nice Balzers high-pressure freezing system. In 2011: we just moved to a lab twice the size, 5,400 sq ft. (500 M^2). We now have 3 TEMs—1 is a replacement and 1 is a new one that didn't exist in 1995; 2 SEMs, both are replacements; 3 confocal microscopes; 4 multi-mode microscopes; 18 computer workstations; digital capture; and dedicated network servers. All these instruments are designed to help users do what they need to do. A lot of this equipment is *institutional commitment*. The big instruments come off of federal and state grants, while the integrating support equipment comes from the institution. How do you get this sort of institutional commitment? You make people happy, so they then go back to their dean and provost, and they say, "You know, we've got a great microscopy facility. I had some students who went to this meeting, and they got an award because of the work they did in the microscopy facility." If students come back to visit and tell you how wonderful your facility is compared to where they have moved to, take them in hand to the dean's office and have them thank the dean for supporting the facility, saying why and how your facility compares to others.

Keep the administration happy, keep the faculty happy, and things will progress. We will take any equipment into the facility if we have space for it and it deals with microscopy. We will maintain it, we will set up schedules for it, we will repair it, and we will even upgrade it over the years. However, if it is in the facility, it is open and available to everyone. If it is not open to everyone, it doesn't belong in a central facility. That's what "central" facility means. None of "This is the Jane's Group microscope, and no one else can use it." No, they may have special scheduling priorities, but not sole ownership. When purchasing, make the instruments as flexible as possible so they live through the years. If someone needs a new detector system, they don't need a new microscope, they need a new detector. Put the detector on the microscope, so long as it doesn't prohibit some other use. Now we have a "New and Improved Microscope."

These are the starting steps to building a strong microscope facility. Don't expect anyone to just give you pretty toys that you are going to dust and keep pretty, not let anyone use, and keep them safe so the students don't break them. How are they going to learn? Teach them, and teach them to do the microscopy right. That's how you get them to learn and actually use the microscopes. The more things get used, the more results get done and published and the more new toys you get!

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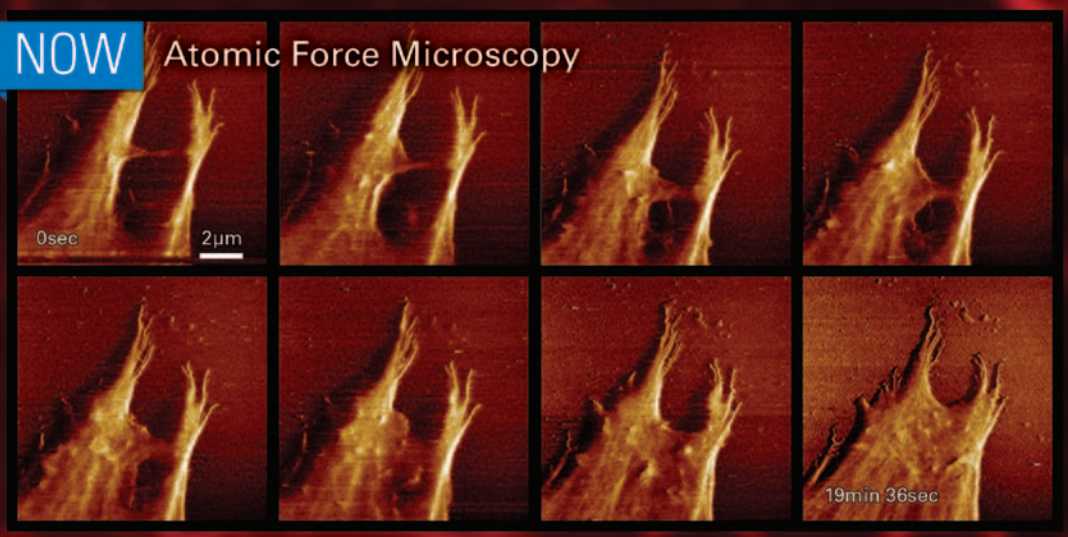

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