Center for Advanced Materials

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Kwok-Wai Ng, Physics, University of Kentucky
Sean Parkin, Chemistry, University of Kentucky
Doug Strachan, Physics, University of Kentucky
Y.T. Cheng, Engineering, University of Kentucky
Haluk Karaca, Engineering, University of Kentucky
Three New Faculty Members, University of Kentucky

*The Center involves **15 faculty members** from four institutions in Kentucky*

Motivations and Goals

- It is widely recognized that whoever controls the synthesis and discovery of novel materials controls the evolution of basic research into their properties and, ultimately, their successful application in advanced technologies

- We are establishing a ***Center for Advanced Materials*** as part of a comprehensive, multidisciplinary research program to design, synthesize and characterize novel materials, multilayer films, magnetic clusters, inorganic/organic hybrid systems and single-molecule magnets. Our research will be focused on bulk materials development.

- The ***Center*** is timely especially when the traditional U.S. leadership in materials research has eroded in recent years due in part to the lack of scientists who possess skills in both the synthesis and characterization of new materials

- The ***Center*** will create complementary expertise and facilities that will optimize the proposed program

- The ***Center*** will generate synergies and funding opportunities to initiate new materials research efforts among participating colleges and universities in the Commonwealth and National Laboratories. These efforts will be particularly significant in strengthening the recruitment of students in the physical sciences, which has become an increasingly important national problem.

Outlook of the Center

The ***Center*** will become the driving force in the Commonwealth for materials research and education by offering the following programs:

A. A Comprehensive Research Program The scope of ***Center*** research can be aggressively expanded to explore emerging research topics and interdisciplinary areas and it is expected that the research program at the ***Center*** will eventually have experimental, theoretical, and computational components and pursue research grants from federal and private funding agencies.

B. New Course and Program Developments will be a coherent part of our efforts at the ***Center***. The ***Center*** provides a natural base for developing courses in interdisciplinary sciences. Although revolutionary developments in interdisciplinary materials research have taken place in recent decades, efforts to develop relevant new courses are conspicuously lacking. The ***Center*** sets as a main goal that UK becomes one of a few universities in the nation to develop an integrated education and research program in interdisciplinary materials science. This program can be supported internally by UK, and through external funding gained from sources such as the Integrated Graduate Education and Research Training (IGERT) program at NSF.

C. Center Workshop will be held every other year. Similar to the ***UK Workshop*** of 2005 and 2008, these events will feature forefront international materials research and researchers. Special sessions will be held for graduate and undergraduate student participation. This will give the ***Center*** both local and national exposure, and provide us more opportunities to recruit students.

D. Center Seminars by both ***Center*** scientists and prominent international researchers will be held regularly. The ***Seminars*** will address new developments and issues, and will benefit students by exposing them to experts who work at the forefronts of contemporary materials research.

E. Technology Transfer will be pursued. The ***Center*** will aggressively work to solicit and identify technology transfer opportunities originating from research activities at the ***Center***

Four New Faculty Positions Approved for the Center

This initiative has already garnered strong support from University of Kentucky and the UK College of Arts and Sciences, which has approved ***four initial tenure-track positions*** for the seeding of the Center.

The new faculty members will be in areas of neutron scattering or thin films, condensed matter theory and organic materials synthesis.

Planned Activities and Milestones

2008-2009:

- Doug Strachan, the ***Center's*** first hire, has arrived.
- Search for the ***Center's*** second and third faculty members (condensed matter theorist and experimentalist):

  (a) Neutron Scattering/Thin film Synthesis and Characterization

  (b) Analytical or Computational background in Low Dimensional and High Correlated Electrons

  Screening starts on November 1, 2008
- Install the **helium liquefier** in UK Chem-Phys building by May, 2009

  (a) We invited a business manager from Linde Cryogenics to UK for detailed planning

  (b) We have had meetings with UK PPD for space renovation and its cost (~$370 K). But the funding has been an issue.
- Common Space to House Center Facilities (~2000 sq. ft.)

  Target space: Old Chem-Phys. Library (~5000 sq. ft.)

"Putting the Helium Back in the Bottle"-NYT

"Linde North America, one of the world's largest helium suppliers, plans not only to inflate the balloons of the 82nd annual Macy's Thanksgiving Day Parade, but when it's over, to recapture the helium as well"—New York Times

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- Form the ***Center's*** three-member **Executive Committee** and two-member External Advisory Committee

- Support four undergraduate students for summer research

- Support four graduate students (UK match)

- Center Monthly Seminar

Strachan Lab

Currently equipping the lab



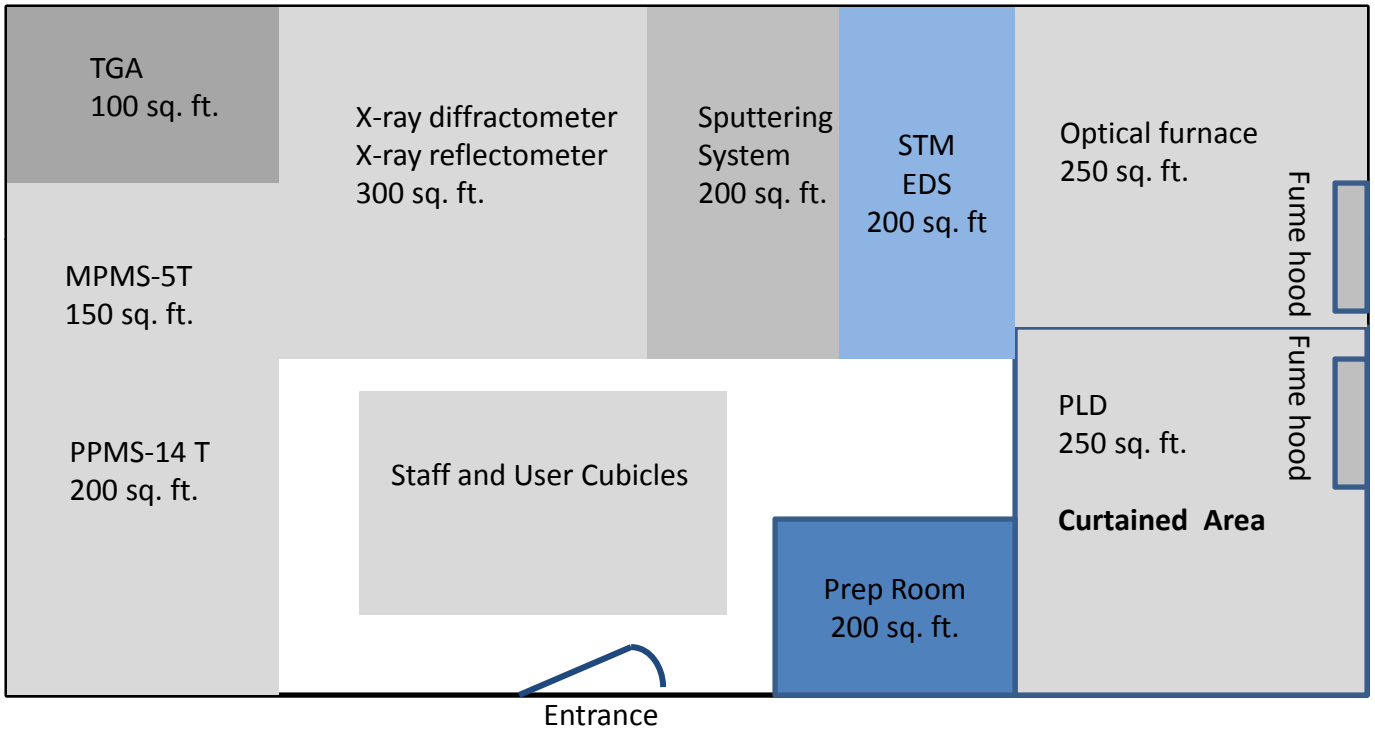

Stephen Johnson (Post-doc)

CVD system

CVD system

Conference room and study


Center for Advanced Materials
Floor Plan (first floor)



Total Space: 1,850 sq. ft.

2010-2011

- Install the PLD system, x-ray reflectometer and optical furnace
- The Research Associate arrives
- Submit a proposal to the IGERT program at NSF
- Summer internships (5 undergraduate students)
- The 3rd Workshop on Novel Electronic Materials (the 2nd Workshop held at UK in May 15-17, 2008 drew more than 80 leading scientists from the US and around world)

2011-2012 and Beyond

- Install 18/20 T magnet and x-ray diffractometer
- Submit major research proposals to funding agencies for programs such as MRSEC at NSF
- Implement the new courses and program for graduate students.
- Summer program for high school science teachers and students.
- Develop a user program and encourage external scientists to use the ***Center*** facilities as well as collaborate with ***Center*** scientists
- Develop a visitor program that sponsors two Distinguished Scientists for a six-month visit to the ***Center*** each year

- Develop devices using materials developed at the ***Center***
- Identify and transfer technologies developed at the ***Center***
- Establish broad and productive collaborations or partnerships with national labs as ***a leading materials institution in the nation***.

Management

- The progress of each participant will be reviewed by the ***Executive Committee*** before the *Annual Meeting*.
- The ***Executive Committee*** will prepare a summary of activities of the year as well as the budget for the next year. Each PI will receive a written evaluation of his or her progress and proposal, including a statement of funds to be allocated during the next year. We will also solicit new proposals from the Faculty.
- We will support a part-time ***Administrative Assistant*** to the *Director*, responsible for all budgetary issues, reports and publications.

Evaluation, Assessment

- An ***External Advisory Committee*** consisting of three prominent scientists, selected for their academic accomplishments, international recognition and administrative experience, will evaluate all research and educational activities of the ***Center***.
- The ***External Advisory Committee*** will conduct a site visit each year, review the summary annual reports, and provide feedback to the ***Executive Committee***.

Evaluation and Assessment

The evaluation for each PI and the ***Center*** as a whole will be based upon the following ***criteria***:

(1) Publications, invited talks, patents and other recognition

(2) Individual research grants sought and awarded

(3) Collaborative research among the PI's and with external scientists

(4) Graduate student research, fellowships awarded, and other recognition

(5) Undergraduate research, summer internships, publications involving undergraduate students

(6) Other outreach activities with local schools and industrial contacts

(7) Efforts contributed to enhancing ***Center*** facilities

(8) Interpersonal relations and team work.