

THREE-YEAR EVALUATION REPORT

RCQM ADVISORY BOARD

The External Advisory Board met on November 3, 2016 to assess the progress and strategic direction of the center. This meeting is a follow up to the board meeting that was held on December 16, 2014 during the Center's Launch symposium. RCQM faculty members presented reports on the four research thrust areas of the center. RCQM Postdoctoral Fellows also presented progress reports outlining their research and contributions to the center. The following pages contain the final report from the External Advisory Board.



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RICE CENTER FOR QUANTUM MATERIALS

Summary Recommendations of External Advisory Board November 3, 2016

The External Advisory Board of the Rice Center for Quantum Materials (RCQM) met on November 3, 2016. The substance of the meeting was an activity report to the Board by various participants in RCQM, followed by a discussion within the Board of issues and recommendations to be forwarded to the Rice University administration.

It is noted that several of the issues raised in the previous report of the Board (December 16, 2014, appended) continue to be of concern. At the same time, the Board notes with pleasure the RCQM's expansion of research activity and especially the recognition the Center has achieved in a very short period. RCQM's title perhaps does not convey that the unifying theme of its research activity deals with fundamental issues of quantum theory and their realizations in experiment. As we mention below, RCQM members are visibly in this research frontier, as was particularly confirmed in the Research Thrust presentations that the Board heard, as well as by the excellent set of four RCQM workshops that have been held since inception. Mysteries of quantum matter are often expressed by the emergence of totally unexpected material properties. In the modern age, their identification and explanation have always been a basis for new technologies.

A fifth workshop "Frontiers of Quantum Materials" took place in the two days following the Board meeting. The program was extraordinarily broad with substantial international participation and the speakers were top researchers in their fields, without exception. The enthusiastic participation of such leaders attests to the recognition that RCQM has achieved in only two years. It is noteworthy that between the Board meeting and this workshop, eight members of the National Academy of Sciences participated. In addition, the Board draws attention to the recognition that individual members of RCQM have received in addition to research grants: 7 Sloan Fellowships, 3 NSF Career awards. The latter, awarded to untenured faculty, indicates that recent hiring into the RCQM group maintains a high standard of excellence. The RCQM Advisory Board's assessment is that the Center is doing extraordinarily well overall. While there are many superficially similar centers at some of the best universities, RCQM stands out in its success in generating interactions and collaboration among its members from different departments.

1. Comments on Funding

A main issue for RCQM going forward continues to be its sustainability. External grants to individual RCQM members come to about \$600K per PI per year. This number is impressive and the university can be assured that the RCQM researchers are well-recognized on the national scene. However, RCQM activities require and indeed justify funding arrangement(s) that go well beyond this total of \$13.5 M. To that end:

- i). A formal arrangement of "overhead return" on individual grants to RCQM members should be established.
- ii) Sectors of RCQM should continue to prepare group proposals to the various funding agencies that solicit them. Consideration should be given to preparing group proposals that are larger than those previously submitted, to take advantage of the breadth of RCQM research.

iii) RCQM should be a specific part of Rice University's new Capital Campaign. Indeed, it can be pointed to as illustrative of the success of the University's research enterprise.

iv) Development activities associated with RCQM should include exploration both of the possibility of establishing an endowment and that of attracting an industrial affiliate.

v) A formal competitive RCQM postdoctoral scholar program with university support should be considered, along the lines of MIT's Pappalardo Fellowships. A center such as RCQM depends for its continuing success on its ability to attract and mentor outstanding post-doctoral researchers. The Board heard from two of the first three Smalley-RCQM postdocs and was suitably impressed. It is important in this regard that RCQM have the funds to manage a continuing and expanding post-doc program with supplements over the usual grant support level.

vi) The first three years of university funding of RCQM has enabled the Center to establish itself with successes in several areas: International collaborations, outstanding workshops, postdoctoral program, and most importantly, research productivity of its members (e.g. in 2015-2016 alone: 10 Nature publications, 11 Physical Review Letters). All this has made RCQM an important and visible asset for Rice University. The Board was impressed by the dynamic through which the activities of RCQM have enhanced the visibility of its members and indeed, the reverse. The Board encourages the University to continue the seed funding at least the same level for another three years, while other sources of support continue to be explored.

2. Comments on Program

i) RCQM has been extraordinarily successful in generating cross-disciplinary proposal preparation and research activities among its participants, notably involving Physics, Chemistry, Electrical & Computer Engineering, and Materials Science & Nanoengineering. An important aspect of RCQM is the development of state-of-the-art instrumentation (especially in the area of advanced electron microscopy) at Rice, which is available to and used by RCQM researchers.

ii) As the cohort of postdoctoral fellows and graduate students in RCQM increases in size, some consideration might be given to establishing a mechanism whereby these junior scientists have the opportunity to organize an activity. For example, with very modest funding, there could be an annual lecture series for which they invite an outside speaker of their choosing for a two-day visit to RCQM.

iii) The Board notes with approval that the RCQM workshop series has included topics of interest to all its components. In the interest of encouraging cross-disciplinary interaction, a "RCQM research lecture" series could be established with speakers, chosen by the RCQM Executive Committee, rotating through the various components of RCQM

3. Comments on Administration

It is essential for the continuing success of RCQM that it have dedicated administrative support in the form of a permanent position of Administrative Assistant, supported by the university. The Board's extensive experience with RCQM and its workshops informs this recommendation: the dedication of a full-time staff member is instrumental in assuring the smooth operation of RCQM.

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