

November 25, 2009

**Proposal for a
Centre for Advanced Materials and Biomaterials Research
(CAMBR)**

The goal of this proposal is to establish a new Centre for Advanced Materials and Biomaterials Research (CAMBR) to be the lead organization at the University of Western Ontario for coordinating the research, educational, and outreach activities in the broad area of Materials and Biomaterials. The CAMBR mandate goes beyond that of its predecessor, the Western Institute for Nanomaterials Science (WINS), in two important ways: (1) the scope is significantly expanded beyond nanoscale materials to embrace the existing diversity and breadth of materials research in the Faculty of Science and in cognate Faculties; and (2) while WINS was created as primarily a Faculty of Science organization, the goal of CAMBR is to fully integrate materials researchers from all Faculties, and for all Faculties to have a role in the administration of the Centre.



Primary Proposal Contacts:

Dr. R. H. Lipson (rlipson@uwo.ca)

Dr. M. G. Cottam (cottam@uwo.ca)

1. Purposes and Functions

a. Proposed name

Centre for Advanced Materials and Biomaterials Research (CAMBR)

b. Faculties/Departments/School or external institutions directly involved

University of Western Ontario

Faculty of Engineering:

- Department of Chemical and Biochemical Engineering
- Department of Electrical and Computer Engineering.
- Department of Mechanical and Materials Engineering.

Faculty of Science:

- Department of Applied Mathematics
- Department of Biology.
- Department of Chemistry.
- Department of Computer Science
- Department of Earth Science.
- Department of Physics & Astronomy.

Schulich School of Medicine & Dentistry

- Department of Biochemistry
- Division of Biomaterials Science

c. Rationale and Justification

The Academic Plan of the Faculty of Science designates *Materials and Biomaterials* as one of the core themes, which crosses discipline, departmental and Faculty boundaries. It represents one of the Faculty's top priorities for research initiatives. *Materials and Biomaterials* is also designated as a Signature Area in the University Strategic Research Plan, 2008-2011 (http://www.uwo.ca/univsec/board/minutes/2008/r0806sen_annex1.pdf).

The establishment of CAMBR creates an active organizational entity that supersedes the existing Western Institute for Nanomaterials Science (WINS) and will be the organizational structure for the *Materials and Biomaterials* signature area. This name change is designed to signal a more inclusive organization that readily welcomes individuals who work in materials and biomaterials, but not necessarily at the nanometer length scale.

The new Centre will harness, facilitate and promulgate the collective potential of the already-distinguished materials and biomaterials research within and beyond the University. The Centre will

play the leading role in recognizing opportunities and in catalyzing multidisciplinary research and teaching in materials and biomaterials across Western. The formation of the new Centre was discussed following an external review of the Faculty of Science's research theme in Materials and Biomaterials (in 2006-07) and a subsequent ad hoc UWO committee (chaired by M. Cottam and with representation from the Faculties of Engineering and Science) in 2007-08.

The following mission statement forms the basis of the mandate for CAMBR:

The responsibility of CAMBR, as an umbrella organization, is to facilitate, promote, and coordinate the research and teaching activities of all aspects of materials science at Western. Its goal is to establish a unified approach that provides the best undergraduate and graduate student experience in materials science and to raise substantially the profile of UWO in pure and applied research in materials and biomaterials at all length scales from nanometres upwards.

d. Primary Objectives

Specifically there are four objectives:

- i. To provide a cohesive presence and collective vision for the UWO Faculties, Departments, laboratories and facilities whose researchers work on materials and biomaterials (particularly nanomaterials). This will include coordinating large-scale external grant proposals (CFI, ORDCF, NSERC, etc.) to build on current strength in this research field.
- ii. To develop a graduate program in the Materials and Biomaterials Sciences. This will be strongly integrated with the undergraduate programs in the same area recently introduced by the Faculty of Science; it might also be linked to materials-related courses offered in Engineering.
- iii. To enhance the shared facilities available to researchers and students working in the materials and biomaterials area. This will include providing advice on the operation and future directions for such facilities on campus, coordinating/leading group grant applications to upgrade or enhance the capabilities of existing facilities or to create new facilities, and arranging access for members of the Western research community to facilities at other institutions.
- iv. To serve as an organization where Centre members working in materials research will be able to meet, interact and collaborate effectively, and as a communication hub to the outside world (e.g., through an external advisory panel, through a web page and by mounting a visiting scientist speaker program).

e. Primary academic and/or non-academic functions

These are elucidated in the Primary Objectives section above. Some further details are provided later in Section 4.

f. Expected contributions to the University's mission

Materials and Biomaterials research is a growing area in the Faculties of Science and Engineering, and Schulich School of Medicine and Dentistry. CAMBR is expected to be a major player in coordinating and leveraging the university's effort in this area.

2. Membership

a. Sources, proposed period of tenure, and criteria for membership

Once the CAMBR is established, there will be a search conducted within the Western community for an inaugural Director with a three-year term.

The minimum criterion for principal membership in CAMBR is that each principal member will be a faculty member (or have equivalent status) whose research program contains a substantial thrust in materials science, and/or can teach material sciences at the graduate level. There is no restriction based on the individual's home Faculty. Principal members will be appointed for a three-year initial term, which will be renewable. Membership status for other researchers on campus (graduate students, postdoctoral fellows, research associates) and also for external (non-UWO) researchers will be considered at a later date.

b. Names, institutional affiliation, qualifications, and expected contribution of principal members

A partial list of prospective principal members, based on the current faculty complement at Western, is given in the Appendix. It is recognized that this list (already numbering well over 50 faculty members) is likely to be incomplete. Every attempt was made to generate as complete a list as possible and any omissions are inadvertent. Omission does not signal that an unlisted individual is not qualified for membership. New faculty who qualify for principal membership will be invited to join upon arrival at Western.

c. New faculty appointments proposed

Although none are proposed at present it is expected that the success and activities of CAMBR, as well as the University budget situation, will dictate the level of future support by Faculty Deans for faculty appointments in this research and teaching area.

d. Alternative faculty workload arrangements proposed

It is anticipated that the service duties associated with the CAMBR Directorship would be appropriately recognized by his/her home Department.

3. Governance, Administration and Organizational Relationships

a. Description and membership of governance structure or governing body (Note especially the CONDITIONS section in the policy dealing with respect to University representation)

It is proposed that the administrative structure of CAMBR consist of a Steering Committee, a Director, an Operations Committee, and an External Advisory Board, the details of which are as follows:

Steering Committee:

Consists of the Deans (or designates) of the Participating Faculties (Engineering, Schulich, and Science at time of submission) and chaired by the Dean (or designate) of the Host Faculty (Science at time of submission). It is recognized that the number of Participating Faculties could increase or decrease. In the event that the number of Participating Faculties is reduced to one, then a review of MBI and its mandate should be initiated by the VP Research in order to assess its future.

Director:

The Director will normally be principal member of CAMBR and a full-time faculty member at Western. Appointment will be made by the Steering Committee based on recommendation from an ad hoc selection committee formed by the Steering Committee. Recruitment will be via a competition open to all qualified faculty members at Western. The appointment will normally be for a period of three years. The Director will report to the Steering Committee and will serve as an ex officio, non-voting member of the Steering Committee. An Interim Director may be appointed by the Steering Committee to bridge between the terms of Directors and for the start up phase.

Operations Committee:

Consists of the Director of CAMBR, Directors of cognate facilities (e.g., Surface Science Western, Nanofabrication Laboratory) and Chairs of cognate graduate and undergraduate programs, as appropriate. It will be chaired by the Director of CAMBR and is intended to provide support for the Director, coordination of activities in the materials/biomaterials area, a forum for information sharing and for the development and implementation of new activities, programs, policies, etc.

External Advisory Board:

Consists primarily of representatives external to the Participating Faculties with a preponderance of membership coming from industry and a minimum of one international member. It will normally be chaired by the Director, unless the Board elects to choose another of its members as chair. It is anticipated that the Board would be formed after other components of the administrative structure are functioning but by the end of first year of operation. The Director is responsible for populating the Board in consultation with the Steering Committee, Operations Committee, and the CAMBR constituency.

It is proposed that the activities of CAMBR focus on three general areas: commercialization; curriculum development at the undergraduate and graduate levels; and outreach, seminars/conferences and internationalization. It will be incumbent upon the university-wide CAMBR community to participate in the various committees, task forces, or working groups, which would be struck to assist in carrying out these functions.

b. Frequency of meetings of governing body

It is proposed that when the Centre is fully functioning the Steering Committee will normally meet once every fall and winter term. Initially, there may need to be more meetings to get all the activities up to speed. The Operations Committee would be convened by the Director and is expected to meet normally circa once per month during the fall and winter terms and at other times as necessary. Sub-committees would meet on an *ad-hoc* basis.

It is proposed that the External Advisory Board meet annually in face-to-face format or via tele/video conferencing or a combination of both formats. One possibility is in coincidence with a major annual CAMBR event, e.g., an annual CAMBR Workshop or a CAMBR Distinguished Lecture Series.

c. Names, institutional affiliations, qualifications, and responsibilities of all officers of the Centre

The sole officer is the Director. Responsibilities include:

- establishing an Operations Committee, in consultation with the Steering Committee
- establishing terms of membership in CAMBR in consultation with the Executive Committee (upon formation of CAMBR)
- recruitment of members
- leading the process of fulfilling the mandate of CAMBR
- implementing the Centre's strategic plan (or equivalent set of plans).
- oversight of any programs under the auspices of the Centre
- general responsibilities for overseeing the administration of CAMBR.
- establishing the External Advisory Board in consultation with the Steering and Operations Committees and the CAMBR constituency
- establishing, and ensuring the functionality of, other standing and/or *ad hoc* CAMBR subcommittees as determined by the Operations Committee.

d. Level of participation of external institutions in governing body, and/or administration of the Centre. (Provide evidence that necessary agreements between the University and the external institution have been approved by the University's General Counsel or have been submitted for approval and attach copy of agreement or proposed agreement)

No direct participation by external institutions is planned at this stage, although it is anticipated that informal contacts will be developed with, and exchanging information with, similar centres or institutes elsewhere (e.g. the McGill Institute for Advanced Materials at McGill University, and the National Institute for Nanotechnology at the University of Alberta). The External Advisory Board is expected to provide an enhance level of external awareness of CAMBR in the industrial community and may from time to time lead to direct engagement of a particular company or industry in MBI-related research or other activities.

e. If incorporation is sought, set out reasons for incorporation as appropriate for consideration by the Board of Governors of the University

Not applicable.

4. Students and Courses

a. Level and type of involvement of undergraduate or graduate students in Centre activities

i) Undergraduate Program

It is proposed that, while the existing interdisciplinary undergraduate Materials Science program continue to be managed by the Participating Departments (currently Physics & Astronomy, Chemistry, and Earth Sciences), the Participating Departments appoint a Program Chair/Coordinator who would sit on the Operations Committee, and that the current program be extended in scope, for example with the involvement of more Science and/or Basic Medical Science departments in addition to the current Participating Departments and by the inclusion of selected courses or course modules from Engineering. CAMBR seeks to stimulate broader student and faculty interest in the undergraduate Materials Science Program and to work with Departments to reposition the Program, and to increase enrolments in it. Elements to be considered in a program repositioning include: creating a high quality interdisciplinary option for strong students; forsaking the current perception that it is an option for weak students to obtain a degree without taking any difficult courses; including (and encouraging) an internship option; ensuring closer alignment with requirements for entry to more traditional discipline-based graduate programs. It is anticipated that principal members of CAMBR would be engaged in counseling students with respect to career opportunities and course selections.

ii) Graduate Program

It is proposed that a collaborative graduate program in materials and biomaterials be initiated with the support of anticipated Participating Departments. A Program Chair/Coordinator appointed by the Participating Departments would sit on the Operations Committee. Such a program would be structured in a similar manner to the programs in Scientific Computing and in Theoretical Physics; that is, a program that requires additional qualifications rather than being a stand-alone entity. One significant advantage of such an approach is that it eliminates the potential sticking point around “ownership” of graduate student TA funding; this would flow to the department in which a student was registered. A materials/biomaterials graduate program should be a high-quality interdisciplinary option for strong students. Concrete educational goals need to be defined for the program and it would need to be differentiated from existing programs with which there is a potential for overlap, e.g. Biomedical Engineering. Program elements that would provide a sense of community for students and supervisors and some common subject matter would need to be developed..

b. If Graduate students are involved, provide documentation as appropriate indicating that consultation has occurred between the centre/institute, the School of Graduate and Postdoctoral Studies and to the Faculties/Departments/Schools involved with respect to: (i) advertizing of positions or opportunities; (ii) admissions; (iii) student support; (iv) student supervision

The current Director of WINS has previously consulted with the School of Graduate and Postdoctoral Studies and with the Associate Deans with responsibility for graduate studies in the three Participating Faculties. Pedagogically there is support for a graduate program in this strategic area.

c. Contribution to the development of new courses, seminars or other instructional programs (Provide documentation with respect to Faculty/Departmental/School support

for new instructional initiatives) (NOTE that any and all proposed course/program additions/changes must be pursued through normal departmental/Faculty/senate channels)

Undergraduate Education

Contributions in this area will include, but are not limited to:

- participation in consultations/meetings as part of any formal reviews of the undergraduate Materials Science program
- direct participation (at the invitation of the Participating Departments) in revisions to the undergraduate Materials Science program
- provision of academic/career counseling, supervision of 4th year thesis projects, summer research opportunities by CAMBR members
- seminars, workshops, career events, etc., aimed at undergraduate students.

Graduate Education

Contributions in this area will include, but are not limited to:

- direct participation (at the invitation of the Participating Departments) in the creation of, and subsequent revisions to, the proposed Collaborative Graduate Program in Materials/Biomaterials
- offer to development of a core course to be taken by all graduate students in the proposed collaborative program
- participation in consultations/meetings as part of any formal reviews of the proposed graduate program
- training of highly qualified personnel in materials/biomaterials by CAMBR members via thesis supervision, membership on grad supervisory and thesis examining committees, academic/career counseling, access to state-of-the-art instrumentation, conference presentation opportunities for grad students, etc.
- creation and operation of a materials/biomaterials seminar series and occasional workshops, in consultation with cognate Departments.

Public Education and Outreach

It is anticipated that there will be a seminar series (possibly including an annual Distinguished Lectureship), and an Annual Workshop. Outreach activities will also depend on having a good web site as a portal for the public. A recruitment strategy for the undergraduate and graduate programs will be developed and implemented in collaboration with Participating Departments and an effective web site developed.

One method of ensuring a vibrant environment is to establish a new seminar series involving both internal and external speakers (see the budget section). This seminar series, which will be open to the public, will showcase Western's strength in Materials and Biomaterials Science and serve as a forum that will foster interactions across disciplines. It will also present a platform for a more formal dialogue within Western as to the strategic direction in Material/Biomaterials Science at Western.

5. Physical Requirements

a. Space requirements at Western:

(i) at start-up;

It is envisaged that the CAMBR will provide a forum for people to meet and interact in person. This will require some meeting space, which could be permanent or reserved on an as-needed basis. A dedicated office will be required for the Director and possibly for an Administrative Secretary. Office space for interdisciplinary Centres/Institutes has been included in the design of the renovated Physics & Astronomy Building; office for the Director and administrative support has been allocated to CAMBR. Temporary space will be found in the interim period.

The following facilities are crucial to the research mission of researchers within CAMBR. All facilities listed have their own space and each is responsible for its own operations. However, from time to time, a given facility may seek to expand, to acquire funds for new or replacement equipment, or to acquire funds to support personnel. CAMBR, at the request of the facility, is expected to provide support and assistance in such endeavours.

a) *Nanofab Lab:* The Nanofab was established in 2000 through a large CFI grant awarded to PI Ian Mitchell. This success was followed by an ORDCF proposal to use the Nanofab for fundamental photonics research (primarily on photonic band gap materials). The Western proposal, again fronted by Mitchell, was ultimately folded into the successful province-wide Ontario Photonics Consortium initiative led by McMaster University. The Western group initially included PIs from Physics & Astronomy (I. V. Mitchell, M. Zinke-Allmang) and Chemistry (N. O. Petersen, K. M. Baines, P. R. Norton) as well as physicist K. Robbie from Queen's University. This group was expanded to include R. H. Lipson, Z. Ding and F. Lagugné-Labarthe (Chemistry), J. Sabarinathan (Engineering) and S. Mittler (Physics & Astronomy). Recently they were joined by G. Fanchini (Physics & Astronomy). The current Director of the Nanofab (Kraatz) was appointed by an *ad hoc* selection committee struck by the Dean of Science. The salaries of two of the three staff members working in the facility are base-funded through budget requests put forward by WINS.

The Nanofab is expected to remain the core infrastructure for a large number of academic users across campus. Coordination of the Nanofab through CAMBR will ensure the involvement of the Materials/Biomaterials community on campus in the Nanofab facility and will play a central role in coordinating efforts to update the facility and to enhance its capabilities. CAMBR should work with SSW to maintain funding from NSERC through the MRS (or an equivalent) program.

b) *Tandetron Facility:* The Tandetron was purchased in 1988 with funding procured by I. V. Mitchell from the Ontario Centre for Materials Research. Until recently, the key users have been the (former) Interface Science Western (ISW) group (K. Griffiths, W. Lennard, I.V. Mitchell, P.R. Norton, P.J. Simpson and M. Zinke-Allmang) which held an MFA grant to pay for technical support of the instrumentation. Currently the main active internal users of the Tandetron are P.J. Simpson and L. Goncharova, both of the Dept. of Physics & Astronomy. There are also a number of external users, the most significant being A. Knights (McMaster). It is envisioned that responsibility for the management of the facility will be transferred to Physics & Astronomy, as will be the staff position of the technician who operates the instrument.

c) **Surface Science Western:** SSW was established circa 1990 with a mandate to provide surface analysis services to the academic and industrial communities, consulting services to the industrial community, to provide an environment for the training of highly qualified personnel in surface analysis research and instrumental techniques. The current Director is Leo Lau (Dept. of Chemistry) who manages a total of ~14 staff scientists and administrative personnel. SSW currently occupies about 6,000 sq. ft. in the basement of the Western Science Centre. Instruments available include, but are not limited to, SIMS, ToF-SIMS, XPS, SEM, FTIR, Raman, AFM, and Tencor. In 2008-09 SSW was used by numerous research groups from Engineering, Science, and Schulich, among others.

(ii) within 3 years and (iii) within 6 years

The proposed administrative office space at start-up should suffice for the next three to five years. The space associated with shared research facilities may grow if future CFI or other large institutional grants are successful; indeed it is anticipated that the existence of CAMBR will catalyze and strengthen large group grants requesting instrumentation to conduct leading research in materials/biomaterials science. Space required for the undergraduate and graduate programs are the responsibility of the Participating Departments.

b. Space requirements at other institutions or locations as appropriate (Please provide documentation of any arrangements in place to secure such space)

Not applicable

c. Demands on library, computing or other University services such as purchasing, accounting, human resources, payroll, and so forth

It is expected that CAMBR will have little to no impact on library or computing services. The hiring of any administrative personnel will place only a small demand on human resources and payroll.

6. Staffing Requirements

a. Requirements for administrative, and/or technical personnel support

It appears there will be a need for one part-time administrative/secretarial position. The incumbent would schedule meetings, circulate materials and announcements, organize the logistics of, and advertise, CAMBR events including the proposed seminar series, keep the web site up to date, field inquiries, etc. It is likely that these duties would form part of the workload for a full-time administrative secretary the remainder of whose workload would be assigned to another Centre/Institute and/or to a Department.

b. Details of all proposed support staffing arrangements, as follows: For each support staff member, please indicate: i) proposed employer (e.g. University vs. Centre); ii) role or duties; iii) source of compensation. For employees of external institutions or corporations, please provide copies of agreements or draft agreements outlining the obligations of the University and the institution/corporation, respectively, vis-à-vis such employees. For employees of Centres/Institutes which are, or intend to become incorporated, please

provide copies of agreements or draft agreements outlining the obligations of the University and the Centre/Institute, respectively vis-à-vis such employees

Details of proposed part-time administrative secretary position are as follows:

For the first 1-2 years this will be a non-permanent, contract position in order to assess duties/workload and also to determine possible shared administrative support position with other Centres (in particular Environment Sustainability and Planetary Science and Exploration, both of which are currently seeking additional, non full-time administrative support). Anticipated workload for CAMBR is 1 to 1.5 days per week. The Centre will receive one-time funding for first three years and would be expected to cover cost of this position from such funding (or from any additional funding it might acquire from other sources). The incumbent will likely be employed by the Faculty of Science, either by the Dean's Office or by a Department with the latter choice determining to whom the incumbent directly reports. If position becomes permanent, then base funding will be required – see Sec. 7 below.

Appendix. Partial List of Prospective Principal Members

NAME	DEPARTMENT	FACULTY
K. Baines	Chemistry	Science
M. Bancroft	Chemistry	Science
J. Corrigan	Chemistry	Science
Z. Ding	Chemistry	Science
Y. Huang	Chemistry	Science
R. Hudson	Chemistry	Science
L. Konermann	Chemistry	Science
R. Lipson	Chemistry	Science
L. Lau	Chemistry / SSW	Science
P. Norton	Chemistry	Science
W. Meath	Chemistry	Science
O. Semenikhin	Chemistry	Science
T. K. Sham	Chemistry	Science
D. Shoesmith	Chemistry	Science
M. Stillman	Chemistry	Science
J. Wisner	Chemistry	Science
C. Wren	Chemistry	Science
H. B. Kraatz	Chemistry	Science
F. Labarthe-Lagugne	Chemistry	Science
E. R. Gillies *	Chemistry/Chem & Biochem	Science/Engineering
Y. Song	Chemistry	Science
P. R. Ragogna	Chemistry	Science
B. Chronik	Physics & Astronomy	Science
M. Cottam	Physics & Astronomy	Science
J. de Bruyn	Physics & Astronomy	Science
J. Hutter	Physics & Astronomy	Science

W. Lennard	Physics & Astronomy	Science
P. Simpson	Physics & Astronomy	Science
S. Mittler	Physics & Astronomy	Science
M. Singh	Physics & Astronomy	Science
M. Zinke-Allmang	Physics & Astronomy	Science
G. Fanchini	Physics & Astronomy	Science
R. N. Costa Filho	Physics & Astronomy	Science
L. Goncharova	Physics & Astronomy	Science
C. Denniston	Applied Mathematics	Science
A. MacIsaac	Applied Mathematics	Science
M. Mueser	Applied Mathematics	Science
N. Huner	Biology	Science
L. Kari	Computer Science	Science
R. Flemming	Earth Sciences	Science
F. Longstaffe	Earth Sciences	Science
W. Nesbitt	Earth Sciences	Science
R. Secco	Earth Sciences	Science
S. Shieh	Earth Sciences	Science
D. Moser	Earth Sciences	Science
L. Briens *	Chemical and Biochemical	Engineering
P. Charpentier *	Chemical and Biochemical	Engineering
A. Margaritis *	Chemical and Biochemical	Engineering
J. Herrera	Chemical and Biochemical	Engineering
K. Mequanint *	Chemical and Biochemical	Engineering
A. Rizkalla *	Chemical and Biochemical	Engineering/Schulich
W-K Wan *	Chemical and Biochemical	Engineering
Jin Zhang *	Chemical and Biochemical	Engineering
Jingxu Zhu *	Chemical and Biochemical	Engineering
R. Sobot	Electrical and Computer	Engineering
J. Sabarinathan	Electrical and Computer	Engineering
S. Salisbury	Electrical and Computer	Engineering
Liyin Jiang	Mechanical and Materials	Engineering
R. Klassen	Mechanical and Materials	Engineering
D. Shinozaki	Mechanical and Materials	Engineering
A. Sun	Mechanical and Materials	Engineering
J. Wood	Mechanical and Materials	Engineering
Jun Yang	Mechanical and Materials	Engineering
C.H. Driessen	Biomaterials Science	Schulich
S. Habitovic-Kofman	Biomaterials Science	Schulich
H.A. Goldberg	Biochemistry	Schulich
G. Hunter	Biochemistry	Schulich
D. Hamilton	Biochemistry/Dentistry	Schulich
D. Litchfield	Biochemistry	Schulich

* denotes faculty also in the Biomedical Engineering program