

Strategies for Establishing and Operating Microscopy Core Facilities in Non-R1 Institutions

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Increasing demand for a high-tech workforce has led to younger and smaller universities adding or expanding degree offerings in the STEM disciplines. These institutions are often faced with the challenge of establishing research infrastructure to attract and retain faculty, as well as provide opportunities for professional advancement. Without major instrumentation many junior faculty are forced to move away from experimental research or travel to distant institutions to access the necessary equipment, making it difficult for them to simultaneously perform well in both teaching a scholarship. It is incumbent upon non-R1 institutions to develop facilities for major research instrumentation to attract and retain faculty in key STEM areas. Core facilities that offer microscopy and materials characterization methods present strategic advantages to smaller institutions seeking to support research across the breadth of STEM disciplines. Strategy for establishing of such a facility, addressing operational challenges, and continued operation will be presented.

Funding in the tens of millions for the creation of a core facility and acquisition of major instrumentation can only come from a limited number of sources; existing institutional funds, grant awards (NSF-MRI), private donations, and special government funds (plus-ups, earmarks, legislative programs, etc.). Smaller institutions rarely have the funding in their existing budgets to dedicate to a new building and/or laboratory including all major instrumentation. Without pre-existing facilities and expertise to properly house, operate, and maintain major instruments, there is little likelihood of a successful grant award. Private donations, while beneficial are few and far between. In the absence of funding from these more traditional sources, a university can make a more strategic approach to create facilities, infrastructure, and equipment acquisition as part of a program that appeals to the economic drivers that create demand for STEM graduates in the first place.

For a university that is growing STEM degree production there is likely a regional demand for high-tech jobs that require the degrees which necessitate a highly qualified faculty. Finding a relevant economic driver, such as workforce production, to be entrained into a special legislative ask or earmark can generate funding sufficient to create and outfit a core facility. The strength of the request must capitalize on existing faculty expertise and leverage political appeal specific to the region, local industry, and the institution. The major instrumentation associated with materials science and engineering presents the most broadly applicable research tools to faculty from biology, chemistry, physics and engineering. Electron and optical microscopy uniquely bridge across all these disciplines creating a basic template which can be augmented with specific research methods for correlative microscopy, spectroscopic methods, diffraction, etc. to meet the specific research needs of the institution and appeal to local industry.

Support from the highest level of the institution is paramount to success in obtaining the funding to create the facility, but creating facility isn't always the biggest challenge. It must be made clear from the onset that without commitment to support the ongoing cost of operating the facility, there is no chance

of long term success in building a user base, maintaining equipment and proper staffing. Numerous mechanisms to incent faculty must be considered, including internal grants to generate much needed preliminary data for successful grant proposals. In the absence of a robust doctoral program, there are fewer graduate students to serve as users of the instruments, and as potential employees of the facility, making proper staffing a challenge. Full time staff must be capable of method development, sample preparation and instrument operation across the breadth of disciplines that make the combination of major instruments appealing in the first place. In the best case scenario of special government funding, recurring funds can be requested for the ongoing operation of the facility to provide security of operation while the research enterprise of the institution matures to meet the goals of the institution.