Memorandum

To: University Senate

From: Raymond A. Noe, Chair
Council on Academic Affairs

Date: September 19, 2005

A PROPOSAL FROM THE COUNCIL ON ACADEMIC AFFAIRS TO ESTABLISH THE DEPARTMENT OF BIOMEDICAL ENGINEERING

WHEREAS biomedical engineering includes the application of engineering to medicine, and is the fastest growing engineering subfield at both undergraduate and graduate levels in the country; and

WHEREAS the current Biomedical Engineering Center is well prepared to move to departmental status, and the new department will have the requisite resources for its research, education, and service missions; and

WHEREAS many colleges and universities in North America and throughout the world have programs and academic departments in biomedical engineering; and

WHEREAS the proposal was approved by the College Committee on Academic Affairs, and the College faculty, and has the support of the Dean of College of Engineering; and

WHEREAS the proposal was discussed with the University Senate’s Faculty Council on May 26, 2005; and

WHEREAS the proposal was reviewed and approved first by a Subcommittee, and then the full Council on Academic Affairs at its meeting on August 24, 2005;

NOW THEREFORE BE IT RESOLVED that the University Senate approve the proposal to establish the Department of Biomedical Engineering, and respectfully request concurrence from the Board of Trustees.
I am pleased to inform you that the proposal from the College of Engineering to establish a Department of Biomedical Engineering, was approved by the Council on Academic Affairs at its meeting on August 24, 2005. Thank you for submitting the last set of revisions.

This proposal will now be sent to the University Senate for action at a forthcoming meeting. Once I have been given that date, I will contact you. If approved by the University Senate, the proposal will go to the Board of Trustees for action as the final step in the review/approval process.

Please note that this message represents my formal communication with you about this action. You will not receive a separate letter from me. In that regard, please make a copy of this message for your file(s) on the proposal and I will do the same for the file in the Office of Academic Affairs.

If you have any questions/comments about this action, please contact the Chair of the Council, Professor Ray Noe (noe.22@osu.edu) or me.

Congratulations on the successful completion of this important stage of the approval process!

Randy

W. Randy Smith
Vice Provost
MEMORANDUM

TO: Vice Provost W. Randy Smith
Council on Academic Affairs, Office of Academic Affairs
203 Bricker Hall, 190 North Oval Mal

THROUGH: William A. Baeslack III, Dean CoE

FROM: Andreas F. von Recum, Director BME

DATE: July 26, 2005

RE: Additional Information to Proposal to Establish BME Department

During the meeting of the Council on Academic Affairs (CAA) on the Proposal for the Establishment of the Biomedical Engineering Department, the council requested clarifying information, which I submit herewith. I thank the council members for their genuine efforts to support this proposal. If there are further needs to help you clarify the intent of the proposal or details of its implementation, I will be eager and ready to respond.
PROPOSAL
For the Establishment of the
BIOMEDICAL ENGINEERING DEPARTMENT
In The College of Engineering At The Ohio State University

Submitted by the Core Faculty of the
Biomedical Engineering Center
August 2003
Additional Information requested by the CAA regarding the original Proposal of August 2003 for the Establishment of the Biomedical Engineering Department

1. CAA requested an update on which faculty members will join the TIU in BME. Below is the update to pages 15 and 16 of the original application:

B. DEMAND

1. Faculty for the Proposed Department of Biomedical Engineering

The table below (1a) lists the faculty members that intend to become members of the new BME TIU as of July 2005; The second table (1b) shows currently open positions for which recruiting is advanced.

Table 1a: BME Center Faculty Status July 2005

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Rank</th>
<th>Current TIU</th>
<th>Anticipated to join BME TIU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gunjan Agarwal</td>
<td>Assistant Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Rita Alevriadou</td>
<td>Associate Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Derek Hansford</td>
<td>Assistant Professor</td>
<td>Materials Science</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Douglas Kniss</td>
<td>Professor</td>
<td>Obstetrics &amp; Gynecology</td>
<td>Intends to join</td>
</tr>
<tr>
<td>Stephen Lee</td>
<td>Associate Professor</td>
<td>Molecular and Cellular Biochemistry</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Alan Litsky</td>
<td>Associate Professor</td>
<td>Orthopaedics</td>
<td>Intends to join</td>
</tr>
<tr>
<td>Jun Liu</td>
<td>Assistant Professor</td>
<td>Electrical &amp; Computer Engineering</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Nicanor Moldovan</td>
<td>Assistant Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>Intends to join</td>
</tr>
<tr>
<td>Cynthia Roberts</td>
<td>Associate Professor</td>
<td>Ophthalmology</td>
<td>Intends to join</td>
</tr>
<tr>
<td>Mark Ruegsegger</td>
<td>Assistant Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>Obligated as of appointment letter</td>
</tr>
<tr>
<td>Andreas von Recum</td>
<td>Professor</td>
<td>Veterinary Biological Science</td>
<td>Committed to join</td>
</tr>
<tr>
<td>Ronald Xu</td>
<td>Assistant Professor</td>
<td>Mechanical Engineering</td>
<td>Obligated as of appointment letter</td>
</tr>
</tbody>
</table>

Faculty members intending to join BME TIU 12

Table 1b: Additional, Open Funded Positions in BME as of July 2005

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Rank</th>
<th>Current TIU</th>
<th>Anticipated TIU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selective Investment Active search</td>
<td>Asst. Prof. level intended</td>
<td>Mechanical Engineering intended</td>
<td>Biomedical Engineering by letter of appointment</td>
</tr>
<tr>
<td>Replacement for Waldron, offer made</td>
<td>Assoc. Prof. level offered to Gooch</td>
<td>Chemical Engineering</td>
<td>Biomedical Engineering by letter of appointment</td>
</tr>
</tbody>
</table>

Additional faculty members obligated to join BME’s TIU 2

Total anticipated faculty members planned for BME’s TIU 14
2. CAA questioned the acceptability of CITIZENSHIP/COLLEGIALITY as a P&T evaluation criterion.

If this assessment criterion becomes unacceptable to CAA I suggest that it be stricken as a separate evaluation criterion (see below). Its intent will be considered within the evaluation criteria 1 – 3.

6.1.4 CITIZENSHIP/COLLEGIALITY

The success of an institution's operation depends on the dedication, cooperation, professionalism, ethical behavior, and the collegial attitude of its members. Therefore, it is appropriate to consider the candidate's attitude and performance in fulfilling Departmental and other university-related responsibilities as part of the evaluation, as described in Section 6.6.8. From a somewhat broader perspective, members of the BME faculty are expected to adhere to the Code of Ethics of their professional and/or research society.

3. CAA asked whether the budget Cost/Resources, page 21 are sufficient.

Concerning faculty there are no plans to hire additional faculty at this point in time beyond the two shown in the attached table. Once an undergraduate curriculum is approved for implementation, more faculty and staff positions will be requested one year prior to start of classes to develop courses and prepare for recruiting and teaching.

Concerning renovations, two renovation projects are currently underway for a total of $765,226. These two projects will provide initial space for biomedical engineering work. In the long run, Bevis Hall is unsuitable for laboratory work and an alternative accommodation will have to be found that is closer to partnering research laboratories in the medical school. The construction of a new facility on the main campus to support the BME department is a high priority of the Dean of Engineering and is currently being evaluated.

Concerning minimum budget: BME is barely able to function on a Center level and will not be able to function on a departmental level with raised expectations, unless the current budget is adjusted as requested on page 21. The Dean of Engineering has committed to provide additional cash support to the new department to meet the additional programmatic and administrative financial needs. The College is implementing a new budget process that will more effectively align permanent department financial support with workload and productivity, this new model should facilitate an appropriate level of financial support for the growing BME department, including resources required to hire additional faculty and staff.

Monday, July 25, 2005
Andreas F. von Recum
Director BME
MEMO

TO: Council on Academic Affairs
FROM: Subcommittee C (M. Fullerton, Chair, Frank Schwartz, Electra Paskett, William Parker)
RE: Proposal to create a Department of Biomedical Engineering.
DATE: July 18, 2005

Subcommittee C of the Council on Academic Affairs unanimously recommends the attached proposal for approval by the full council. The current program in Biomedical Engineering is widely respected, and this is an extremely significant and promising area of research and teaching; we strongly support the creation of a department in this area. The Subcommittee had considerable discussion among itself and with the principals proposing the creation of the department. Two main topics were discussed. First, we sought assurance that the number of faculty FTE (as outlined in the chart forming part of the proposal) would be sufficient for the goals of the program. Second, since a new Dean of Engineering had taken office since the original proposal had been submitted, we asked that an additional statement of support be provided by the current dean. Both of these requests were satisfied by the attached documentation. Moreover, since the number of FTE faculty will be, at the outset at least, lower than the ten stipulated by the University as minimum for a department, we (Vice Provost Smith and myself) met with Faculty Council, who approved this deviation from policy.
MEMORANDUM

To: Professor Mark Fullerton, Chair, Subcommittee C, Council on Academic Affairs

From: Bud Baeslack, Dean of Engineering

Date: May 4, 2005

Re: Support for the Establishment of a Biomedical Engineering Department

Fully consistent with the request submitted to the Council of Academic Affairs (CAA) by the College of Engineering on December 3, 2003, I strongly endorse the establishment of a Biomedical Engineering Department in the College of Engineering. As you are aware, this proposal was approved unanimously by both the College Committee on Academic Affairs and by the College’s faculty at a College faculty meeting. It is also strongly endorsed by deans whose colleges would collaborate closely with this new department.

As I discussed with your subcommittee, I envision Biotechnology as being a key focus area of the College of Engineering as we move forward in developing and implementing a strategic plan that will establish goals, strategies and specific actions required to advance the excellence and reputation of our academic programs, research, and outreach and engagement. The development of a Biomedical Engineering Department will serve as a key component of achieving success in this priority focus area. It will be essential to the establishment of an outstanding, innovative undergraduate degree program in Biomedical Engineering. This program, which is currently being developed by a faculty committee comprised of individuals from across the campus, will attract outstanding, high quality and diverse students. The department will also serve as a major component of a growing interdisciplinary, cross-department and cross-college research and graduate studies enterprise in Bioengineering and Biotechnology.

As the attached table from pages 15 and 16 of the original proposal describes (that was forwarded to you previously), following currently planned hires the department will increase its total FTE’s from 7.75 to 10.25 to support its academic programs. As the BME undergraduate program ramps up it is fully expected that additional faculty will be hired to support the additional workload. Finally, the College has made space renovations in the current BME facility to support this growth a high priority, directing current University renovation funds and additional College discretionary funds to support laboratory and classroom renovations.

In summary, I consider the establishment of a BME Department to be fully aligned with the priorities of the College of Engineering and a key component in our future plans, and therefore I unequivocally support its immediate establishment.


B. DEMAND

1. Faculty for the Proposed Department of Biomedical Engineering

The table below (1a) lists the current faculty and their declared intent* to become members of the new department; the older BME core faculty members are yet undecided** whether or not to transfer their TIU to BME. The second table (1b) shows funded but not yet filled faculty positions that will become part of the new department.

Table 1a: BME Center Faculty Status March 2005

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Rank</th>
<th>Current TIU</th>
<th>Academic FTE Assignment (BME)</th>
<th>Additional FTE</th>
<th>Research Area</th>
<th>BME Related Assignments in 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gujnan Agarwal*</td>
<td>Assistant Professor</td>
<td>Internal Medicine</td>
<td>0.50</td>
<td>0.50</td>
<td>Imaging</td>
<td>Teaching: 2 courses/yr in her field Directs IGERT AF Microscopy Lab and Technician Member Grad. Studies Committee Chair BME Computer Committee Member CCAA Committee</td>
</tr>
<tr>
<td>Rita Alevradou*</td>
<td>Associate Professor</td>
<td>Internal Medicine</td>
<td>0.50</td>
<td>0.50</td>
<td>Cellular Engineering</td>
<td>Teaching: 2 courses/yr in her field Member, CoE Comm. on Academic Affairs Member Grad. Studies Committee Member TE Search Committee</td>
</tr>
<tr>
<td>Derek Hansford*</td>
<td>Assistant Professor</td>
<td>Materials Science</td>
<td>1.00</td>
<td></td>
<td>Microfabrication of biomedical devices</td>
<td>Teaching: 4 courses/yr Manages pMD Laboratory Manages m-Technology focus in BME Member CoE Core Curriculum Member Biology in Eng. Subcommittee Member BME BS Curriculum Comm Member BME TE Search Committee</td>
</tr>
<tr>
<td>Douglas Kniss**</td>
<td>Professor</td>
<td>Obstetrics &amp; Gynecology</td>
<td>0.25</td>
<td>0.75</td>
<td>Tissue Engineering</td>
<td>Faculty Senator Teaches TE in various classes for BME courses adding to equivalent of a 1 credit hour course per year Chair TE-Search Comm BME: CoM&amp;PHE Member SI Search Comm BME: CoM&amp;PHE</td>
</tr>
</tbody>
</table>

* indicates those who declared intent to join BME during TIU transition
** indicates those yet to decide
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Department</th>
<th>FTE</th>
<th>Title</th>
<th>Role/Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stephen Lee*</td>
<td>Associate Professor</td>
<td>Molecular and Cellular Biochem.</td>
<td>0.80</td>
<td>0.20 (Chem. Eng.)</td>
<td>Biomedical nanotechnology</td>
</tr>
<tr>
<td>Alan Linsky**</td>
<td>Associate Professor</td>
<td>Orthopaedics</td>
<td>0.50</td>
<td>0.50 (Orthopaedics)</td>
<td>Biomaterials orthopaedic implants</td>
</tr>
<tr>
<td>Jun Liu*</td>
<td>Assistant Professor</td>
<td>Electrical &amp; Computer Eng.</td>
<td>1.0</td>
<td>none</td>
<td>Biomedical Imaging with μn-Technology</td>
</tr>
<tr>
<td>Nicanor Molovyan*</td>
<td>Associate Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>0.25</td>
<td>0.50 (Cardiol) 0.25 (Ophthalmol)</td>
<td>Micropatterning, vascular tissue eng.</td>
</tr>
<tr>
<td>Cynthia Roberts**</td>
<td>Associate Professor</td>
<td>Ophthalmology</td>
<td>0.20</td>
<td>0.80 (Ophthalmology)</td>
<td>Laser &amp; optical applications</td>
</tr>
<tr>
<td>Mark Rugsegger*</td>
<td>Assistant Professor</td>
<td>Internal Medicine (Cardiology)</td>
<td>0.50</td>
<td>0.50 (Davis Heart &amp; Lung Res. Inst.)</td>
<td>Cardiovascular biomaterials, biodegradable implants</td>
</tr>
<tr>
<td>Andreas von Recum*</td>
<td>Professor</td>
<td>Veterinary Biological Science</td>
<td>1.00</td>
<td>0 (Vet. Biol. Sci.)</td>
<td>Biocompatibility</td>
</tr>
<tr>
<td>Jessica Winter</td>
<td>Assistant Professor</td>
<td>Chemical Engineering</td>
<td>0.25</td>
<td>0.75 (Chemical Engineering)</td>
<td>Tissue Engineering</td>
</tr>
<tr>
<td>Ronald Xu*</td>
<td>Associate Professor</td>
<td>Mechanical Engineering</td>
<td>1.00</td>
<td></td>
<td>Imaging, device design &amp; fabrication</td>
</tr>
<tr>
<td><strong>Total BME FTEs:</strong></td>
<td></td>
<td></td>
<td>7.75</td>
<td></td>
<td><strong>Manages 1 FTE focus in BME:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>---</td>
<td>5.25</td>
<td><strong>Teaching: manages 2 seminar type courses/year teaches 1 course in his field year for BME:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Member MSP in CoM&amp;PH Comm:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Member OSU Ethics Comm.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Member MSP-Steering Comm. for CoM&amp;PH BM:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Chair BM&amp;I Grad. Studies Committee</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Member OSU Grad. Studies Committee Chairs</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Starts faculty appointment in October 2005, will teach 9 credit hrs/yr, will assume leadership in BME imaging focus</strong></td>
</tr>
</tbody>
</table>

Associate Director of BME with curriculum oversight responsibility
Chair: CoF BS in BME Curric. Planning Comm
Member OSU Res. & Grad. Council
Member SI Search Comm. BM&I CoM&PH
Manages Imaging focus in BM&I

Teaching: 2 courses/year in his field
Laboratory Safety Officer
Member SI Bionanotechnology Search Committee
Member Grad. Studies Comm., freed from other assignments this year (pursuit of year)

Center administration
Teaching: Classes in Biocompatibility in various BM&I courses adding to equivalent of a 1 credit hour course per year

Starts faculty appointment July 1, 2006 will teach TE in BM&I and contribute to collaborative research in TE

Teaching: in preparation
Member Grad. Studies Comm
Started in October, 2004
<table>
<thead>
<tr>
<th>OPEN POSITIONS AND FUNDING</th>
<th>FUNDED HIRES 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculty</strong></td>
<td><strong>Rank</strong></td>
</tr>
<tr>
<td>Selective Investment</td>
<td>Open, ongoing recruitment</td>
</tr>
<tr>
<td>Selective Investment</td>
<td>Open, ongoing recruitment</td>
</tr>
<tr>
<td>Selective Investment</td>
<td>Open, ongoing recruitment</td>
</tr>
<tr>
<td>Selective Investment*</td>
<td>Open, ongoing recruitment</td>
</tr>
<tr>
<td>Open (M. Waldron replacement)*</td>
<td>Open, ongoing recruitment</td>
</tr>
</tbody>
</table>

**Total BME FTEs:** 2.50  
**Total FTEs contributed to other departments:** ---  
**3.00**

From the sum of Table 1a & b it becomes evident, that there will be **10.25 FTEs** assigned to BME and 8.25 FTE contributions to other departments, which includes current assignments and anticipated hires.

BME faculty will have undergraduate, graduate and or professional training in many different fields, which may or may not include engineering. A mix of engineering and non-engineering faculty is actually required to meet cutting edge educational goals of BME.

In addition to the core faculty, over 75 other University faculty members are part of the participating faculty or have affiliations with the Center (see list in Appendix C). Most will be offered joint (no-salary) faculty appointments; some may decide to transfer partial or full administrative affiliation and/or tenure-home to the Department of Biomedical Engineering.
TO: David Stetson  
Chair, Council on Academic Affairs (CAA)  

FROM: Jim Williams  
Dean, College of Engineering  

SUBJECT: Establishment of the Biomedical Engineering Department  

DATE: 3 December 2003  

The College of Engineering's Biomedical Engineering Center has requested that a Biomedical Engineering Department be established in the college. Their proposal has been approved by our College Committee on Academic Affairs (CCAA) as well as the college's faculty, at a college faculty meeting, by a vote of 32 in favor, 0 against, and 0 abstentions.  

This proposal has my full endorsement. Consequently, I wish to request that CAA also recommend approval of this proposal and forward it to the University Senate once it has been approved.  

Attachments:  
1. Letter from Rob Wagoner, Chair CCAA  
2. Proposal for the Establishment of the Biomedical Engineering Department in the College of Engineering at The Ohio State University
TO: Robert J. Gustafson  
Secretary, College of Engineering  

FROM: Rob Wagoner  
Chair, CCAA  

SUBJECT: Establishment of the Biomedical Engineering Department  

DATE: 22 October 2003  

On the 22nd of October 2003 the College Committee on Academy Affairs (CCAA) voted to recommend approval of the request to create a Department of Biomedical Engineering in the College of Engineering by a vote of 10 Approved, 0 Opposed, and 0 Abstentions. We would like for you to present their proposal, with our recommendation of approval, at the next College Faculty Meeting.  

CCAA would also like to recommend that the faculty vote to establish a Department of Biomedical Engineering be taken at the same faculty meeting in which it is discussed unless there is substantial controversy about the proposal.
Proposal for the Establishment
of the
Biomedical Engineering Department
in the
College of Engineering
at the
The Ohio State University

August 2003

Submitted by the Core Faculty of the Biomedical Engineering Center;
Andreas F. von Recum, D.V.M., Dr. med. vet., Ph.D., FBSE,
Director
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1. INTRODUCTORY STATEMENT

The Biomedical Engineering (BME) Center at The Ohio State University, currently a Center in the College of Engineering, is seeking status as the Department of Biomedical Engineering. This status will create the environment necessary for improved support of the existing graduate program and an undergraduate minor program, for attracting and retaining quality faculty and students, and for enhancing research opportunities. It shall also support an undergraduate major program the establishment of which will be requested at a later date. Although BME has been, and remains in charge of a graduate program and the undergraduate minor, it has been severely restricted in attracting and retaining faculty because BME as a Center is not a tenure-initiating unit (TIU). Without TIU status, BME has to find tenure homes for its faculty recruits in other departments and is restricted to faculty candidates willing to accept the uncertainties inherent in split loyalties (teaching in one department and earning tenure in another).

Broadly defined, BME almost always includes the application of engineering to medicine. More than 95 North American colleges and universities and numerous additional institutions worldwide have programs and academic departments in BME, most within Engineering Schools or Colleges, some within Medical Schools, and very few with dual administration. The vast divergence of culture and procedures that separate the OSU College of Engineering and the OSU College of Medicine and Public Health, coupled with our primary mission of training future biomedical engineers, has steered us towards proposing that Biomedical Engineering become a department within the College of Engineering.

The BME Center is well prepared to move to departmental status. The requisite faculty and staff will become part of the BME Department. Academic Enrichment and Selective Investment awards have created the necessary environment to move the new department towards national prominence. Three faculty lines and two support staff positions were attained through the Academic Enrichment. Nine faculty positions were secured through the Selective Investment; eight of these will have partial appointments in the planned BME Department. The proposed faculty hires will have joint (split funding and split responsibilities) appointments within departments in the College of Engineering, College of Medicine and Public Health, or in some cases, both colleges, thus reflecting and strengthening the collaborative relationships already in place.

The graduate program in BME currently offers two graduate degrees, M.S. and Ph.D. We also participate actively in the University’s Medical Scientist Training Program (M.D./Ph.D. program), which develops competence in engineering and the life sciences, and specifically fosters the ability to work in an interdisciplinary environment. Besides our active graduate program, the College of Engineering and the Office of Academic Affairs approved the undergraduate minor in BME which was implemented Winter Quarter 2002.
II. BIOMEDICAL ENGINEERING AS A DISCIPLINE

Advances in technology have spurred major beneficial transformations in the way medicine is practiced. The fields of medical diagnostics, health monitoring, and disease assessment have reached previously unforeseen levels of efficacy with the advent and refinement of Computerized Tomography (CT) and Positron (PET) Scans, Magnetic Resonance Imaging (MRI), and Nuclear Magnetic Resonance (NMR). These have combined with time-honored, yet continuously evolving technologies such as ultrasound, scintigraphy, x-rays, and fluorescence imaging to provide unprecedented opportunities in health care. New diagnostic and monitoring technologies are continuously emerging, such as implantable and, possibly, telemetric sensors, which soon will have the ability to detect, for example, the onset of a glycemic crisis in a diabetes patient. At the same time, they will also trigger the delivery of life-saving therapy and promptly inform the attending physicians through the Internet.

Most spectacular advances in medical therapeutics may be ascribed directly to technological engineering advances. Minimally invasive surgical tools, culminating in computer-controlled robotic surgery (a field in which OSU is a global leader), balloon angioplasty, and stent technology have revolutionized cardiothoracic and vascular medicine, resulting in extraordinary reductions in the mortality, morbidity, and cost of therapeutic interventions. Technological innovation in the delivery of drugs (implantable pumps, biodegradable polymeric wafers and microspheres) and radiation (gamma knife, brachytherapy, boron neutron capture) have not only advanced treatment, but also promise greater strides in the fight against disease.

Tissue engineers have pioneered the replacement of tissues and tissue functions in patients by using the body’s own cells, or even cells from surrogate donors such as pigs. Such tissue engineered methods and devices will eventually replace many of the man made implants or offer therapeutic or diagnostic solutions where there are no others available.

Both medicine and the basic life sciences have received major impetus from the development of advanced technologies for laboratory analysis. These range from desktop laboratory-on-chip devices to gene- and proteomic-chips for the rapid sequencing of nucleic acids and peptide chains.

None of these advances would have taken place without profoundly innovative contributions from engineering, the life sciences, the physical sciences, and the clinical disciplines. Such interfaces actually have grown to be recognized globally as the new discipline: Biomedical Engineering.
A. Biomedical Engineering as a Field of Study

Though drawing deeply from traditional engineering fields, such as Mechanical, Chemical, Materials, and Electrical Engineering as well as from the physical and life sciences, Biomedical Engineering is indeed an independent discipline. To elaborate further on this point: A mechanical engineer attempting to model the mechanical constitutive properties of skeletal muscle would encounter features that are not found in the world of engineering materials, such as the fact that the dominant load-bearing component is associated with an active (living) response, and not the passive material properties. Similarly, non-biological chemical engineering does not prepare for the interactions between man-made materials and living cells and tissues, commonly termed biocompatibility. Engineers are not traditionally trained in designing for appropriate biological interface properties of their materials, yet biocompatibility is the most important factor determining the viability of any biomedical implant. Conversely, biologists do not traditionally consider the material properties of cell culture dishes even though they influence cell behavior significantly.

BME's degree of complexity and sophistication calls for in-depth and systematically organized instruction in both engineering and the life sciences to insure proper considerations of safety and efficacy for medical use. In past decades, the national and international trend was to couple engineering and the life sciences to graduate education. Today the discipline is well represented in graduate and undergraduate programs, which integrate the foundations of biology, biochemistry, anatomy, and physiology with the pivotal elements of engineering education – mathematics, physics, chemistry, mechanics, electrical circuits, materials, and design. At the same time, opportunities for further specialization at the graduate level continue to grow. BME is now the fastest-growing engineering sub-field at both undergraduate and graduate levels in the country¹.

BME is a broad and expanding discipline. Covering the entire discipline well with a limited faculty is prohibitively expensive and time consuming so the current faculty have selected three foci in which they wish to establish and develop both research and teaching excellence. Those areas are:

- Biomaterials and Tissue Engineering
- Micro- and Nano- Fabrication

¹ "The number of biomedical engineering jobs will increase by 31.4 percent through 2010 --- double the rate for all other jobs combined, according to the U.S. Department of Labor---according to projections released last month by the Labor Department's Bureau of Labor Statistics. Overall engineering jobs will grow by 9.4 percent." Source: www.whitaker.org
Biomedical Imaging and Tissue Interactions
Also included within the educational mission of the Department will be related fields that have frequent interaction with these primary areas such as biotechnology, bioethics, and bioinformatics. As a whole, BME is a substantive and rapidly evolving discipline that combines engineering and the life sciences into a unique and potent new sector.

B. Biomedical Engineering at Ohio State

1. History
The Ohio State University was the first public university in Ohio and among the first public universities in the nation to offer distinct programs in BME. Under the leadership of its first director, pioneer Professor Herman Weed, the BME Center was established in 1971 as part of the Department of Electrical Engineering (EE) in the College of Engineering. The Center's objective was to develop a graduate program through EE and coordinate biomedical research activities across the diverse Ohio State campus. The first M.S. degree and Ph.D. in BME were granted in 1976 and 1978, respectively.

In 1988, the BME Center was restructured as a fully independent center within the College of Engineering. At that time, BME courses were removed from the auspices of EE, and the Center became autonomous in all academic programs and fiscal matters. The reorganization included the appointment of a new director, Dr. J. Fredrick Cornhill; the establishment of new faculty lines; and the assignment and renovation of classroom space for BME's use in Bevis Hall on West Campus.

The new concept of core BME faculty was developed. Core faculty would have primary responsibility to and be paid by the BME Center. In addition, participating faculty represented nearly 30 departments in nine colleges. Although their primary responsibilities were in their home departments, they would support, advise, and examine graduate students and collaborate in research programs through the BME Center and BME graduate program. The combined scientific and clinical research capacities of the College of Dentistry, College of Engineering, College of Medicine and Public Health, and the College of Veterinary Medicine, all in proximity to the medical center of the Ohio State University Hospitals, have provided extensive resources for biomedical research. Over the years there have been strong participating faculty partnerships especially with faculty of the College of Dentistry. For a number of years, listing one of the many examples, Dr. William Brantley from Restorative & Prosthetic Dentistry has been chairing the BME Graduate Studies Committee and active teaching interactions persisted in topics of biomaterials and prosthetics. A university external academic and research partnership was initiated with the Cleveland Clinic Foundation (CCF) in 1991. CCF staff members were given auxiliary faculty appointments at Ohio State and became participating faculty in BME. Over 60 BME graduate students have conducted research projects under the direction and financial sponsorship of CCF. Another effective type of sharing resources and combining strength has been BME's participation in the...
MD/DDS/DVM+PhD programs of dentistry (NIH-T32 training grant), medicine (MD/Ph.D. program), and veterinary medicine.

In 1994, the BME Center received a Whitaker Foundation Special Opportunity Award for $730,000. The grant for “The Biomedical Imaging Engineer” included funding for two faculty positions, equipment purchases and upgrades, and course development.

A new phase in BME’s history began in January 1999, when Mauro Ferrari, Ph.D., the third director of the BME Center, established a focus in Micro- and Nano-technology which triggered the University to establish the MicroMD fabrication center. In August of 2002, Dr. Ferran stepped down from the director’s position to assume a Vice President position in the Health Sciences Center. At that time Jim Williams, Dean, College of Engineering and Fred Sanfilippo, Dean, College of Medicine and Public Health recruited Dr. Andreas von Recum, Associate Dean of Research, College of Veterinary Medicine, at The Ohio State University to fill the position. Dr. von Recum’s primary objectives were to reinstate faculty governance, re-establish teaching as a priority, develop excellence in the faculty selected focus areas, and achieve departmental status.

The accomplishments of all the directors of the center are summarized in Table 1 below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herman Weed</td>
<td>1971</td>
<td>Developed a graduate program through Electrical Engineering and coordinated biomedical research across OSU campus</td>
</tr>
<tr>
<td>J. Fredrick Cornhill</td>
<td>1988</td>
<td>Restructured BME as a fully independent center within the CoE</td>
</tr>
<tr>
<td>Morton Friedman</td>
<td>1996</td>
<td>Served as acting director</td>
</tr>
<tr>
<td>Mauro Ferrari</td>
<td>1999</td>
<td>Established a focus in micro and nano-technology</td>
</tr>
<tr>
<td>Andreas F. von Recum</td>
<td>2002</td>
<td>Develop three BME research foci, applied for departmental status including establishing faculty governance, and establish teaching as a faculty priority</td>
</tr>
</tbody>
</table>

2. Current Status

Currently, BME exists as a Center within the College of Engineering but it has fulfilled departmental type obligations for the past 20 years. Its director serves on the College Executive Committee and reports directly to the Dean of the College. Table 2 below shows the typical OSU functions of a department and a center in comparison with BME.
In 1999, the Center received an Academic Enrichment Award, “Biomedical Micro/Nano Engineering Initiative,” and in 2000, a Selective Investment Award, “Cardiovascular Bioengineering” in collaboration with the College of Medicine and Public Health. Funding from these two awards includes faculty lines in the areas of biomedical nanotechnology, tissue engineering, bio-MEMS, biomaterials, robotic surgery, and biomedical imaging. At present, ten core faculty members (4.0 FTE) and ten faculty lines are either open or have searches underway (5.15 FTE) (see Table 6). The total FTE, including open and funded positions, is currently 9.15. Over 75 faculty from colleges across the OSU campus are part of the body of participating faculty or have center affiliations (see Appendix D).

Two BME graduate degrees are offered: an M.S., and a Ph.D. They share the goal of developing competence in both engineering and the life sciences and the ability to work in an interdisciplinary environment. As of Spring 2003, the program has awarded 326 graduate degrees (M.S. = 251; Ph.D. = 75) and has a current enrollment of 41 graduate students (M.S. = 17; Ph.D. = 24). In order to move toward a more Ph.D.-oriented program, graduate admissions have been more selective, with an emphasis on bringing in only the best students we can attract. Two BME graduate students are currently participating in the Medical Scientist Training Program (M.D./Ph.D.) in the College of Medicine and Public Health.

An undergraduate minor in BME was implemented Winter Quarter 2002. The Center has secured a $1.5 million endowment from the Kettering Fund specifically earmarked for undergraduate education, which is being used to support students earning a minor in BME. In March 2001, Dr. Mauro Ferrari received the Edgar C. Hendrickson Designated Chair in Biomedical Engineering. The College of Engineering has pledged the related annual earnings to support faculty using the Ohio Micro MD Laboratory facility located in OSU’s Science Village.

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14.
Current research focus areas include cardiovascular imaging, orthopedic biomaterials, laser-tissue ophthalmology, biomedical microdevices (bio-MEMS), biomedical nanotechnology, cardiovascular bioengineering, drug delivery technology, and tissue engineering. The participating faculty additionally offer a broad variety of biomedical medicine and engineering topics to the BME graduate students.

The BME Center, with funding from the State of Ohio, has established the Ohio MicroMD Consortium, dedicated to research, education, and development in therapeutic biomedical micro- and nanotechnologies. The consortium’s Ohio MicroMD Laboratory is located (within walking distance from BME’s headquarters) on the Science and Technology Campus, Ohio State’s new research park, and is administrated by The Ohio State University in collaboration with BME. In addition, the Davis Heart and Lung Research Institute (DHLRI) of the medical college is closely collaborating with BME in many research programs.
III. UNIVERSITY GUIDELINES

The following text is structured in response to the University’s guidelines for establishing an academic department.

A. RATIONALE

1. Mission Statement for BME Department

The overall mission of the BME Department will be the achievement of excellence in the education of professionals, the dissemination of knowledge and technology, and the development of innovative solutions to problems in the field of BME.

The vision of the BME Department will be to graduate students with the knowledge, skills, and ethical standards necessary to improve the care of patients, preserve health, further understanding of physiology and pathophysiology, and to support technology development and application, teaching, and research to these ends.

The research mission of the BME Department will be to engage in basic, translational, and applied research that will generate new knowledge or applications. All faculty will be expected to disseminate knowledge acquired from their research through timely publications and other scholarly endeavors, including technology transfer. Undergraduate, graduate, postgraduate, and professional students will be expected to participate in research.

The educational mission of the BME Department will include the following five general objectives:

(1). The department will prepare students for successful engineering careers, for graduate or professional studies, and for life-long learning.

(2). The students will learn principles and the fundamental tools of BME and will acquire engineering problem-solving skills.

(3). The students will be well versed in the mathematical, physical, and life sciences.

(4). The students will develop skills pertinent to the design process, including the ability to formulate problems, to analyze and synthesize information, to think creatively, to make informed decisions, to communicate effectively, and to work collaboratively. They will specifically learn to:

(a). design and execute biomedical experiments and interpret the resulting data,

(b). use current data analysis techniques for design as well as research and development applications, and
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(c). understand the function of engineering in solving health related problems and their professional and ethical implications.

(5). The students will develop an understanding and appreciation of the ethical and societal responsibilities inherent to being a biomedical engineer.

The service mission of the BME Department will include disseminating knowledge and professional expertise to the biomedical community, both within (dentistry, medicine, and veterinary medicine) and outside the university, and to the general public. Service also includes administrative and committee activities in the department, college, and university.

Both, vision and mission of the proposed BME Department will primarily focus on the educational needs of students and professionals engaged in BME in academia, industry, government, and society. They are in keeping with University objectives and the mission of the College of Engineering.

2. Purpose of Unit

The purpose of the BME Department will be to provide a focus for academic programs, faculty research, and public service as they relate to the field of BME.

The letters of support for the BME Department (see Appendix E) indicate no overlap with other academic units. Responses are included from the Deans of Food, Agriculture, and Environmental Sciences; Biological Sciences; Dentistry; Mathematical and Physical Sciences; Medicine and Public Health; and Veterinary Medicine.

3. Role of New Unit

The BME Department will be a separate departmental unit replacing the BME Center within the College of Engineering.

a) Biomedical Engineering in the College of Engineering

The College of Engineering is made up of eight departments (Aerospace Engineering and Aviation; Chemical Engineering; Civil and Environmental Engineering and Geodetic Science; Computer and Information Science; Electrical (and Computer\(^2\)) Engineering; Industrial, Welding and Systems Engineering; Materials Science and Engineering; and Mechanical Engineering) and the Knowlton School of Architecture.

\(^2\) Name addition pending at the time of this writing. AvR

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The Mission of College of Engineering and the Knowlton School of Architecture is to:

- Foster a learning culture that prepares our students to be key contributors to society
- Provide new knowledge that can be assimilated by our customers and partners
- Create and disseminate new ideas and concepts that expand our understanding of science and engineering
- Be an innovative leader in engineering education
- Be a prime resource for Ohio economic development
- Provide life-long learning for engineers and architects
- Promote and support the purposes of the entire university

The BME Department will enhance the role of the current Center by facilitating the expansion of course offerings for students and scholarships in this area. Administratively, the chairperson of the department will serve on the College of Engineering’s Executive Committee (as had the Center’s Director). This committee advises the Dean on academic and administrative policies in the College. The Department faculty will be voting members of the College, within the guidelines of the University and College Faculty Rules.

Currently, strong graduate programs (M.S., Ph.D. and M.D./Ph.D., D.D.S./Ph.D., and D.V.M./Ph.D.) are offered in or in conjunction with BME at Ohio State. Relevant courses are offered in Dentistry, Medicine, and Veterinary Medicine. An undergraduate minor in BME has been developed, approved, and implemented. Students have the option of making use of course work, beyond the engineering core and BME courses, in chemical engineering, electrical engineering, material science and engineering, or mechanical engineering. Early indications are that the minor is very attractive to a significant number of engineering students.

BME is an opportunity area for expanded interdisciplinary research and outreach for the College in collaboration with other units. Current Center partnerships with the College of Dentistry, College of Medicine and Public Health, and College of Veterinary Medicine will continue to grow with the formation of the new department. Specifically, it can become the TIU for non-clinical scientists in Dentistry, Medicine, Veterinary Medicine, and especially in the Davis Heart and Lung Research Institute, who work in the field of BME. Over the past 30 years, the BME Center has formed a solid academic foundation for the establishment of a departmental unit within the College of Engineering and the initial risks of forming a new department for a novel scientific field have been eliminated.

4. Academic Programs at both undergraduate and graduate levels
Application for Departmental Status  
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a) Similar units at other universities in Ohio, in the Big Ten, and in the United States and their levels of success

There are more than 95 North American colleges and universities and numerous institutions worldwide that have separate academic units in BME. Each year, U.S. News and World Report ranks the top 20 graduate programs in BME (April 2001 results are reported in this proposal). Every 10 years, the National Research Council, operating arm of the National Academy of Sciences, ranks the top 38 Ph.D.-centered programs. The next is scheduled for 2005. According to the Council, the rankings remain relevant today since growth and decline in the scholastic achievements of universities occur gradually.

b) State of Ohio

In addition to Ohio State, six other universities in Ohio have administrative units focusing on BME. Five are at the departmental level: University of Akron, Case Western Reserve University, University of Cincinnati, University of Toledo, and Wright State University; the other is a program at Cleveland State University.

The most established Department of BME is at Case Western Reserve University, a private institution located in Cleveland, Ohio. U.S. News and World Report and the National Research Council ranked Case Western Reserve’s graduate program 5th and 13th, respectively. The National Research Council ranked Ohio State 26th in its evaluation. The new BME Department at Ohio State is expected to be among the top 20 nationally in the Council’s rankings. Table 3 provides information on BME in the State of Ohio.

Table 3: Bioengineering Programs within the State of Ohio

<table>
<thead>
<tr>
<th>Institution &amp; College</th>
<th>Unit</th>
<th>Graduate Degrees Offered</th>
<th>Rankings</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Akron, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>37 (NRC)</td>
</tr>
<tr>
<td>Case Western Reserve School of Engineering</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
<td>13 (NRC)</td>
</tr>
<tr>
<td>University of Cincinnati CoE &amp; CoM</td>
<td>Department</td>
<td>Proposed M.S., Ph.D.</td>
<td>5 (US News)</td>
</tr>
<tr>
<td>Cleveland State University CoE</td>
<td>Program</td>
<td>Doctor of Eng. in Appl. Biomed. Eng.</td>
<td>--</td>
</tr>
<tr>
<td>Ohio State University, CoE</td>
<td>Proposed</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
<td>26 (NRC)</td>
</tr>
<tr>
<td>University of Toledo, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>--</td>
</tr>
<tr>
<td>Wright State University, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>--</td>
</tr>
</tbody>
</table>

c) Big Ten Universities

In addition to Ohio State, the Big Ten has eight other administrative units focusing on BME. All eight are departments. Michigan State University and Indiana University are the only two Big Ten schools without BME units. Table 4 provides information on BME departments in the Big Ten.

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Table 4: Bioengineering Programs in the Big Ten Universities

<table>
<thead>
<tr>
<th>Institution &amp; College</th>
<th>Unit</th>
<th>Grad. Degrees Offered</th>
<th>Rankings</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Illinois, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>35 (NRC)</td>
</tr>
<tr>
<td>Indiana University, School of Health</td>
<td>Biomech. Grad. Degree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>University of Iowa, CoE</td>
<td>Department</td>
<td>Ph.D.</td>
<td>24 (NRC)</td>
</tr>
<tr>
<td>University of Michigan, CoE</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
<td>11 (NRC); 9 (US News)</td>
</tr>
<tr>
<td>Michigan State University, CoE</td>
<td>None</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>University of Minnesota, School of Medicine</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>---</td>
</tr>
<tr>
<td>Northwestern University, School of Engineering</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>14 (NRC); 12 (US News)</td>
</tr>
<tr>
<td>Ohio State University, CoE</td>
<td>Proposed</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
<td>26 (NRC)</td>
</tr>
<tr>
<td>Penn State University, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>19.5 (NRC)</td>
</tr>
<tr>
<td>Purdue University, CoE</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
<td>---</td>
</tr>
<tr>
<td>University of Wisconsin, CoE</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
<td>---</td>
</tr>
</tbody>
</table>

\textit{d) United States}

The top 10 BME departments and programs ranked by the National Research Council and their comparison with \textit{U.S. News and World Report} data are shown below in Table 5.

Table 5: The top 10 BME departments and programs

<table>
<thead>
<tr>
<th>Institution &amp; College</th>
<th>Ranking NRC</th>
<th>Ranking \textit{U.S. News &amp; World Report}</th>
<th>Unit</th>
<th>Graduate Degrees Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT</td>
<td>1</td>
<td>4</td>
<td>Division</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>U.C. -San Diego, CoE</td>
<td>2</td>
<td>5</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
</tr>
<tr>
<td>U. Washington, CoE &amp; CoM</td>
<td>3</td>
<td>6</td>
<td>Grad. Program</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
</tr>
<tr>
<td>Duke U., School of Eng.</td>
<td>4</td>
<td>2</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
</tr>
<tr>
<td>U. Pennsylvania, CoE</td>
<td>5</td>
<td>8</td>
<td>Department</td>
<td>M.S., Ph.D., M.D./Ph.D.</td>
</tr>
<tr>
<td>Johns Hopkins U., CoE &amp; CoM</td>
<td>6</td>
<td>1</td>
<td>Department</td>
<td>Ph.D., M.D./Ph.D.</td>
</tr>
<tr>
<td>U.C.-San Francisco, CoM</td>
<td>7</td>
<td>Joint Department with UC- Berkeley</td>
<td>Ph.D.</td>
<td></td>
</tr>
<tr>
<td>U.C.- Berkeley, CoM</td>
<td>8</td>
<td>10</td>
<td>Joint Department with UC- San Francisco</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>U. Utah, CoE</td>
<td>9</td>
<td>14</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Rice U., Eng. School</td>
<td>10</td>
<td>11</td>
<td>Department</td>
<td>M.S., Ph.D.</td>
</tr>
</tbody>
</table>
5. Proposed Program

a) Enrollment projections and justifications

The graduate program in BME has 41 students enrolled (17 M.S.; 24 Ph.D.). Over the past few years, graduate admissions have been selective to move toward a more Ph.D.-oriented program with emphasis on bringing in the best students. Currently, two graduate students in BME are pursuing their M.D./Ph.D. degrees through the Medical Scientist Training Program. Enrollment in the graduate program is expected to remain stable.

The College of Engineering approved a proposal for a minor in BME and, following approval by the Office of Academic Affairs, it was implemented during the 2002-2003 academic year. Enrollment for the first academic year is 5 students and is expected to rise as its availability becomes more widely known. Based on the currently expressed interest of engineering undergraduate students one can expect a growth of enrollments to 30 within two to three years.

Enrollment patterns are moderately strong and increasing in BME and bioengineering programs. This is due primarily to the diversity of career paths available and the growing interest precipitated by media coverage of recent technological breakthroughs and research in the area.

b) Goals of enrollees in academic programs; estimation of opportunities for graduates of academic programs

Professional avenues of choice for biomedical engineers include industrial positions, entrepreneurial opportunities, and the pursuit of academic careers. A rapid web search completed during the preparation of this proposal showed that many major academic institutions (Massachusetts Institute of Technology, Harvard, Johns Hopkins, University of California-Berkeley, University of Michigan, Purdue, Indiana, Northwestern, Wisconsin, and Virginia, among many others) are hiring BME faculty. Companies explicitly recruiting biomedical engineers are too numerous to list and range from such multinational giants as Procter and Gamble, Roche, Motorola, Abbott, and Genentech to small start-up businesses in Ohio and the rest of the nation. All these employment opportunities exist for biomedical engineers with graduate degrees (M.S. and Ph.D.) whereas opportunities for biomedical engineers with B.S. degrees only have shown to be very limited.

6. Opportunities for study or application of BME beyond the structure of the classroom

Students will perform hands-on activities in the context of their required bioinstrumentation laboratory. They will also have available additional laboratory
experience in cell and tissue culture, biomaterials characterization and biocompatibility evaluations, micro- and nano-fabrication, and biomedical imaging. Faculty will offer these experiences in conjunction with thesis and dissertation research under externally funded research grants and contracts.

7. Potential for development of national or international recognition as an academic discipline

With most major academic institutions in the United States and abroad featuring undergraduate and graduate BME programs, the field enjoys recognition as an established academic discipline. Both the National Research Council and U.S. News and World Report provide rankings for the sector. The BME Society, the Engineering in Medicine and Biology Society, and more specialized societies such as biomaterials, biomechanics, tissue engineering, and biomedical imaging have memberships in the multiple thousands, both national and international. Many leading federal agencies offer specific programs in BME and its sub-fields. For instance, the National Institutes of Health added a new Institute for Biomedical Imaging and Bioengineering in 2001 and since 1998 has awarded major multidisciplinary grants under the Bioengineering Research Partnerships and Bioengineering Research Groups.

Starting with the BME Center’s reorganization in 1999, activities in the Center have reflected its growing national and international visibility. This strategy involves the development of “horizontal,” scientific discipline-specific foundations of excellence in biomedical imaging, biomedical micro/nanotechnology, biomaterials and tissue engineering, biomechanics, and surgical instrumentation. For example, a Special Opportunity Award from the Whittaker Foundation first recognized the Center’s leadership in biomedical imaging as early as 1994. The Center also received an Academic Enrichment Award, “Biomedical Micro/Nanotechnology Initiative,” in 1999 as well as major program-building awards from the State of Ohio. In September 2001, the MicroMD Lab, a facility for research in biomedical micro/nanotechnology, began operations on West Campus. Funding for this effort came from both the University and State of Ohio.

While continuing to build on these and other specific areas, BME is also developing clinical foci for its major strategic directions. The first three have evolved in cardiovascular, oncological, and ophthalmologic bioengineering, respectively. The BME Center led in the formulation of a Selective Investment Program in cardiovascular bioengineering, which was awarded in 2000. As a result of these and other efforts, the BME Department is expected to move up into the ranks of the first 20 nationally in the next report published by the National Research Council in Year 2005.
8. *Previous submittals of the same or similar unit proposals*

A previous proposal for the establishment of a BME Department jointly in the Colleges of Engineering and was submitted in 2001 was recommended for approval by the College of Medicine and Public Health but was returned for revisions by the Dean of Engineering and the CCAA in Spring 2001.

**B. DEMAND**

1. *Faculty for the Proposed Department of Biomedical Engineering*

The table below lists the faculty, their intent to become members of the new department and open but funded faculty positions that will become part of the new department.

**Table 6: BME Center Faculty and Open Positions, Status August 2003**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Rank</th>
<th>Current TIU</th>
<th>FTE (BME)</th>
<th>Additional FTE</th>
<th>Research Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CURRENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gunjan Agarwal*</td>
<td>Assistant Professor</td>
<td>Internal Medicine</td>
<td>0.50</td>
<td>0.50 Davis Heart &amp; Lung Inst.</td>
<td>Imaging</td>
</tr>
<tr>
<td>William Brantley</td>
<td>Professor</td>
<td>Dentistry</td>
<td>----</td>
<td>100% Dentistry</td>
<td>Biomaterials Metallurgy</td>
</tr>
<tr>
<td>Mauro Ferrari</td>
<td>Professor</td>
<td>Mechanical Engineering</td>
<td>0.50</td>
<td>0.50 CoM&amp;PH</td>
<td>Biomedical nanotechnology, BioMEMS</td>
</tr>
<tr>
<td>Doug Kniss</td>
<td>Professor</td>
<td>OB/GYN</td>
<td>0.25</td>
<td>0.75 OB/GYN</td>
<td>Tissue Engineering</td>
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<td>Alan Litsky</td>
<td>Associate Professor</td>
<td>Orthopaedics</td>
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<td>0.50 (Orthopaedics)</td>
<td>Biomaterials, orthopaedic implant fixation</td>
</tr>
<tr>
<td>Cynthia Roberts</td>
<td>Associate Professor</td>
<td>Ophthalmology</td>
<td>0.20</td>
<td>0.80 (Ophthalmology)</td>
<td>Laser &amp; optical applications in ophthalmology</td>
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<tr>
<td>Derek Hansford*</td>
<td>Assistant Professor</td>
<td>Materials Science</td>
<td>1.00</td>
<td></td>
<td>Microfabrication of biomedical devices</td>
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<td>Stephen Lee*</td>
<td>Associate Professor</td>
<td>Molecular and Cellular Biochemistry</td>
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<td>0.20 (Chemical Engineering)</td>
<td>Biomedical nano-technology, supramolecular devices</td>
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<td>Nicanor Moldovan*</td>
<td>Assistant Professor</td>
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<td>0.50 (Cardiology)</td>
<td>Micropatterning, vascular tissue engineering</td>
</tr>
<tr>
<td>Mark Ruegsegger*</td>
<td>Assistant Professor</td>
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<td>0.50 (Heart &amp; Lung Research Inst.)</td>
<td>Cardiovascular biomaterials, biodegradable implants</td>
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</table>
**OPEN POSITIONS AND FUNDED HIRES 2004**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Rank</th>
<th>Current TIU</th>
<th>Additional FTE</th>
<th>Research Area</th>
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</thead>
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<tr>
<td>Academic Enrichment*</td>
<td>Assistant Professor</td>
<td>Intended for BME</td>
<td>0.90</td>
<td>0.10 (Electrical Engineering)</td>
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<tr>
<td>Selective Investment</td>
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<td>Surgery (Cardiothoracic Surgery)</td>
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<td>0.50 (Cardiothoracic Surgery)</td>
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<tr>
<td>Selective Investment</td>
<td>Open</td>
<td>Materials Science</td>
<td>0.25</td>
<td>0.75 (Materials Science)</td>
</tr>
<tr>
<td>Selective Investment</td>
<td>Open</td>
<td>Chemical Engineering</td>
<td>0.25</td>
<td>0.75 (Chemical Engineering)</td>
</tr>
</tbody>
</table>

* Stated intention to transfer tenure-home to the BME Department or intended hire with tenure-home in Department of Biomedical Engineering.

From this table it is clear that BME faculty will have undergraduate, graduate and or professional training in many different fields which may or may not include engineering. A mix of engineering and non-engineering faculty is actually required to meet cutting edge educational goals and research targets of BME.

In addition to the core faculty, over 75 other University faculty members are part of the participating faculty or have affiliations with the Center (see list in Appendix C). Most will be offered joint (no-salary) faculty appointments; some may decide to transfer partial or full administrative affiliation and/or tenure-home to the Department of Biomedical Engineering.
2. Evidence of sufficient demand by students, faculty, general public and/or business

Biomedical engineers are unique from other engineers and scientists due to their extremely interdisciplinary outlook. They act as a bridge between medicine and the life sciences and more traditional engineering. Student and industrial demand for BME programs has steadily increased over the last three decades. The demand by undergraduate students has especially increased during the past few years. For example, during the last two quarters, Center faculty received more than 30 inquiries from high school and undergraduate students interested in either a BME major or minor. Nationwide, graduate enrollment in the field has increased 33% in the past eight years, while overall engineering enrollment decreased during the same period (National Science Foundation, Division of Science Resource Studies).

Industry has also increased its demand for engineers with a graduate degree in BME. The medical device and diagnostic industry is around $90 billion in the U.S. (employing over 300,000 a substantial number of whom are biomedical engineers) and nearly $180 billion worldwide. The U.S. dominates this industry, demonstrated by an annual trade surplus of $9 billion (Adva Med industrial survey, 1993, adjusted to 2000 values by Vincent DiCaprio for the Whitaker Foundation's BME Educational Summit, 2000). Innovation is the cornerstone of the medical device and diagnostic industry, shown by R & D budgets of 6.8%, compared to a national level of 1.8% for all U.S. industry. These figures demonstrate the need for strong basic education in this field (all data taken from a talk by DiCaprio, available online at summit.whitaker.org).

3. Estimation of the duration of the demand (long/short term)

The U.S. Labor Department reports that the largest demand for engineers through 2008 will be in the medical instrument and supply industry. As reported by the Whitaker Foundation (see http://www.whitaker.org/glance/outlook.htm), engineering jobs in the medical sector are forecast to increase by 33.4% from 1998 to 2008, while overall demand for engineers in industry will only increase by 19.9%. Engineers with degrees in traditional disciplines can fill many of these jobs; however, employers are looking for those with knowledge of BME technology and the issues involved in interfacing products with the human body.

The creation of the BME Department at OSU will support the local and regional biomedical product industry and health care facilities. It is also consistent with Governor Taft’s promise to make Ohio fertile ground for research and entrepreneurship in medical technology (EBTC Bio Lines, 12.2, Winter 2000).

Job prospects for BME graduates (M.S. and Ph.D.) are good due to the demand from a variety of existing and emerging companies. They include state and federal agencies, government laboratories, consulting groups, pharmaceutical firms, medical product companies, and a wide range of emerging technology businesses in such areas as BioMEMS, nanotechnology, tissue engineering, and microfluidic diagnostics. Graduates
will be able to pursue graduate or professional study in a number of science and engineering disciplines, including M.S., Ph.D., and M.D./Ph.D. programs that the Center currently offers through the Graduate School and the College of Medicine and Public Health.

4. Reasons that other units are not able to meet demand

The need for a devoted curriculum in BME had been identified by OSU already in 1971 when the national demand was still in its infancy. By now, BME has evolved into a new academic discipline with over 95 recognized academic programs in North America alone. The challenge for any university has been the mandatory, close interactions between the classical fields of sciences, medicine, and engineering to support of BME. BME requires a multitude of very different teaching and research environments and specially trained interdisciplinary faculty that do not easily fit into the classical department or even college environment but fits best in between classical disciplinary units. The lab variety spectrum ranges from typical engineering benches, Class 100 clean rooms for microfabrication, tissue engineering work benches, animal surgery and recovery facilities, to bed site clinical research suits. This is why the preparation of the BME application for departmental status has taken so long to crystallize.

This particular application is based on the conclusion of the core faculty and the college administrations of Engineering and Medicine, that no single college can provide the necessary environment or afford to maintain it. The decision was made to place the future department within engineering but rely heavily on the sharing of labs and faculty positions with other departments and colleges as needed. Special collaboration of faculty and sharing of facilities is anticipated with the College of Medicine and Public Health and the formation of a bioengineering research center is currently planned for that purpose. It is the hope that OSU's current budgeting system gives credit to BME for its sharing faculty (release time, grant expenditures, and teaching credits), students (student credit hours), and facilities (F&A returns).

For all of the above reasons there is no other academic unit readily willing or available to house BME. However, there are alternatives that could be considered such as to locate the BME Department within a new, larger unit (school or college) that can also accommodate other similar biomedical programs with similar needs. Biophysics, Biostatistics, and Medical Informatics come to mind.

C. COST/RESOURCES

1. Internal funding and external funding potential

The current BME operating budget, explained below under #5 in the Requirements of Efficiency section, will become part of the new Department of Biomedical Engineering. A request for additional permanent budget allocation (PBA) and one-time funding has been submitted to the College of Engineering. This support is essential to the successful formation of the new Department of Biomedical Engineering.
Currently, core faculty in the Biomedical Engineering Center have research awards that exceed $9.5 million (see list in Appendix C).

2. Cost comparison of proposed unit with that of like institutions with similar academic units

Table 7 includes information provided by four Departments of BME that have between 10 to 14 faculty members and both undergraduate and graduate BME degree programs.

Table 7: Comparative BME Data of Peer Institutions

<table>
<thead>
<tr>
<th>Institution</th>
<th>Unit</th>
<th>Faculty Size</th>
<th>Number of Students</th>
<th>Operating Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Iowa</td>
<td>Department</td>
<td>10</td>
<td>253/34</td>
<td>$1.1M</td>
</tr>
<tr>
<td>University of Penn</td>
<td>Department</td>
<td>14</td>
<td>209/70</td>
<td>$2.5M</td>
</tr>
<tr>
<td>Penn State University</td>
<td>Department</td>
<td>10</td>
<td>160/50</td>
<td>$1.2M</td>
</tr>
<tr>
<td>University of Toledo</td>
<td>Department</td>
<td>11</td>
<td>118/23</td>
<td>$.7M</td>
</tr>
</tbody>
</table>

3. Cost of additional faculty

Additional faculty will be funded through open faculty lines that currently exist in the: (1) BME Center; (2) 1999 Academic Enrichment Award to Biomedical Engineering, "Biomedical Micro/Nano Engineering Initiative"; (3) 2000 Selective Investment Award, "Cardiovascular Bioengineering". These positions, indicated in Table 5, will be sufficient to support the current teaching goals of the undergraduate minor and the growth of the graduate degree programs in BME. There is no request for new positions accompanying this application. With the anticipated application for an undergraduate major, additional engineering faculty will be required and will be shared with other engineering departments.

4. Adequacy and availability of facilities as well as faculty

The BME Center has 16,700 square feet of office and laboratory space in Bevis Hall on the West Campus. Adequate office space is available for current faculty and future faculty hires. The Center has a limited number of classrooms, which include a small computer laboratory. Space is available for a teaching lab, a bioinstrumentation lab, and additional classrooms. Funding for the renovation of these facilities has been requested in the budget section of this proposal.

Several key core research and individual laboratory facilities are located in Bevis Hall. These include an imaging and computing facility, a multi-user biomaterials and cell culture facility, a micro- and nano-fabrication lab for instruction, and a laser tissue...
laboratory. Additional, available laboratory space will be renovated for the new faculty hires and their teaching obligations. They are shown in Table 8.

Table 8: Research Laboratories in BME located in Bevis Hall

<table>
<thead>
<tr>
<th>Lab Title</th>
<th>Available Bevis Rooms</th>
<th>Requirements</th>
<th>Cost Estimate for Budget Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tissue Engineering 1</td>
<td>332</td>
<td>in good shape</td>
<td>none</td>
</tr>
<tr>
<td>Tissue Engineering 2</td>
<td>324 or 328</td>
<td>lab furniture, plumbing, hoods</td>
<td>$128,404.00</td>
</tr>
<tr>
<td>Biomedical Imaging 1</td>
<td>232</td>
<td>in good shape</td>
<td>none</td>
</tr>
<tr>
<td>Biomedical Imaging 2</td>
<td>228, 324 or 328</td>
<td>lab furniture, plumbing, hoods</td>
<td>$129,988.00</td>
</tr>
<tr>
<td>Nano-Fabrication</td>
<td>320</td>
<td>lab furniture, plumbing, hoods, audiovisual equip.</td>
<td>$156,000.00</td>
</tr>
<tr>
<td>Micro-Fabrication</td>
<td>316</td>
<td>lab furniture, plumbing, hoods, audio visual equip.</td>
<td>$156,000.00</td>
</tr>
<tr>
<td>Classroom 1</td>
<td>245</td>
<td>class room furniture, walls, doors, podium, computer equip., etc.</td>
<td>$214,988.00</td>
</tr>
<tr>
<td>Classroom 2</td>
<td>241</td>
<td>class room furniture</td>
<td></td>
</tr>
<tr>
<td>Classroom 3</td>
<td>008 or 016</td>
<td>class room furniture</td>
<td></td>
</tr>
</tbody>
</table>

In addition, the Ohio MicroMD Laboratory is available on a fee-for-service basis. This facility has the potential to develop into a world-class Biomedical Nanotechnology and Biological Micro Electromechanical Systems (BioMEMS) Laboratory. Facilities include a microfabrication facility dedicated to biomedical microdevices (class 100 clean room) coupled with a complete biochemistry, cell culture, tissue culture, and biohybrid device laboratory. Both academic and industrial researchers are able to perform research and development ranging from basic science to fabrication of prototype medical devices usable in early stage clinical trials.

Two laboratories in the Davis Heart and Lung Research Institute are currently assigned to BME core faculty, Mauro Ferrari and Nicanor Moldovan. Space has also been reserved in the Institute for faculty hires on the Selective Investment Award.

Faculty for the new BME Department are discussed in "Requirements of Efficiency" below. Active research awards for current core BME faculty are presented in Appendix C.

5. Requirements of Efficiency

The BME Center has 10 core faculty members (4.0 FTE) and ten faculty lines that are either open or have searches underway (5.15 FTE). All three faculty ranks, from assistant to professor, are represented. The total FTE, including open and funded
positions, is currently 9.15. All faculty, at minimum, will retain administrative affiliation with the Biomedical Engineering Department. Table 5 on page 15 lists the proposed faculty and their ranks.

6. A minimum budget of $1.5 million

Negotiations are underway with the College of Engineering to provide additional PBA and one-time funding for the renovation of BME teaching labs, which in their current condition does not lend themselves to the teaching of basic BME research techniques. With approval of this request, the PBA budget for FY 2004 will be $1,718,208. Bringing the total operating budget to nearly $2,053,208. Over the next three years, the PBA budget (with the funded faculty hires and additional PBA) will increase to over $1,932,750. Other sources of income (release time, development, and endowment income) will put the total BME operating budget to over $2,352,750 (see Table 9). It should be noted that these amounts do not include research or contract funding generated by BME faculty.

Table 9: Budget Proposal for the BME Department

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>FY 2004 BME Center</th>
<th>FY 2005 Proposed Dept of BME</th>
<th>FY 2006 Proposed Dept of BME</th>
<th>FY 2007 Proposed Dept of BME</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBA budget w/benefits <em>(includes open faculty lines and new faculty hires)</em></td>
<td>$1,718,208</td>
<td>$1,786,936</td>
<td>$1,858,414</td>
<td>$1,932,750</td>
</tr>
<tr>
<td>Additional one-time funding for lab renovations</td>
<td>$270,000</td>
<td>$270,000</td>
<td>$270,000</td>
<td>$270,000</td>
</tr>
<tr>
<td>Release time, endowments, development (estimated)</td>
<td>$65,000</td>
<td>$100,000</td>
<td>$120,000</td>
<td>$150,000</td>
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<tr>
<td>Total Operating Budget</td>
<td>$2,053,208</td>
<td>$2,156,936</td>
<td>$2,248,414</td>
<td>$2,352,750</td>
</tr>
</tbody>
</table>

*Salaries and benefits were inflated by 4% each year.
*All cost at estimate.

7. Courses which enroll students for a minimum of 1,000 quarter credit hours per quarter

The Biomedical Engineering Center currently offers two graduate degrees (M.S. and Ph.D.), in addition to the M.D./Ph.D. In AU02, approximately 420 quarter credit hours were taught (see table below). The College of Engineering approved a minor in BME and, following approval by

08/15/03-AvR
### Table 10: Total Student Enrolments and Credits per Academic Year 1993 - 2003

<table>
<thead>
<tr>
<th>QQ YY</th>
<th>Total Enrollment</th>
<th>UG Enrollment</th>
<th>Grad Enrollment</th>
<th>Prof Enrollment</th>
<th>Total Credits</th>
<th>UG Credits</th>
<th>Grad Credits</th>
<th>Prof Credits</th>
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the Office of Academic Affairs, it was implemented during the 2002-2003 academic year. Six new BME courses are approved and will be part of the current minor and soon-to-be-requested undergraduate major degree curriculum. New faculty hires will develop additional courses. Enrollments by undergraduate students seeking a minor or an undergraduate degree in BME will increase the number of credit hours to over 1,000 per quarter as estimated from undergraduate degrees taught at other universities. Table 10 above shows the total of graduate students enrolled and course credits accumulated since 1993.

D. OTHER

1. Accreditation

Graduate programs in BME are usually not accredited. Accreditation, therefore, is not proposed for the BME Department at this point in time. However, the current curricula are developed and designed for ABET accreditation. When application is submitted for an undergraduate program this will be done with an application for accreditation by ABET.

2. Consultants or advisory committees

Since the BME Center has been allowed to function in a departmental mode for the past 20 years, the BME core faculty strongly feels that consultants or advisory committees will not be necessary and could not be afforded at this point in time. However, it is anticipated to develop an external committee to advise in the planned development of an undergraduate major curriculum. This may be especially helpful in developing a curriculum that can be shared between a number of relevant departments (such as ChemE, MatSci&E, EE, and MechE, and Oral Biology in the College of Dentistry).

3. Proposed date for unit to be effective

The target date for initiation of the BME Department is July 1, 2004.

4. Proposed Pattern of Administration

A draft Pattern of Administration for the Department of BME is included in Appendix A. The Pattern of Administration will be approved by the BME Center core faculty members prior to submission of this proposal. The contents of this document follow the university and college guidelines closely.

5. CVs of current faculty members for the proposed BME Department

See Appendix B.

E. CONCLUSION

Departmental status is required for the continued viability of the BME education program. The new BME Department within the College of Engineering will have TIU
status which the BME Center did not have, and through it the new BME Department will have faculty that are devoted to the educational mission and goals of the departmental teaching and research programs.
APPENDICES

A. Draft Pattern of Administration

B. Biomedical Engineering Core Faculty C.V.’s

C. Research Awards for Biomedical Engineering Core Faculty-Spring 2003

D. Participating Faculty Members in Biomedical Engineering

E. Letters of Support

F. Appointment, Promotion and Tenure Criteria and Procedures
Appendix A

Draft Pattern of Administration
PATTERN OF ADMINISTRATION
FOR THE
BIOMEDICAL ENGINEERING DEPARTMENT

Approved unanimously by BME Core Faculty Vote on 8/15/03:
Approved by College of Engineering:
Approved by the Office of Academic Affairs:

I. INTRODUCTION

The Pattern of Administration (PoA) described here for the Biomedical Engineering (BME) Department, supplements the rules of the University and such other regulations to which the department is subject.

This PoA is subject to continuing revision. It must be reviewed and either revised or reaffirmed on appointment or reappointment of the Department Chair. However, revisions may be made at any time subject to approval by the College of Engineering (CoE) and the Office of Academic Affairs (OAA).

II. MULTIDISCIPLINARY NATURE OF THE DEPARTMENT

Although BME is an academic unit within the College of Engineering, and although the CoE predominantly deals with academic and professional issues of engineering, BME represents a multidisciplinary professional field which includes aspects of other professions (such as the health sciences, including but not limited to medicine, dentistry, and veterinary medicine) and other scientific fields such as biology, physics, chemistry, and mathematics, to name a few that are relevant at this time. This PoA, therefore, addresses special multidisciplinary concerns of administration that are absent in most other departmental PoAs.

III. DEPARTMENT MISSION

The overall mission of the BME Department will be the achievement of excellence in the education of professionals, the dissemination of knowledge and technology, and the development of innovative solutions to problems in the field of BME.
IV. FACULTY

BME is comprised of Assistant Professors, Associate Professors, and Professors, to include regular, adjunct, and clinical ranks as permitted by the College of Engineering. Faculty members must have at least a partial, salaried appointment of 50% or more (with or without tenure) in the BME Department to be considered as core faculty. All regular, tenured, and tenure-track faculty members electing BME as their TIU are called core faculty. Current senior faculty members may be grandfathered in as core faculty if they so choose and even if they maintain their TIU unit in another department or have a salary appointment of less than 25%. All other BME faculty with part-time, adjunct, or courtesy appointments are called participating faculty. Although all BME faculty are consulted on matters pertaining to the discharge of the mission of the Department, and are invited to participate fully in the regularly scheduled faculty meetings, voting rights are, however, restricted to core faculty.

At the time of appointment to the regular ranks of core faculty, and for the duration of their permanence therein, the Biomedical Engineering Graduate Studies Committee (GSC) will automatically make appropriate graduate faculty status recommendations to the Graduate School for new core faculty members. Adjunct and clinical BME faculty may apply for graduate faculty status in BME, as may be done by regular faculty in other departments of The Ohio State University. Approval of an application for graduate faculty status will be voted upon by the GSC, with approval requiring a 75% majority with a quorum of no less than 75% of the GSC.

V. ORGANIZATION OF DEPARTMENT SERVICES AND STAFF

While BME presently combines the fiscal and human resources functions largely in a single administrative staff position, it is expected that with near-term growth of the Department these functions will be separated. The fiscal and human resource managers will report to the Chairperson directly and through the Chair to the faculty. BME staff is further comprised of an academic program assistant, a fiscal/HR assistant, a secretarial assistant, and one computer specialist. (All support staff report to the lead Administrative Manager for all administrative matters). The computer manager reports directly to the chair on technical and scientific matters. The academic program assistant will report all academic matters to the Associate Director of BME who is charged with overseeing the graduate and undergraduate minor programs.

VI. OVERVIEW: DEPARTMENTAL ADMINISTRATION & DECISION-MAKING

Policy and program decisions are made in a number of ways: by the department faculty as a whole, by standing or special committees of the department, or by the Chair. The nature and importance of any individual matter determines how it is addressed. Department governance proceeds on the general principle that the more important the matter to be decided, the more widespread the agreement on a decision needs to be. Open
discussions, both formal and informal, constitute the primary means of reaching consensus on decisions of central importance. In matters not achieving consensus, the chair has the responsibility to make a final decision on the department’s behalf.)

VII. DEPARTMENT ADMINISTRATION

A. CHAIR AND ASSOCIATE CHAIR

The Chair is the department head. Candidates for this position will be nominated by a search committee; approved by the BME department; and appointed by the Dean of the CoE for a 4-year, renewable term. The Chair is charged with developing and/or reviewing yearly, and in consultation with the faculty, a Pattern of Administration (PoA) document, which will be made available to all present and prospective members of the faculty and staff. A copy of the PoA will be deposited in the office of the Dean of Engineering, and an additional copy will be provided to the Senior Vice President For Academic Affairs And Provost. The PoA will comply with Board of Trustees Rule 3335-3-35.

The Chair will preside at regularly scheduled, faculty meetings. The Chair will consult with faculty members as a whole on all policy matters. Such consideration will, whenever practicable, be undertaken at regular meetings of the faculty as a whole.

The Chair recognizes the presumption favoring majority faculty rule on all matters covered by the Pattern of Administration. Whenever majority rule is not followed, the chair will explain the reasons for the departure to enhance communication, and to facilitate constructive understanding within the Department. This explanation will outline the majority decision, the decision of the Chair, and the reasons the decisions differ. The explanation shall be communicated in writing, and where possible, at faculty meetings, with an opportunity provided for faculty to comment.

The faculty shall participate in the initiation, review, and selection of new faculty members for appointment by the Chair and Dean. Faculty participation will be assured by the involvement of the faculty search committee. Faculty duties and responsibilities in instruction, scholarship, and service will be assigned by the Chair in consultation with the faculty whenever possible.

An Associate Chair may be appointed by the Chair upon consultation with the core faculty and approval by the Dean. The associate chair person may have a specific assignment such as supervision of curricula and teaching schedules. The associate chair person will be authorized to make emergency decisions and have signature authority in the absence of the Chair.

B. Administrative Manager

Assisting the Chair is the Administrative Manager, who oversees the fiscal, human
resources, and the non-academic operations of the department and is funded by
departmental resources. The Administrative Manager reports directly to the Chair, but
provides administrative service to all departmental personnel. The Administrative
Manager is the supervisor of records for all BME office staff, including academic
program staff, fiscal/HR staff, secretarial staff, and computer staff.

VIII. COMMITTEES

BME comprises the following standing faculty committees, with the respective
description and assigned tasks:

- **Appointment, Promotion and Tenure Committee (P&TC).** This committee and
  its function is described in detail in a separate departmental Appointments,
  Promotion and Tenure document.

- **Graduate Studies Committee (GSC).** This committee consists of no less than
  five and no more than eight faculty members, of which no less than 70%
  must at all times be BME Core faculty; one BME graduate student representative
  (non-voting); and an academic program staff member (non-voting).
  Membership in the committee may be extended to BME faculty in the adjunct
  and clinical ranks, and to participating faculty from other departments. The
  GSC recommends graduate faculty status for approval by the Graduate
  School, develops and implements protocols for graduate student selection and
  recommendation for admission, selects fellowship candidates and prepares
  their nominations, monitors the progress of graduate students, assigns new
  students to faculty mentors, hears and decides on all student petitions
  concerning graduate education, recommends strategies for improvement of the
  graduate curriculum and overall graduate experience in BME. At the end of
  each Spring Quarter, the GSC will provide a list of courses that must be taught
  in the following year, in order to warrant timely progress of BME's graduate
  students towards their degree objectives.

- **Undergraduate Affairs Committee (UAC).** This committee is identical in
  structure to the GSC. At this time, the work is done by a BME Curriculum
  subcommittee. The UAC develops new degree programs, and recommends
  strategies for the improvement of the existing ones e.g., BME undergraduate
  minor, both in terms of curricular issues, and the overall undergraduate
  experience in BME. The UAC further selects candidates for fellowship and
  scholarships, and prepares the relevant nomination materials. The UAC
  develops and implements optimal strategies for use of the Kettering
  Foundation and other internal BME funds in support of undergraduate
  education, including making recommendations for scholarship awardees to the
  Chair. At the end of each Spring Quarter, the UAC will provide a list of
  courses that must be taught in the following year, in order to warrant timely
  progress of BME's undergraduate students towards their degree objectives.

- **Faculty Search Committee (FSC).** In view of the multiplicity of new faculty
  lines and multidisciplinary nature of faculty expertise to be sought, a unique
  search committee will be assembled for each faculty search, by the Chair in
cooperation with the core faculty assuring that the members of the committee have a good understanding of the desirable expertise. The committee will be comprised of core faculty and participating faculty as needed. The FSC reviews the files of the applicants, and presents their recommendations to the full faculty at the regular faculty meetings, arranges and conducts formal interviews for candidates of interest, and makes hiring recommendations to the Chair of BME. There is no limit on the size of the FSC, or on its composition, with the proviso that the Chair of the FSC be a BME core faculty member.

- **Computer Services Committee (CSC).** The CSC consists of no less than three BME members, one of which may be core or participating faculty in BME; one BME graduate student representative (nonvoting); and a BME computer staff specialist. This committee makes recommendations to the Chair on hardware and software purchases for educational objectives, and on the associated access and maintenance issues.

- **Minority Affairs Committee (MAC).** This committee addresses issues of concern to minority representation, participation, and successes for students, staff, and faculty in BME. It consists of no less than three faculty members, one of which may be core or participating Faculty, one staff member, and one graduate student representative.

- **Ad-Hoc committees** may be formed at the discretion of the Chair, following faculty recommendations, and in all cases in consultation with the BME faculty.

The Department Chair will appoint, from the BME core and participating faculty, several Vice Chairs to lead the above committees. Each Vice-Chair will preside over regularly scheduled meetings. The Vice-Chairs also will ensure minutes of all committee meetings are kept, subject to approval by the appropriate committees. Vice Chairs will see to it that documentation regarding all administrative decisions is carefully maintained and housed in a central location for faculty review.

Membership in all of the above-listed committees is by invitation by the Chair, who will consult with the faculty in order to ensure that committee service for each faculty member is aligned with the faculty’s interests, to the extent possible. All committees are intended to reflect the spectrum of faculty status within BME in terms of seniority, rank, and membership in the core or participating faculty.
C. FACULTY MEETINGS

Faculty meetings are held no less than once per month, and are managed in accordance with prevailing parliamentarian protocols (Roberts Rules). The Chair ensures that minutes be recorded, reviewed, and approved in an appropriate fashion, and that the agenda for each meeting be reflective of the faculty priorities and issues of interest. All BME faculty members are invited to participate in all discussions at faculty meetings; however, voting privileges are reserved for core faculty in all ranks.

Faculty meeting schedules are set by the Chair, in a manner that will minimize scheduling conflicts with BME classes. The Chair will circulate proposed agendas no less than 48 hours ahead of each meeting, with a request for faculty input for additional agenda items. Under ordinary circumstances, time will be left at the end of all faculty meetings to discuss novel agenda items. All efforts will be made by the Chair to ensure that all issues of interest to the faculty will be discussed at faculty meetings in a timely fashion, possibly by calling for additional or extended meetings, if necessary. Motions will be approved by a simple majority of the voters, with the quorum being a simple majority of faculty having voting rights.

IX. POLICY ON FACULTY DUTIES AND RESPONSIBILITIES

All faculty members are expected to maintain a balance amongst instructional duties, scholarly research, and service to the University and the community at large. Different combinations of these essential elements will typically be optimal for different faculty’s professional effectiveness. However, it is expected that all faculty meet the minimum criteria described below. It is also recognized that, in view of the multidisciplinary nature of the BME Department, faculty members may have very differing backgrounds and areas of expertise. All efforts will be made to tailor the duties and responsibilities in order to best fit the talents and interests of the faculty.

The work load of BME faculty consists of teaching, research, service and other scholarly activities. The standard course load in BME is one regular course (section) per quarter or four for the academic year in addition to advising and teaching graduate students. This is considered to comprise 40% of a full-time faculty member's workload. The other 60% of the workload is divided with 40% being devoted to research and other scholarly activities, and 20% to service and administrative duties. Faculty who do not teach, on the average, one course [section] per quarter are expected to provide their own release time by paying the equivalent part of their academic salary from their grants or contracts, or by providing release time to BME in some other form (e.g., BME approved teaching courses for another department or college). The release time rate is 10% of one's yearly salary per course [section]. All full-time faculty, however, are expected to teach a minimum of one BME course [section] during the academic year.

For faculty members with a part-time appointment, the normal workload and minimum teaching requirement are proportioned by the percentage of their BME salaried
appointment (e.g., those with a 50% BME salaried appointment would have a workload composed of 20% teaching, or two courses, per academic year; 20% research and other scholarly activities; and 10% service and administrative duties; and would be expected to teach a minimum of 1/2 BME course [section] per year). Those who carry more than the normal workload in any given academic year may carry forward 'earned' release time to count towards their workload in the following year(s). Likewise those who do not carry a normal workload will be expected to carry a 'make-up' overload in the following year(s).

In addition, it is hereby clarified that instructional activities are considered to include the development of pedagogical materials such as textbooks, and service as an examiner for graduate exams.

Scholarly activities are evaluated based on publications (such as refereed journal manuscripts, books, published reports or conference papers), invited seminars, and research funding efforts (such as proposal preparations). Both quality and quantity are considered when evaluating faculty publications. The impact of research results on a faculty member’s respective field is an important indicator of the success of the research effort. A minimum of two published articles in a prestigious peer reviewed journal, or equivalent productivity, is required annually. External research support is essential for research conducted in the Department. Faculty members are encouraged to obtain external funding to support their research, which includes financial support of graduate student researchers. The number of graduate degrees granted that can be attributed to individual faculty research efforts will also be considered part of the fulfillment of scholarly activities.

Service activities include serving on Department, College, or University committees. Participation in professional activities is also included. The Department committee workload will be distributed as equitably as possible. Faculty are urged to take a major role in the decision-making process whenever possible in their college and university committee assignments. Active participation in professional societies enhances visibility amongst one’s colleagues. Important service activities include serving as an officer or committee member of professional societies. Service to the community and industry (including serving as a consultant) is also considered part of the fulfillment of service activities.

The three activities covered above are interrelated. For example, research activities lead to publications, which could be directly translated to enhanced or updated instructional materials for the classroom. Service activities, such as serving as an officer of an organization, frequently reflect recognition of the individual as either an outstanding teacher and/or researcher. These activities have synergistic effects. However, balanced efforts in each of the three activities are required.

The above policy does not constitute a contractual obligation. Fluctuations in demands and resources in the Department (College, University) and the individual circumstances...
of faculty members may warrant temporary deviations from the policy as discussed with and approved by the Chair.

X. COURSE OFFERINGS AND TEACHING SCHEDULES

The process of assignment of teaching responsibilities involves three steps. The first is the determination of the expected teaching load for each faculty member, for any given year. This is the responsibility of the Chair, in consultation with the individual faculty, and in compliance with the guidelines reported in section 8 above.

Secondly, in consultation with the faculty, and no later than the end of the Spring Quarter of each academic year, the chair compiles the list of classes that must be offered in the following year, in order to warrant timely progress of BME’s graduate and undergraduate students towards their degree objectives. This list is based on the input provided by the GSC and UAC, respectively. Again, in consultation with the faculty, and in compliance with the specifications of section 8 above, the Chair assigns the teaching responsibilities for these courses.

Thirdly, all faculty that have an expected teaching load that exceeds the teaching load generated through step 2 (as will happen in most cases), will be consulted for their preference on which classes they wish to teach. This will be the basis for the final assignment of teaching responsibilities for the year.

In general, faculty will be expected to carry a balanced classroom teaching load, comprising basic and advanced undergraduate courses, as well as graduate class offerings. However, faculty will generally be expected to teach at least one course in the undergraduate minor per year. Courses that carry an enrollment below the minimum required of (8) per undergraduate course, and (5) per graduate course, require approval of the Chair in order to be counted against the individual faculty’s expected teaching load. Auditors do not count against the minima.

Special considerations will apply for the first year in the appointment of junior faculty, in order to allow them a smooth and successful start of their academic careers.

XI. ALLOCATION OF DEPARTMENT RESOURCES

The Chair will consult the faculty at a faculty meeting at least once per year on the issue of department resource allocation. On these occasions, special ad-hoc committees may be formed to review the utilization of resources, and to recommend changes when appropriate. These resources include laboratory and office space, travel, and seed funds when available.

The overarching principles governing the management of space are that:
• Normally, all laboratory and student space is considered shared. This principle reflects the desire not to duplicate facilities and equipment unnecessarily, and the recognition that an environment where space and facilities are shared frequently leads to the interdisciplinary breakthroughs that often characterize true excellence in academe in general, and in biomedical engineering in particular.

• Graduate student offices are considered shared in the sense that, while all students have their own space and desks, no single faculty is assigned control over entire offices. Rather, students are free to aggregate any way they prefer.

• All efforts will be made to involve undergraduate students in research as early as possible. Consistent with this, undergraduate researchers will also be provided with desk space whenever possible, managed per the criteria set forth for graduate researchers.

• Obviously, there are special equipment and laboratory functions that require independent and isolated settings under the control of a single faculty member. Whenever such circumstances arise, opportune arrangements will be made, at the discretion of the Chair.

• Individual faculty research space, whenever justified, is assigned on a competitive basis, with the assignment of space being linked to funding state and prospects of the proposed projects and activities to be discharged in said space.

• Whenever new faculty office space becomes available, it will be offered sequentially to interested core faculty, in an order reflective of ranks, and seniority within the rank.

XII. LEAVES AND ABSENCES

A. Absence from Duty

Absence of any faculty member from ordinary service in the University, for any causes other than sickness, must be with the knowledge and approval of the Chairperson or Director and of the Dean of the College and, if for longer than ten days, with the approval of the provost. Sick leave is granted on approval of the appropriate administrative official when notification is given as soon as practicable, presumably on the first day of absence.

Faculty and staff members are required to fill a Leave Form when they will be absent from the University. Such forms will be submitted to the departmental office prior to leaving and must be signed by the Department Chair or Acting Chair.

B. Leave of Absence Including Family and Medical Leave
An unpaid leave of absence may be requested by faculty and staff for a variety of reasons. Professional reasons include the opportunity for faculty to take a temporary paid position outside the University that will enhance professional development. Personal reasons may include family difficulties or other matters that prevent a faculty or staff member from carrying out duties for a relatively short period of time or illness that continues after a faculty or staff member has used all paid sick leave. Paid sick leave must always be used before a leave of absence is granted for illness.

Leaves of absence require approval of the Department Chair, Dean, and Provost/Office of Human Resources. Approval is necessarily based on the reasonableness of the request and, in the case of leaves for professional purposes, the potential value of the proposed leave to the Department. A leave of absence is not granted for more than one year at a time and leaves may not exceed two consecutive years for faculty. Leaves of absence will not be granted to individuals who are leaving to accept new positions, except in extraordinary circumstances.

C. Family Medical Leave

The Department supports a work environment that offers solutions to the complex issues individuals face in balancing their work and family commitments. Family Medical Leave (FML) provides eligible faculty and staff members up to 12 work weeks (480 hours) of leave during any 12-month period for one or more of the following reasons: 1) to care for a child during the first year following birth, adoption or foster care placement; 2) to care for a family member who has a serious health condition; 3) to take care of a serious personal health condition that prevents an employee from performing his or her job. Such leave may be paid or unpaid as appropriate under University policy guidelines and eligibility requirements established in the document, OSU Office of Human Resources Policy and Procedure Manual for Family and Medical Leave. A request for FML is subject to the approval of the Chair who will base his/her decision on compliance with the provisions of this policy.

XIII. SUPPLEMENTAL COMPENSATION AND PAID EXTERNAL CONSULTING ACTIVITY

Consulting is participation by faculty members of the Ohio State University in activities of government, industry, and other private institutions, which generally serve the academic interests of the University. The following activities are NOT subject to this policy’s guidelines and reporting requirements:

1) Professional activities that reflect normal and expected public service activities of faculty and that do not entail compensation beyond reimbursement for expenses and/or a normal honorarium. These activities include service to governmental agencies and boards such as peer review panels and advisory bodies to other universities; presentations to either professional or public audiences in such
forums as professional societies, libraries, and other universities; and peer review activities undertaken for either for-profit or nonprofit publishers.

2) Health care activities that are explicitly covered by approved practice plans.

Faculty members may engage in paid external consulting to the extent that these activities are clearly related to the mission of the University and the expertise of the faculty member, provide direct or indirect benefits to the University, and do not entail a conflict of commitment or conflict of interest.

As a general rule, a faculty member's professional effort devoted to consulting should not exceed one business day per week. Faculty members should avoid any conflict between consulting and University responsibilities. In particular, the disruption of formal instructional activities because of consulting must be avoided. Consulting during off-duty quarters is not subject to time limitations.

Under Ohio law, the University owns any intellectual property that is a “product of the University research” as defined in Section B of the Policy on Patents and Copyrights. The external consulting policy applies to faculty members from the initial date of employment, including during off-duty quarters, until the date of resignation. When consulting, faculty members must not assign to other entities the rights to a product of University research. Before signing a consulting agreement that requires assignment of intellectual property rights, a faculty member should contact the Office of Technology Transfer to determine the applicability of the Policy on Patents and Copyrights.

Faculty may not, in connection with paid external consulting, use the University name, or the fact that they are affiliated with the University, in the manner which:

1) Suggests that the University approves or disapproves of a product or service provided by a profit, non-profit, or governmental entity, or,
2) Suggests that the University has performed research or issued research findings when it has not done so, or misleadingly states the results of University research, or,
3) May be interpreted to communicate the official position of the University on any issue of public interest.

Faculty may not use University letterhead in connection with paid external consulting, nor may they use University facilities, and other resources to support consulting unless permission is obtained from the Department Chair, and the University appropriately compensated.

Faculty may not use University Institutional Review Boards, e.g., the Human Subjects Review Board, for research conducted as part of a consulting arrangement.
XIV. GRIEVANCE PROCEDURES

Appeals, grievances, and misconduct can involve a wide range of issues. Several common types will be discussed here. The Chair or his/her designee will be responsible for implementation of faculty, staff, and student appeals and grievance procedures. When presented with a grievance, the Chair will consult with the Dean of the College and with appropriate University personnel knowledgeable in handling grievances (i.e., relevant vice Provost, representative of the Offices of Employee Relations or Legal Affairs) if there is any question regarding proper process or if the grievance includes complex issues. It is hoped that early consultation might prevent further complication of the issues.

In handling any type of grievance, appeal, or misconduct, the Chair of the Department or his/her designee will communicate to others as appropriate, that retaliation of any form against a person who files a grievance is illegal and will not be tolerated.

A. Student Complaints about Faculty in an Education Setting

If a complaint is made by a student against a Departmental faculty member, the Department Chair or designated member of the GSC will discuss the complaint with that person. If, after talking with both the complaining student(s) and the Professor, the Chair or designee believes that the complaint has no merit, an explanation will be provided to the student(s). If the Chair or designee determines that the complaint has merit, he/she will work with the faculty member to resolve the matter. A report of the complaint, the finding, and the resolution, if relevant, will be prepared and a copy given to the faculty member and placed in his or her personnel file. If the complaint was found to have merit, the record may be important if there are future complaints. Some complaints, of course, cannot be resolved. Nonetheless, the Chair will keep a record of such complaints in order to determine whether a pattern develops. Students whose complaints remain unresolved will be encouraged to initiate further discussion with the department chair. Those dissatisfied with the chair’s decision will be informed of their right to take grievances to the Graduate School.

B. Staff Grievances

Staff may present their grievances about working conditions, treatment by others, or other problems which would warrant remedial actions. The Chair or his/her designee will investigate the situation to determine the validity of the grievance and will follow up as appropriate. When the problem takes the form of on-going conflict between individuals who must necessarily work together or be in close proximity, it may be appropriate to seek mediation and/or establish ground rules for interaction between the parties. It may be appropriate in some cases for the Chair to consult with the Office of Employee Relations for advice in addressing the staff grievance. Staff whose grievances remain unresolved will be encouraged to initiate further discussion.
with the department chair. Those dissatisfied with the chair’s decision will be informed of their right to take grievances to the Office of Human Resources.

C. Grievance Alleging Discrimination

Problems of this nature should be brought directly to the attention of the Department Chair. The Department Chair will initially discuss all such grievances with a staff member of the Office of Employee Relations for advice on proper handling.

D. Procedures for Handling Acts of Misconduct

Misconduct includes violations of University rules and policies, violation of laws, and behavior that any reasonable person would judge to be unacceptable whether articulated or not in a specific policy or law.

Any allegation of misconduct on the part of faculty, staff, or students, which is found to be true would require remedial actions, and must be investigated under procedures appropriate to the situation. If the allegation is presented orally to the Chair, the Chair will listen carefully and elicit additional information as needed. However, most often the appropriate response will be to describe to the individual making the allegation the steps the Chair will take to investigate the situation. Normally it also will be appropriate and desirable to indicate when the individual making the allegations can expect a timely response and further information from the Chair. If the allegation is presented in writing, the Chair will indicate that the complaint will be investigated and every effort will be made to respond by a reasonable future date.

Any allegation of criminal behavior should be referred to the University Police.

It is expected that departmental faculty, staff, and students will behave in a mutually respectful and collegial manner. This means treating departmental colleagues, faculty, staff, and students with respect, and working constructively on behalf of the Department.
Appendix B

BME Core Faculty CV’s
GUNJAN AGARWAL

Education
Ph.D. (Biophysics), Tata Institute of Fundamental Research, Bombay, India (1997)
M.Sc. (Physics), Indian Institute of Technology, Delhi, India (1993)
B.Sc. (Physics, Maths and Computer Science), University of Allahabad, India (1991)

Professional Experience
Assistant Professor Sep 2003-
Biomedical Engineering and Davis Heart & Lung Research Institute, The Ohio State University, Columbus, OH

Research Scientist (Biophysicist) Nov 2001-May 2003
Biotechnology Group, Air Force Research Laboratory, WPAFB, OH

Postdoctoral Research Fellow Sep 2000-Oct 2001
Research Analytical, Procter & Gamble Pharmaceuticals, Mason, OH

Postdoctoral Research Associate Nov 1997-July 2000
Physiology and Biophysics, Albert Einstein College of Medicine, Bronx, NY

Graduate Research Scholar Aug 1993- Sep 1997
Chemical Physics, Tata Institute of Fundamental Research, Bombay, India

Awards and Distinctions
- Young scientist travel fellowship by IUPAB for “Depolymerization Mechanisms of HbS Fibers” at 13th International Biophysics Congress, Delhi, India (1999).
- Travel fellowships by Council for Scientific & Industrial Research, Department of Science & Technology and Indian National Science Academy for presentation at the 8th International Conference on Organized Molecular Films, Asilomar, San Francisco, USA (1997).
- Obtained highest percentile in Graduate Aptitude Test in Engineering, Physics, Delhi zone, India (1993).

Invited Lectures
“Applications of Scanning Probe Microscopy to Biology”
- March 2003 at University of Cincinnati, OH
- June 2003 at Procter and Gamble Company, Cincinnati, OH

“Novel Methods Of Film Deposition And Properties Of Self-Assembling Systems”
- September 1997, at Lucent Technologies, NJ, USA
- September 1995, at Ecole Polytechnique Federale de Lausanne, Switzerland
- September 1995 at Centro "E. Piaggio", University of Pisa, Italy
Memberships
Biophysical Society
American Association for the Advancement of Science
American Chemical Society

List of Publications (selected)


Principal Investigator/Program Director (Last, first, middle): Brantley, William A.

**BIOGRAPHICAL SKETCH**

Provide the following information for the key personnel in the order listed for Form Page 2. Follow the sample format for each person. **DO NOT EXCEED FOUR PAGES.**

**NAME**

William A. Brantley

**POSITION TITLE**

Professor

**EDUCATION/TRAINING** *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(S)</th>
<th>FIELD OF STUDY</th>
</tr>
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<tbody>
<tr>
<td>North Carolina State University, Raleigh, NC</td>
<td>B.S.</td>
<td>1963</td>
<td>Metallurgical Engineering</td>
</tr>
<tr>
<td>Carnegie Inst. of Technology, Pittsburgh, PA</td>
<td>M.S.</td>
<td>1965</td>
<td>Metallurgical Engineering</td>
</tr>
<tr>
<td>Carnegie Inst. of Technology, Pittsburgh, PA</td>
<td>Ph.D.</td>
<td>1968</td>
<td>Metallurgy and Materials Science</td>
</tr>
</tbody>
</table>

**POSITIONS:**

Research Metallurgical Engineer and Lecturer, Carnegie-Mellon University

Member of Ceramics Laboratory and Group Leader, US Army Materials and Mechanics Research Center, Watertown, MA (US Army active duty)

Member of Technical Staff, Compound Semiconductor Department, Bell Laboratories, Murray Hill, NJ

Marquette University School of Dentistry, Milwaukee, WI

Assistant Professor, Department of Dental Materials (1974-79);
Associate Professor (1979-1986); Professor (1986-89);
Chairman, Department of Dental Materials (1980-89); Acting Chairman (1979-80);
Director, Graduate Dental Materials (1980-89) and Dental Graduate Studies (1984-89)

The Ohio State University, College of Dentistry

Professor, Section of Restorative and Prosthetic Dentistry; Director, Graduate Program in Dental Materials Science

Graduate Faculty, Oral Biology Program; Participating Faculty, Biomedical Engineering Program;
Graduate Faculty, Integrated Biomedical Science Graduate Program, College of Medicine

Adjunct Faculty, Department of Materials Science and Engineering

**HONORS:**


Senior Professor Research Award, College of Dentistry (1997).

**IMPORTANT RECENT PUBLISHED ABSTRACTS** *(total of 192 published IADR/AADR abstracts)*


**RECENT PEER-REVIEWED PUBLICATIONS** – 116 articles, 19 book chapters, and 2 books (co-editor):


Alapati SB, Brantley WA, Svec TA, Powers JM, Mitchell JC. SEM observations of new and used nickel-titanium rotary files. *J Endod* (accepted for publication).


Other Support (William A. Brantley):

(a) R01EB003204-01 [Pending] 9/30/03–9/29/07
NIH/NIBIB  Submitted 3/26/2003 and presently under review. Total funding request of $2,266,562 for four-year project period.

Grant Application Title: Advanced Dental Materials Produced by Laser Deposition [Grant PI]

The major goal of this proposed project is the further development of a commercial process, laser-engineered net shaping (LENS, Optomec, Albuquerque, NM) to prepare improved dental restorations and prostheses from titanium and Ti-6Al-4V.

(b) R01 DE10147 9/30/98–7/31/03
NIH/NIHCR  $53,812 with F&A cost balance of $24,754, for a total carry over of $78,566, in May 2002 (Second no-cost extension year of 2002-2003 approved by NIDCR). Total grant award for original three-year period of 10/30/98 – 7/31/01 was $895,548

Grant Title: Structure and Properties of High-Palladium Dental Alloys. [Grant PI]

The major goal of this project is to obtain fundamental information about the relationships between compositions, microstructures and properties that would result in scientific development of new optimum high-palladium alloys. This project is a continuation of the original funded grant application listed below.

(c) T32 DE14320
NIH/NIHCR  This is a training grant entitled “Comprehensive Training in Oral and Craniofacial Sciences”. [2% release time] Member of the Steering Committee that has oversight of training activities.

(d) R21 DE 14556 4/01/03–3/31/05
NIH/NIHCR  $100,000 annual direct costs [10% release time]

Grant Title: Nanostructured, Liquid Crystalline Dental Restoratives. [PI: Schricker]

The major goal of this project is to obtain fundamental information about the relationships between compositions, nanostructures and properties of innovative liquid crystalline materials that have strong potential for future dental restorative materials.

Previous Support (William A. Brantley):
R01 DE10147 8/1/94-7/31/97
NIH/NIHCR  $451,579 [Grant PI]

Structure and Properties of High-Palladium Dental Alloys

The major goal of this project was to obtain fundamental information about the relationships between compositions, microstructures and properties that would result in scientific development of new optimum high-palladium alloys.
NAME
Ferrari, Mauro

POSITION TITLE
Professor of Mechanical Engineering

EDUCATION/TRAINING

<table>
<thead>
<tr>
<th>Institution and Location</th>
<th>Degree</th>
<th>Year(s)</th>
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<tr>
<td>Universita' di Padova, Italy</td>
<td>Dottore</td>
<td>1985</td>
<td>Mathematics</td>
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<td>University of California, Berkeley</td>
<td>M.S.</td>
<td>1987</td>
<td>Mechanical Engineering</td>
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<td>University of California, Berkeley</td>
<td>Ph.D.</td>
<td>1989</td>
<td>Mechanical Engineering</td>
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<tr>
<td>The Ohio State University</td>
<td>M.D.</td>
<td>2006</td>
<td>expected</td>
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RESEARCH AND PROFESSIONAL EXPERIENCE

University of Udine, Italy
1988-90 Assistant Professor (Ricercatore) of Theoretical and Applied Mechanics

University of California, Berkeley
1991-96 Assistant Professor, Material Science and Civil Engineering
1994-98 Faculty, Bioengineering Program UC San Francisco/Berkeley and Applied Science and Technology Program
1996-98 Associate Professor with Tenure
1996-98 Faculty, Biophysics Program
1996-98 Director, Biomedical Microdevices Center

Lawrence Livermore National Laboratory
1998 (Summer) Visiting Research Scientist, Microtechnology Center

The Ohio State University
1999- Professor, Biomedical Engineering, Internal Medicine, and Mechanical Engineering
1999-02 Director, Biomedical Engineering Center
2000- Member, Comprehensive Cancer Center, Immunology Group
2000- Associate Director, Dorothy M. Davis Heart and Lung Research Institute
2000- Professor, Material Science and Engineering
2001- Edgar Hendrickson Designated Chair in Biomedical Engineering
2002- Scientific Founder and Scientific Advisor, the Ohio MicroMD Lab
2002- Associate Vice President for Health Science Technology and Commercialization

National Cancer Institute
Senior Advisor to the Director, Dr. Andrew von Eschenbach, on Oncological Nanotechnology

Honors
1993-98 National Science Foundation: National Young Investigator Award.
1999 Wallace H. Coulter Award for Innovation and Entrepreneurship
2001 Wall Street Journal, Businessman of the Year
2001 Year 2001 Top C.A.T. Award for Outstanding Educator Advancing Technology Award of the Industry and Technology Council of Central Ohio
2002 The Ohio Academy of Science, Frontiers of Science All-Academy Lecture, Capital University, Columbus, OH

PROFESSIONAL PUBLICATIONS (SELECTED FROM OVER 100 PEER-REVIEWED PUBLICATIONS)


10. S. Lee, J. Lewis, and M. Ferrari “Nanoscale-Derived Osmotic Pressure Theory” (Proceeding of the National Academy of Sciences, invited)


**Main Patents (from 12 issued and over 30 pending)**


**Expertise Summary**

Dr. Ferrari is a founder of the fields of biomedical micro- and nano-technology. His domains of interest include therapeutic devices such as controlled-release implantable, injectable, and oral administration systems; immunosilating cell transplant devices; medical imaging technologies, clinical laboratory technology; biomaterials; biosensors; and biomechanics. Dr. Ferrari launched three private sector companies (including iMEDD), dedicated to the commercialization of the Intellectual Property (IP) he has generated at OSU, and the University of California at Berkley. For his role as faculty-entrepreneur he has obtained recognitions including the international Wallace H. Coulter Award (1999), the Ambassador Award of the Columbus Chamber of Commerce (2001), and the cover of CEO magazine (2001). He served as consultant and advisor for many companies, such as iMEDD, Abbott, Johnson & Johnson, Affymax, Roche, and HandyLab.
Derek J. Hansford
The Ohio State University
278 Watts Hall, 2041 College Rd., Columbus, OH 43210
(614) 292 - 9957 hansford.4@osu.edu

Education
Ph.D. in Materials Science and Mineral Engineering
University of California, Berkeley, May 1999
Dissertation: Microfabrication Materials for Biomedical Microdevices
M.S. in Materials Science and Mineral Engineering
University of California, Berkeley, Dec. 1996
Thesis: Biocompatible Silicon Wafer Bonding for Biomedical Microdevices
B.S. in Materials Science and Engineering, Magna cum laude
Case Western Reserve University, May 1994

Academic Appointments
The Ohio State University Columbus, OH
Assistant Professor Aug. 1999 – present
Materials Science and Engineering, Biomedical Engineering Center, Biophysics
The Ohio MicroMD Laboratory Columbus, OH
Chief Scientist, Microfabrication Apr. 2002 – present

Other Professional Experience
UC Berkeley Berkeley, CA
Head Graduate Student Instructor Aug. 1997 - May 1998
Electrical Eng. and Computer Science 143: Processing and Design of Integrated Circuits
UC Berkeley Berkeley, CA
Graduate Student Researcher June 1995 - May 1999
Cepheid Sunnyvale, CA
NASA Lewis Research Center Brookpark, OH
Research Assistant June 1994 - Aug. 1994
Case Western Reserve University Cleveland, OH
Research Assistant June 1991 – May 1994

Research Interests
Polymer microfabrication, MEMS, biomedical microdevices, nanochannels for biomolecular manipulation, organic
electronics, micro/nanofluidic clinical chemistry assay development, microdevice assembly techniques, biofluid
dynamics in micro/nanofluidics, biocompatibility, biomaterials, tissue/cell/material interactions, tissue
engineering scaffold materials, interfacial electrochemistry

Representative Publications
1. Z Zheng, DJ Hansford, and AT Conlisk, “Effect of multivalent ions on electroosmotic flow in micro and
nanochannels.” Electrophoresis, Accepted for publication.
2. S Wang, S Lai, Y Yang, J Guan, DJ Hansford, and LJ Lee, “Nanoporous Membranes Based on Polymer
Nanofabrication Methods,” AIChE 2002, Indianapolis, IN, Nov. 3-8, 2002.
microparticles for drug delivery,” BioMEMS and Biomedical Nanotechnology, Columbus, OH, Sept. 6-8, 2002.
5. R Short, N Ferrell, J Guan, and DJ Hansford, “Scaling up production of injectable microfabricated polymer
June 11, 2002.
7. AT Conlisk, J McFerran, Z Zheng, and D Hansford, “Mass transfer and flow in electrically charged micro-

Invited Presentations
- “Use of nanotechnology for drug delivery systems,” Nanotechnology & Health Care, Thanjavur, Tamil Nadu, India, January 11-12, 2003
- “Nanochannels in silicon and polymers: new tools for analytical chemistry,” Rochester chapter of American Chemical Society Annual meeting, Rochester, NY, October 17-18, 2002
- “Engineering of microparticle geometry through microfabrication for enhanced functionality,” Microparticles 2002, Orlando, FL, April 20-23, 2002
- “Polymer Surface Microfabrication for Biomedical Therapeutic and Diagnostic Devices,” The Glennan Microsystems Initiative Breakfast Speaker Series, April 6, 2001
- “Nanofluidic Devices and Therapeutic Applications,” Chips to Hits 2000, Philadelphia, PA, 2000
- “Medical Therapeutics: the Next Frontier in Biochips,” International Forum on Biochip Technologies, Beijing, PRC, October 11-14, 2000
- “Nanotechnology and novel vistas in drug delivery.” The John J. Bonica Memorial Symposium on Cancer Pain and Palliative Care, Palermo, Italy, August 17-20, 1999

Other Professional Activities
- Reviewer for NSF Analytical and Surface Chemistry, March, 2001
- Reviewer for Journal of Vacuum Science & Technology, Biomedical Microdevices, and Synthetic Metals
- Reviewer for DOE Biomedical Engineering Research Program, June 12-13, 2001
- Panelist for NSF SBIR/STTR Sensors, Instrumentation & Membranes Panel, September 5-6, 2001
- Panelist for NSF SBIR/STTR Biotechnology Phase II Panel, September 25, 2002
- Panelist for NSF NER Manufacturing Processes at the Nanoscale, February 13-14, 2003

Main Honors
- Named to the “TR100” list by Technology Review magazine (one of the top 100 innovators under the age of 35)
- Outstanding Poster, BioMEMS and Biomedical Nanotechnology 2002
- Addy Award from Columbus Ad Federation for OSU TV commercial entitled “Really Smart—Derek Hansford”
- NSF Graduate Research Fellowship (1994-1997)
- Graduate Division Fellowship (1999, awarded through MSME)
- President’s Scholarship and Case Alumni Scholarship (1990-1994)

Advised 1 PhD, 4 MS, and 2 BS degrees
Currently advising 9 PhD, 3 MS, and 1 BS/MS, and 3 foreign BS students
BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed for Form Page 2.

Follow this format for each person. DO NOT EXCEED FOUR PAGES.

NAME
Douglas A Kniss, Ph.D.

POSITION TITLE
Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
<thead>
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<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
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<tbody>
<tr>
<td>Susquehanna Univ., Selinsgrove, PA</td>
<td>B.A.</td>
<td>1980</td>
<td>Biology, Psychology</td>
</tr>
<tr>
<td>Ohio State Univ., Columbus, OH</td>
<td>Ph.D.</td>
<td>1986</td>
<td>Cell Biology, Anatomy</td>
</tr>
<tr>
<td>NICHD, NIH, Bethesda, MD</td>
<td>Postdoc</td>
<td>1987</td>
<td>Pharmacology</td>
</tr>
</tbody>
</table>

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.

A. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

Positions
Pharmacology Research Associate, National Institutes of General Medical Sciences, (Laboratory of Developmental Neurobiology), National Institutes of Child Health and Human Development, Bethesda, MD, 1986-1987
Director, Laboratory of Perinatal Research, Department of Obstetrics & Gynecology, The Ohio State University College of Medicine & Public Health, Columbus, OH, 1988-
Member, Program in Molecular, Cellular & Developmental Biology, The Ohio State University, Columbus, OH, 1994-
Professor, Department of Obstetrics & Gynecology, The Ohio State University College of Medicine & Public Health, Columbus, OH, 1999-
Director, Program in Tissue Engineering and Regenerative Medicine, The Ohio State University College of Medicine & Public Health, Columbus, OH, 1999-
Member, Integrated Biomedical Sciences Graduate Program, The Ohio State University College of Medicine & Public Health, Columbus, OH, 2000-
Professor, Center for Biomedical Engineering, The Ohio State University College of Medicine & Public Health, Columbus, OH, 2003-

Extramural Grant Review Service (Last Three Years):
NIH, NICHD, Cooperative Program on Trophoblast-Maternal Tissue Interactions, Bethesda, MD, November 28-29, 2001
NIH, NICHD Special Review Panel, Bethesda, MD, August 7-8, 2001
Fonds zur Forderung der wissenschaftlichen Forschung, Vienna, Austria, 2001
Israeli Medical Research Foundation, Jerusalem, Israel, 2001
Auckland Medical Research Foundation, Auckland, New Zealand, 2001
NIH, Human Embryology and Development 1, IRG, Bethesda, MD, June 18-19, 2001
NIH, Human Embryology and Development 1, IRG, Ad hoc Reviewer, June 5, 1998

Honors and Awards:
President's Poster Award, 41st Annual Meeting of the Society for Gynecologic Investigation, Chicago, IL, 1994 (Interleukin-1β induces cyclooxygenase-2 expression in human amnion cells)
President's Poster Award, 38th Annual Meeting of the Society for Gynecologic Investigation, St. Louis, MO, 1991 (Protein kinase C augments growth factor-mediated prostanooid synthesis in cultured human amnion cells)
PRAT Fellowship, NIGMS, NIH, 1986-1987

B. Selected peer-reviewed publications (in chronological order). Do not include publications submitted or in preparation.

58

C. Research Support. List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

*Stem cells, fatty acids, and adipogenesis*, NIH R21, Principal Investigator, Direct Costs, $300,000, 090103 - 083105
*Bioengineering and Imaging Tissue Repair, Ohio BR77 Program*, Director, Project No. 2, Direct Costs $7,600,000, 100103 - 093006
*Is nanoscale important in tissue engineering?, R21 NIH, Co-Investigator, Direct Costs $275,000, 100103 - 093005
*Mechanisms of Preterm Labor: NF–κB Activation of COX-2*, RO1 NICHD, NIH, Principal Investigator, Direct Costs $784,494, 030198 - 022803
*COX-2 Products and PPAR-γ in the Adipose Cell*, Central Ohio Diabetes Association, Principal Investigator, Direct Costs $35,000, 060101 - 113002
*Maternal-Fetal Medicine Network*, NIH, NICHD, 2 U10 HD27915-10, Collaborator, Direct Costs $1,096,211, 040101 - 033106
Abridged Vita

Stephen C. Lee
Associate Professor of Cellular and Molecular Biochemistry, Associate Professor of Biomedical Engineering, Associate Professor of Chemical Engineering, Investigator, Dorothy M. Davis Heart and Lung Research Institute
The Ohio State University, 305c Heart and Lung Research Institute, 473 W 12th Avenue, Columbus, OH 43210.

(i) Professional Preparation
St. Ambrose College, Chemistry and Biology, BS, 1978; University of Minnesota, Microbiology, Ph.D., 1984; Stanford University, Genetics, Postdoctoral Fellow 1985-1989.

(ii) Appointments (a) Academic
Ohio State University-Associate Professor, (Biomedical Engineering, Chemical Engineering, Molecular and Cellular Biochemistry) 2001; Associate Director Biomedical Engineering Center, 2002; Investigator Dorothy M. Davis Heart and Lung Research Institute 2002-
(b) Industrial
G. D. Searle, St. Louis, MO Senior Research Investigator, 1994-1999

(iii) Publications: [Total Publications include 3 edited volumes, 8 patents (4 issued, 4 pending), 28 primary articles, 17 reviews/reports and 28 abstracts: >80.]
Publications related to the proposed work:

Five Additional Significant Publications
(iv) Synergistic Activities

**Development of Curricular Materials:** Developed Ohio State University course entitled “Biomedical Nanotechnology,” BME736, a permanent, interdisciplinary graduate level Biomedical Engineering course, cross-listed with Chemical Engineering

**Development of Research Tools:** Developed the commercially successful “Bac-to-bac” (Life Technologies, Inc.) molecular cloning system for construction of recombinant viruses in *E. coli*, developed proprietary chemoselective protein ligation method for conjugation of polypeptides to surfaces exclusively through their N-terminal amines, developed proprietary method to design proteins with controlled epitope contents, developed scanning permutagenesis method for identification of active circularly permuted variants of proteins of interest, developed chaperone co-expression technique to enhance properties of recombinant proteins expressed in *E. coli*.

**Development of Databases:** Edited 3 volumes and wrote 18 chapters or invited reviews.

**Broadened Participation of Underrepresented Groups:** In last 2 years, mentored 1 woman student – 1 African American and have recently joined USA-Africa collaborative research group.


(a) **Collaborators and Co-Editors (48 preceding months):** A. Abegg, Pharmacia Corporation; J. Baker, University of Michigan; T. Beck, Pharmacia Corporation; P. Barnes, The Ohio State University; K. Botwin, Monsanto Company; L. Brillson The Ohio State University; A. Donnelly, Pharmacia Corporation; T. Duffin, Pharmacia Corporation; M. Ferrari, The Ohio State University; V. K Granik University of California, Berkley (retired); R. Ibda, Whereabouts unknown; J. Kloper Pharmacia Corporation; D. Kunneman Pharmacia Corporation; G. Lange Pharmacia Corporation; J. McKearn Pharmacia Corporation; C. Orosz, The Ohio State University, R. Parthasarathy, 3-M Corporation; M. Ruegsegger The Ohio State University; E. Rowold, Pharmacia Corporation; N. Summers, Pharmacia Corporation; B. R. Smith; The Ohio State University; P. Streeter, Oregon Health Sciences University, C. VanValkenburgh Washington University; C. F. Voliva. Pharmacia Corporation; M. Zhang, University of Washington; J. Zobel, Pharmacia Corporation

(b) **Graduate and post-doctoral sponsors**
Graduate: P. Patrick Cleary, University of Minnesota; Postdoctoral: Stanley N. Cohen, Stanford University

(c) **Thesis Advisees**
Philip Barnes (Master’s thesis), Khasturbh Bhalerao (PhD candidate), Y. Lee (Medical Student); D. S. Merlin (Postdoctoral Fellow), Bryan R. Smith (PhD candidate), Andrew Browne (Undergraduate)

**Honors and Awards**
2003 Denman Research Forum. Ohio State University, Columbus, OH. A. Browne, M. Ferrari and S. C. Lee. 1st place winner (tie); 2003 Denman Research Forum. Ohio State University, Columbus, OH. B. Ciprani, P. Barnes, S. C. Lee and L. Brillson. 1st place winner (tie); Honoree, Sphinx Senior Class Honorary, College of Engineering, Ohio State University, 2003; Trustee, BioMEMS Society, 2001; Presiding Officer, ACS Symposium on Functional Condensation Polymers, Highly Branched and Biomedical Polymers Section, San Diego, CA, 2001; Sigma Xi, The Scientific Research Society, 1985; Delta Epsilon Sigma National Scholastic Honor Society, 1978; Beta Beta Beta Biological Honor Society, 1976

**Professional Service**
ALAN S. LITSKY, M.D., Sc.D.

<table>
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<tr>
<th>Princeton University</th>
<th>A.B. Chemistry</th>
<th>1975</th>
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<td>Columbia University</td>
<td>M.D. Medicine</td>
<td>1979</td>
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<td>College of Physicians and Surgeons</td>
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<tr>
<td>Massachusetts Institute of Technology</td>
<td>Sc.D. Materials Science</td>
<td>1988</td>
</tr>
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</table>

Associate Professor of Orthopaedics and Biomedical Engineering
Director, Orthopaedic BioMaterials Laboratory
Ohio State University, Columbus, Ohio 43210

Recent Publications

Journals


Proceedings and Published Abstracts


Books / Chapters


BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed for Form Page 2. Follow the sample format for each person. DO NOT EXCEED FOUR PAGES.

NAME

Nicanor I. Moldovan

POSITION TITLE

Assistant Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

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<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School, Sighisoara, Romania</td>
<td>Baccalaureate</td>
<td>1975</td>
<td>Sciences</td>
</tr>
<tr>
<td>Dept. of Biophysics, Univ. Bucharest, Romania</td>
<td>M. S.</td>
<td>1981</td>
<td>Biophysics</td>
</tr>
<tr>
<td>Institute of Cellular Biology and Pathology,</td>
<td>Doctorate (Ph. D.)</td>
<td>1995</td>
<td>Cell Biology</td>
</tr>
<tr>
<td>Bucharest, Romania</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dept. of Biochemistry, SUNY at Buffalo, N.Y.</td>
<td></td>
<td>1995-1996</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>Div. of Cardiology, Johns Hopkins Univ.</td>
<td></td>
<td>1996-1997</td>
<td>Cellular and Molecular Cardiology</td>
</tr>
<tr>
<td>School of Medicine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. Positions and Honors

Positions and Employment

1982-1988: Research Scientist, Institute of Cellular Biology and Pathology, Bucharest, Romania
1988-1995: Scientific Investigator, same Institute
1990-1991: Assistant Professor, Cell Biology and Histology Chair, Faculty of Medicine, Ecological University, Bucharest, Romania
1990-1993: Assistant Professor, Cell Biology Chair, Faculty of Medicine, Constanta, Romania
1996-1997: Research Fellow, Dept. of Medicine, Johns Hopkins U. School of Medicine
1997-2000: Res. Scientist, Heart and Lung Institute, College of Medicine, Ohio State University
2000-: Assistant Professor, Department of Internal Medicine, OSU
2000-: Assistant Professor, Biomedical Engineering Center, Department of Engineering, OSU
2001-: Assistant Professor, Department of Ophthalmology, OSU.

Honors:

1981: Cum Laude, Department of Biophysics, University of Bucharest

Membership in Professional Societies:

2000-: International Society for BioMEMS and Biomedical Nanotechnology (Board of Trustees, Treasurer).
2001-: Association for Research in Vision and Ophthalmology (ARVO).

B. Selected peer-reviewed publications (in chronological order).

B.C. Research Support:

Ongoing Research Support

R01 HL65983 Moldovan (PI) 08/01/00 -07/31/04

Monocyte recruitment-A strategic target in angiogenesis.

In this project a new model of angiogenesis is being developed, based on the drilling of extracellular matrices and formation of microtunnels by monocytes/macrophages, as a pre-requisite or facilitator for the engrafting of circulating progenitor endothelial cells.

Role: PI

Completed Research Support

Beginning Grant-In-Aid, American Heart Association, Ohio Valley Affiliate Moldovan (PI) 07/01/99-06/30/01

Role of monocytes in angiogenesis- A strategic therapeutic target in the management of intravascular thrombi.

The goal of this project was to investigate the penetration of fibrin and Matrigel gels in vitro by monocytes, and to assess the effects of MCP-1 on this process.

Role: PI
BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed on Form Page 2. Photocopy this page or follow this format for each person.

NAME
Mark A. Ruegsegger

POSITION TITLE
Assistant Professor

EDUCATION/TRAINING: (Begin with baccalaurate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Western Reserve University, Cleveland, OH</td>
<td>B. S.</td>
<td>1995</td>
<td>Biomedical Eng.</td>
</tr>
<tr>
<td>Case Western Reserve University, Cleveland, OH</td>
<td>M. S.</td>
<td>1997</td>
<td>Biomedical Eng.</td>
</tr>
<tr>
<td>Case Western Reserve University, Cleveland, OH</td>
<td>Ph. D.</td>
<td>2001</td>
<td>Biomedical Eng.</td>
</tr>
</tbody>
</table>

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. If the list of publications in the last three years exceeds two pages, select the most pertinent publications. DO NOT EXCEED TWO PAGES.

Academic Positions:
1992-1995 Research Assistant in Biomedical Engineering, Case Western Reserve University, Cleveland, Ohio
1993 Student Summer Scholar, Hipple Cancer Research Center, Dayton, OH
1995- Jan 2001 Graduate Research Assistant, Case Western Reserve University, Cleveland, Ohio
Feb 2001-present Assistant Professor of Biomedical Engineering, The Ohio State University, Columbus, Ohio

Honors, Professional Service and Membership:
2002 Review Committee, Tissue Integration Mechanisms (Soft and Hard Tissues) section at Society for Biomaterials 2002 annual conference.
2001 Ph.D. Outstanding Research Award, Society for Biomaterials 2001 conference, Minn, MN.
1995-2000 Whitaker Foundation Fellow (Case Western Reserve Univ).
1996- Member, Society for Biomaterials
1994- Member, American Chemical Society

Academic Activities:
Course instructor, "BME 739:Biopolymers," Developed and taught course to train students to understand structure/function relationship of biological polymers; computer modeling included in class instruction.
Course co-instructor, "BME 721:Biological Transport," Developed and taught mathematical principles of biological mass transport, The Ohio State University, Spring 2001, 2002.
Invited lecturer, "BME 600: Cardiovascular Medicine," The Ohio State University, Fall 2001, 2002.
Invited lecturer, "BME 600: Membrane Biotransport," The Ohio State University, Fall 2001, 2002.
Active Grants:

Current Research Project Pursuits:

• Non-thrombogenic surfaces: Significant improvements in blood-contacting devices can be achieved by understanding nature’s design and the application of biomimicry to artificial surfaces. Novel macromolecular structures derived from polymer synthesis and peptide/saccharide conjugation will likely afford a more blood compatible surface. The blood-compatible surfaces could then be applied to a variety of applications.

• Recent enhancements in Magnetic Resonance Imaging (MRI) techniques have led to increased resolution of anatomical structure and a greater potential for early diagnosis of organ and tissue pathologies. Nanotechnology approaches such as antibody-bound magnetic contrast agents will allow the targeting of diseased tissues and significant improvements in patient care. Hybrid nanostructures with both inorganic and biological components are being designed and tested to increase the resolving power of MRI to diagnosis cancer tissues.

• Coronary artery disease (CAD) continues to be the most significant cause of death in the United States. Studies at the molecular-to-tissue levels have brought about new opportunities for early detection, characterization and therapy for this life-threatening disease of the vascular system. Coated, degradable stents and drug delivery stents represent two such methods being pursued to alleviate the problem of vessel occlusion and restenosis.

Relevant Publications:


<table>
<thead>
<tr>
<th>Name</th>
<th>Position Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynthia Roberts, Ph.D.</td>
<td>Associate Professor</td>
</tr>
</tbody>
</table>

**Education/Training**  
(Begin with Baccalaureate or other initial professional education, such as nursing, and include postdoctoral training)

<table>
<thead>
<tr>
<th>Institution and Location</th>
<th>Degree (if applicable)</th>
<th>Year(s)</th>
<th>Field of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University of Iowa</td>
<td>B.S. with distinction</td>
<td>1979</td>
<td>Nursing</td>
</tr>
<tr>
<td>The Ohio State University</td>
<td>M.S.</td>
<td>1986</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>The Ohio State University</td>
<td>Ph.D.</td>
<td>1989</td>
<td>Biomedical Engineering</td>
</tr>
</tbody>
</table>

**Research and Professional Experience.** Concluding with present position, list in chronological order: previous employment, experience, and honors.

1980-81  
Registered Nurse, Urologic Nursing Division, The University of Iowa Hospitals and Clinics, Iowa City, Iowa.

1981-83  
Registered Nurse, Coronary Intensive Care Unit, “The University of Iowa Hospitals and Clinics, Iowa City, Iowa.

1982  
Undergraduate Teaching Assistant, Materials Division, College of Engineering, The University of Iowa, Iowa City, Iowa.

1983-89  
Graduate Fellow, Laboratory of Experimental Atherosclerosis (1983-87), Graduate Research Associate, Laboratory of Vascular Diseases (1988-89), Graduate Administrative Associate, The Biomedical Engineering Center (1986-89), The Ohio State University, Columbus, Ohio.

1984  
Biomedical Engineering Summer Intern, National Cancer Institute, National Institutes of Health, Bethesda, Maryland.

1987-89  
Researcher, Battelle Memorial Institute, Optical Systems and Technology Section, Columbus, Ohio.

1989-97  
Assistant Professor, Biomedical Engineering and Surgery  
The Ohio State University, Columbus, Ohio.

1994-97  
Assistant Professor, Ophthalmology  
The Ohio State University, Columbus, Ohio.

1997 to Present  
Present  
The Ohio State University, Columbus, Ohio.

2002 to Present  
President and Chief Technical Officer, Vision Optimization, Ltd.

2003 to Present  
Associate Director, Biomedical Engineering Program and Center;  
Torence A. Makley Research Professor, Department of Ophthalmology, The Ohio State University, Columbus, Ohio.

**PROFESSIONAL SOCIETY MEMBERSHIPS**

- ARVO - Association for Research in Vision and Ophthalmology
- ASLMS - American Society for Laser Medicine and Surgery, Fellow Scientist
- BMES - Biomedical Engineering Society
- IEEE - The Institute of Electrical and Electronics Engineers
- LEOS - Lasers and Electro-optics Society, Columbus Chapter Treasurer, 92-present
- EMBS - Engineering in Medicine and Biology, Columbus Chapter Chair, 94-present
- Sigma Xi - The Scientific Research Society

**Professional Publications.** List in chronological order the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. If the list of publications in the last three years will exceed the allotted space, select the most pertinent publications.


Koozekanani D, Boyer K, Roberts C., Katz S. “A System to Automatically Determine the OCT Scan Path In Cases of Ocular Motion.” Third International Symposium on Optical Coherence Tomography Program, April 2001, Longboat Key.


**Expertise Summary** Provide a brief summary of research and commercial expertise including patents and licenses attained in the past five years.

**Research Expertise**: C. Roberts' research expertise covers ophthalmic imaging technologies, including corneal topography, functional MRI, optical coherence tomography, and optical wavefront sensing. Additional areas of research expertise include laser-tissue interactions and corneal response to refractive surgery.

**Commercialization Experience**: The start-up company, Vision Optimization, Ltd., was founded by C. Roberts in April of 2002 for the purpose of commercializing a rasterstereograpy system for the measurement of corneal topography. Two applications are currently under development, including contact lenses and intra-operative topography for corneal transplantation. A second LLC will be formed in the near future for the purpose of commercializing technology owned by The Ohio State University, including an OCT analysis program which provides improved processing of OCT images acquired with the commercially-available Zeiss OCT system, using a Markov boundary model (Inventors: Koozekanani, Boyer, Roberts).

**Patents**

PCT/US01/22936 “Methods and Instruments for Improving Refractive Ophthalmic Surgery” from Provisional 60/220,019; Assignee: The Ohio State University (Inventors: C. Roberts, W.J. Dupos, and N. Katsube)

Provisional: 60/418,511 “Method and System for Designing an Improved Ablation Pattern”; Assignee: The Ohio State University, (Inventors: C. Roberts and A. Mahmoud)

Provisional: "Parametric Model Based Ablative Surgical Systems and Methods"; Assignee: The Ohio State University, (inventors: C. Roberts, A. Mahmoud, E.E. Herderick)
Curriculum Vitae

Andreas F. von Recum

Office of Research
College of Veterinary Medicine
The Ohio State University
1900 Coffey Road
Columbus OH 43210

Personal Data

Birthdate: July 5, 1939
Place of Birth: Dillingen an der Donau, Germany
Citizenship: USA
Social Security No.: 522-88-9018
Family Status: Married, six children
Christian Denomination: Presbyterian (PCA); Deacon 1987-92, Elder 1993-
Clerk of Session, 1994-96

Education

Highschool in Eichstatt, Germany (w/ emphasis on music and classics), Diploma 1959
University of Giessen, Germany, Physicum (approx. equivalent to pre-vet. B.S.) 1965
Free University of Berlin, Germany, Tierarzt (equivalent to D.V.M.) 1968
Free University of Berlin, Germany, Dr. med. vet, in Veterinary Medicine 1969
(approx. equivalent to Ph.D.)
Colorado State University, Fort Collins, CO, Ph.D., Veterinary Surgery 1974

Professional Interests

Administrative leadership in academic education and research in Veterinary Medicine
Biomaterials Science and Engineering: biocompatibility, implant R&D
Experimental Surgery and Histopathology: soft tissue repair and replacement
Veterinary Medicine and Surgery: animal models for biomedical research

Appointments

Director Biomedical Engineering Center, College of Engineering, The Ohio State University 2002-
Associate Dean for Research, College of Veterinary Medicine at 1997-
The Ohio State University, Columbus, OH
Professor of Experimental Surgery, Biomedical Engineering, and Oral Biology, Colleges of Veterinary Medicine, 1997-
Engineering, and Dentistry at The Ohio State University
Professor, Hunter Endowed Chair in Bioengineering, College of Engineering, 1993-97
Clemson University, Clemson, SC
Professor of Biomaterials (Adj.), College of Dentistry, University of Nijmegen, 1993-
Nijmegen, The Netherlands
Scientific Staff, Shriners Hospitals for Crippled Children, Greenville, SC 1989-97
Professor of Surgery (Adj.), Medical University of South Carolina, 1987-97
Charleston, SC
Professor of Surgery (Adj.), Department of Surgery, University of South 1984-97
Carolina School of Medicine, Columbia, SC
Chairman, Bioengineering Alliance of South Carolina, College of
Curriculum Vitae

Engineering, Clemson University, Clemson, SC 1984-88
Head, Department of Bioengineering, Clemson University, Clemson, SC 1982-93
Professor, Department of Bioengineering, Clemson University, Clemson, SC 1978-93
Director, Surgical Research Laboratory, Sinai Hospital of Detroit, Detroit, MI 1975-77
Associate Professor (Adj.) of Comparative Surgery, Department of Comparative Medicine, Wayne State University School of Medicine, Detroit, MI 1975-77
Research Assistant, Surgical Laboratory, College of Veterinary Medicine, Colorado State University, Fort Collins, CO 1972-74
Clinical Staff Member, Small Animal Clinic, College of Veterinary Medicine, Free University of Berlin, Germany 1969-72
Elected Member, Governing Body, College of Veterinary Medicine, Free University of Berlin, Germany 1971
Practitioner, Farm Animal Medicine and Surgery, Meitingen, Germany 1968-69

Honors and Awards

Interdisciplinary Research Award, FRANKFURTER ALLG. ZEITUNG, Federal Republic of Germany, for a 3-year research stay in the USA 1971-73
C. W. Hall Award for the best published manuscript in J. Investigative Surgery, Volume 2 (with Craig Campbell, Graduate Student) 1989
Fulbright Senior Scientist Award 1990-91
Alexander von Humboldt Senior Scientist Award 1990-91
American Society for Engineering Education: Outstanding Educator Award (Bioengineering) 1990
Academy of Surgical Research: Distinguished Service Award, the award established thereafter as the "Andreas von Recum Award" 1990
Society for Biomaterials: Clemson Award for Outstanding Contributions to the Biomaterials Literature 1991
Hunter Endowed Chair in Bioengineering, College of Engineering, Clemson University 1993

Patents:

Nine patents relating to the design and manufacturing of surgical implants; issued to Clemson University

Bibliography

Reviewed Manuscripts

100+ refereed manuscripts dealing with surgical, histological, and engineering issues of implants and implant development.

Selected Books

Appendix C

Research Awards for BME Core Faculty
<table>
<thead>
<tr>
<th>RF Project Number</th>
<th>Title</th>
<th>Sponsor</th>
<th>Start Date</th>
<th>End Date</th>
<th>Principal or Co-Investigator</th>
<th>Funding Requested</th>
<th>Total Funding Received to date</th>
<th>Funded/Pending</th>
<th>Department/College</th>
</tr>
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<tbody>
<tr>
<td>744677/744508</td>
<td>Cardiovascular Bioengineering Enterprise</td>
<td>State of Ohio</td>
<td>2/1/2003</td>
<td>1/31/2006</td>
<td>M. Ferrari</td>
<td>$14,997,990</td>
<td>$6,000,000</td>
<td>Funded</td>
<td>DHLRI/BME</td>
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<tr>
<td>743031</td>
<td>Nanomaterials for the oral delivery of angiotensin in pediatric oncology</td>
<td>Hope St. Kids</td>
<td>7/1/2003</td>
<td>6/30/2004</td>
<td>M. Ferrari</td>
<td>$70,000</td>
<td>$70,000</td>
<td>Funded</td>
<td>BME</td>
</tr>
<tr>
<td>Pre-744110</td>
<td>Targeting nanoparticles for enhanced ultrasonic</td>
<td>NIH</td>
<td>12/1/2003</td>
<td>11/30/2006</td>
<td>M. Ferrari</td>
<td>$258,125</td>
<td></td>
<td>Pending</td>
<td>DHLRI/BME</td>
</tr>
<tr>
<td>Pre-7759700</td>
<td>Nanochannel delivery system for medical therapy</td>
<td>NIH</td>
<td>12/1/2003</td>
<td>9/30/2008</td>
<td>M. Ferrari</td>
<td>$4,284,476</td>
<td></td>
<td>Pending</td>
<td>multiple depts</td>
</tr>
<tr>
<td>Pre-75422000</td>
<td>Nanotechnology in advanced therapy &amp; diagnosis</td>
<td>NSFBES</td>
<td>10/9/2003</td>
<td>not listed</td>
<td>M. Ferrari</td>
<td>$56,445</td>
<td>Pending</td>
<td>DHLRI/BME</td>
<td></td>
</tr>
<tr>
<td>Pre-759500</td>
<td>Genetically Engineered microdevices</td>
<td>AFOSR</td>
<td>9/15/2003</td>
<td>9/16/2006</td>
<td>D. Harsford</td>
<td>$2,100,000</td>
<td>$2,100,000</td>
<td>Funded</td>
<td>Material Sci/BME</td>
</tr>
<tr>
<td>Pre-76022000</td>
<td>Ohio Micro MD Mini Grant</td>
<td>Ohio Micro MD</td>
<td>5/1/2003</td>
<td>4/30/2004</td>
<td>D. Harsford</td>
<td>$46,500</td>
<td>$46,500</td>
<td>Funded</td>
<td>BME</td>
</tr>
<tr>
<td>744113</td>
<td>IGERT: Molecular engineering of microdevices- GRA student grant</td>
<td>NSF</td>
<td>12/15/2002</td>
<td>6/30/2007</td>
<td>S. Lee</td>
<td>$3,000,000</td>
<td>$300,000</td>
<td>Funded</td>
<td>multiple depts</td>
</tr>
<tr>
<td>ACT/SGER</td>
<td>Neuronal Transistor: Protein Patterning for Bio-Electronic Circuits</td>
<td>NSF</td>
<td>9/15/2004</td>
<td>9/15/2004</td>
<td>S. Lee</td>
<td>$100,000</td>
<td>$100,000</td>
<td>Funded</td>
<td>Electrical/BME</td>
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<tr>
<td>NA</td>
<td>Microelectronic Design and fabrication of field effect transistors for detecting biological agents</td>
<td>Ohio Micro MD</td>
<td>9/1/02</td>
<td>8/1/03</td>
<td>S. Lee</td>
<td>$50,000</td>
<td>$50,000</td>
<td>Funded</td>
<td>BME</td>
</tr>
<tr>
<td>NA</td>
<td>Neurosensor for homeland defense</td>
<td>Application submitted to General Todd Steward</td>
<td>9/1/03</td>
<td>9/1/04</td>
<td>S. Lee</td>
<td>$60,000</td>
<td>$60,000</td>
<td>Funded</td>
<td>BME</td>
</tr>
<tr>
<td>Pre-7935100</td>
<td>Posterior Cruciate Ligament Response</td>
<td>NHTSA</td>
<td>7/1/2003</td>
<td>6/30/2004</td>
<td>A. Litsky</td>
<td>$182,095</td>
<td></td>
<td>Pending</td>
<td>Orthopaedics/BME</td>
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<tr>
<td>744799</td>
<td>Biomedical Engineering Graduate Student Support</td>
<td>Cleveland Clinic Foundation</td>
<td>7/1/2003</td>
<td>6/30/2004</td>
<td>A. von Recum</td>
<td>$100,000</td>
<td>$100,000</td>
<td>Funded</td>
<td>BME</td>
</tr>
</tbody>
</table>

Total BME Research Funded: $9,517,682
Total BME Research Pending: $8,364,560
Total BME Estimated Research for Fiscal Year 2004: $17,882,252
Appendix D

BME Participating Faculty Members
Participating Biomedical Engineering Faculty

Hojat Adeli, Professor, Biomedical Informatics; Ph.D.
James O. Alben, Professor, Molecular and Cellular Biochemistry; Ph.D.
Peter Anderson, Associate Professor, Materials Science and Engineering; Ph.D.
Kamran Barin, Assistant Professor, Otolaryngology; Ph.D.
Necip Berme, Professor, Mechanical Engineering; Ph.D.
David Beversdorf, Assistant Professor, Neurology; M.D.
Philip F. Binkley, Professor, Cardiology; M.D.
Thomas E. Blue, Professor, Mechanical Engineering; Ph.D.
Kim L. Boyer, Professor, Electrical Engineering; Ph.D.
Martin Caffrey, Professor, Chemistry; Ph.D.
Jeff Chalmers, Professor, Chemical Engineering; Ph.D.
Shive Chaturvedi, Associate Professor, Civil Engineering; Ph.D.
David Clark, Associate Professor, Cell Biology, Neurobiology and Anatomy; Ph.D.
Bradley D. Clymer, Associate Professor, Electrical Engineering; Ph.D.
A. Terrence Conklin, Professor, Mechanical Engineering; Ph.D.
Roger A. Crawfis, Associate Professor, CIS; Ph.D.
Frederick Davidorf, Professor, Ophthalmology; M.D.
Roger Dzwonczyk, Assistant Professor, Anesthesiology; M.S.
Osamu Fujimura, Professor, Speech and Hearing Science; D.Sc.
Reinhard Gahbauer, Professor, Radiology; M.D.
Somnath Ghosh, Professor, Mechanical Engineering; Ph.D.
Ernesto Goldman, Associate Professor, Anesthesiology; M.D.
Deborah M. Grzybowski, Associate Professor, Ophthalmology; Ph.D.
Robert L. Hamlin, Professor, Veterinary Biosciences; D.V.M., Ph.D.
Deborah G. Heiss, Assistant Professor, Physical Therapy Division; Ph.D.
Hooshang Hemami, Professor, Electrical Engineering; Ph.D.
Russ Hille, Professor, Molecular and Cellular Biochemistry; Ph.D.
David Huang, Assistant Professor, Ophthalmology, and Staff, Cleveland Clinic; M.D.
Jogikal M. Jagadeesh, Associate Professor, Pharmacy; Ph.D.
William M. Johnston, Professor, Restorative Dentistry, Prosthodontics, and Endodontics; Ph.D.
Steven E. Katz, Associate Professor, Ophthalmology; M.D.
P. Ewen King-Smith, Professor, Optometry; Ph.D.
Michael Knopp, Professor, Radiology; Ph.D.
Periannan Kuppusamy, Associate Professor, Internal Medicine; Ph.D.
John J. Lannutti, Associate Professor, Materials Science and Engineering; Ph.D.
Larry Laskey, Associate Professor, Pathology; M.D.
Steven Lavender, Associate Professor; Industrial and Welding Engineering; Ph.D.
Robert Lee, Professor, Electrical Engineering; Ph.D.
Lawrence E. Leguire, Clinical Associate Professor, Ophthalmology; Ph.D.
Richard Lembach, Professor, Ophthalmology; M.D.
Xiaoping Liu, Assistant Professor, Internal Medicine; Ph.D.
Frederick R. Long, Clinical Associate Professor, Radiology; M.D.
William S. Marras, Professor, Industrial and Systems Engineering; Ph.D.
Aleix M. Martinez, Assistant Professor, Electrical Engineering; Ph.D.
W. Mitchell Masters, Associate Professor, Evolution, Ecology, and Organismal Biology; Ph.D.
Philip T. Nowicki, Professor, Pediatrics and Physiology; M.D.
William S. Pease, Associate Professor, Physical Medicine; M.D.
Kimery A. Powell, Assistant Professor, Radiology, and Staff, Cleveland Clinic; Ph.D.
Pierre-Marie Robitaille, Professor, Radiology; Ph.D.
Joel Saltz, Professor, Biomedical Informatics; M.D., Ph.D.
Kenneth H. Sandhage, Professor, Materials Science and Engineering; Ph.D.
Douglas W. Scharre, Associate Professor; M.D.
Petra Schmalbrock, Associate Professor, Radiology; Ph.D.
Scott Schricker, Assistant Professor, Restorative Dentistry, Prosthodontics, and Endodontics; Ph.D.
William E. Shiels II, Clinical Associate Professor, Radiology; D.O.
Robert H. Small, Assistant Professor, Anesthesiology; M.D.
Philip J. Smith, Professor, Industrial and Systems Engineering; Ph.D.
Robert L. Stephens, Jr., Associate Professor, Physiology; Ph.D.
Richard D. Tallman, Associate Professor, Allied Health and Physiology; Ph.D.
James D. Thomas, Professor, Medicine, and Staff, Cleveland Clinic; M.D.
DeLiang L. Wang, Professor, CIS; Ph.D.
Shang-Tian Yang, Professor, Chemical Engineering; Ph.D.
Jay Zweier, Professor, Internal Medicine; M.D., Director, Davis Heart and Lung Research Institute.
Appendix E

Letters of Support
August 14, 2003

Dr. Andreas F. von Recum, Director
Biomedical Engineering Center
The Ohio State University
270 Bevis Hall
1080 Carmack Road
Columbus, OH 43210-1002

Dear Dr. von Recum:

Your application for departmental status within the College of Engineering has been reviewed. This application has been long expected by many and it is good to see that you are moving forward with it.

There appears to be no academic overlap with our field, but there be many possible synergies that I hope will continue to develop between Engineering and Veterinary Medicine. On and off there has been much collaboration between BME faculty and VME faculty. An example of this would be Dr. Hamlin, whose expertise in cardiovascular physiology has been of help to your faculty and graduate students for a very long time and who may have in return benefited from your faculty’s instrumentation expertise. Similarly, I hope that your tissue engineering, micro-machining, biomaterials, and imaging expertise might lead to new partnerships with our clinical faculty in gene therapy and other therapeutic and diagnostic applications.

I fully support your application and hope that it will find the campus’ approval. Andreas, it is good to see you at the helm of this effort and I personally wish you success.

Sincerely,

Glen F. Hoffsis, DVM, MS, ACVIM
Dean
August 4, 2003

Dr. Andreas F. von Recum
Director, Biomedical Engineering Center
270 Bevis Hall
1080 Carmack Road
CAMPUS

RE: Department of Biomedical Engineering

Dear Dr. von Recum:

I am writing to express my strong support for the proposal to create a Department of Biomedical Engineering in the College of Engineering. I agree that the creation of a department will be an important step forward, and will substantially enhance our ability to recruit highly qualified students and faculty. A strong Department of Biomedical Engineering will have significant positive impact on the research and teaching missions in the College of Medicine and Public Health, as well as many other sections of the university community.

Sincerely,

Fred Sanfilippo, M.D., PhD
Senior Vice President for Health Sciences
Dean, College of Medicine and Public Health

FS:sl
Columbus, August 15, 2003

Dr. Andreas von Recum
Director, Biomedical Engineering Center
OSU College of Engineering
1080 Carmack Road
Columbus, OH 43210

Re: Proposal Biomedical Engineering Department

Dear Dr. von Recum:

Thank you for your recent invitation to review the founding document for a new Department of Biomedical Engineering (BME) in the OSU College of Engineering. BME has a long history at this university, initially as a graduate program and more recently as an independent but highly interactive academic center. Today, biomedical engineering is the fastest-growing specialty in engineering with an extremely strong demand from students at the undergraduate and graduate level. Many of leading U.S. research universities, for example, Duke U., Johns Hopkins U., U.C. San Diego, or U. Pennsylvania, have already recognized the critical role biomedical engineering will play in society and created relevant independent academic departments. Needless to say, for OSU, the creation of the BME department will be an important step in its strive for academic excellence and on its way to become a national leader as outlined in the academic plan.

The creation of the BME department is indeed essential for OSU. It will be an attraction for many of the best faculty and students in the country. You have developed an excellent plan that can serve BME as the blueprint towards achieving excellence. Please be assured that you will have my full support not only for the creation of the department but also for future plans of collaborative effort between faculty and students in the College of Dentistry and the Department of Biomedical Engineering. I wish you the best of luck with this project.

Sincerely,

Jan Kronmiller, D.D.S., Ph.D.
Dean
August 18, 2003

Dr. Andreas F. von Recum
Director, Biomedical Engineering Center
270 Bevis Hall
1080 Carmack Road
Campus

Dear Dr. von Recum;

This letter is in support of the application of Biomedical Engineering at the Ohio State University to become a department within the College of Engineering.

We have reviewed the materials forwarded to us, and find the arguments in becoming a department to be sound. We also have taken the effort to research other institutions and have found that many Colleges of Engineering at peer institutions either have, or are planning on having, departments similar to what you propose.

The College of Mathematical and Physical Sciences endorses this application.

Sincerely,

Richard R. Freeman
Dean, College of Mathematical and Physical Sciences

Cc: David Andereck
    Joan Herbers
    Michael Hogan
    Robert Perry
August 8, 2003

Andreas F. von Recum, DVM, Dr. med. vet., PhD
Director, Biomedical Engineering Center
270 Bevis Hall
1080 Carmack Rd.
CAMPUS

Dear Dr. von Recum:

The College of Biological Sciences (CBS) appreciates the opportunity to review the Biomedical Engineering Center’s (BME) proposal to gain status as a department. This request is reasonable, and the faculty of CBS see no apparent conflict between BME’s proposal and our College’s existing programs.

Thus, I heartily endorse BME’s request to become a department. I realize the inherent difficulties of operating a graduate program and undergraduate minor in a non-tenure-initiating unit. For BME to change its status from a center to a department should enhance its ability to attract talented and committed faculty and students.

I look forward to seeing the positive impact this change, if approved, will have on your program.

Sincerely,

Joan M. Herbers
Dean
August 8, 2003

Dr. Andreas F. von Recum
Biomedical Engineering Center
270 Bevis Hall
1080 Carmack Road
CAMPUS

Dear Dr. von Recum:

The Department of Food, Agricultural and Biological Engineering supports your application for the status of a Biomedical Engineering Department. As you know, there have been collaborative activities between the Biomedical Engineering Center and our department. We look forward to continued collaboration with you.

I would like to take this opportunity to share with you our current expertise and activities in biological engineering. Our biological engineering emphasizes the studies of interactions among automation/mechanization, biology, environmental factors, and systems analysis/integration aiming at solving problems in agricultural production, food processing, waste treatment & resource recovery, and infrastructure building & human health/welfare. Please encourage your faculty to discuss these activities with any faculty member in our department regarding potential collaboration opportunities.

Thanks very much for the opportunity to make this input in the process of establishing a Biomedical Engineering Department at The Ohio State University.

Sincerely,

[Signature]
K.C. Ting, PhD, PE
Professor and Chair
Department of Food, Agricultural and Biological Engineering
Appendix F

Appointment, Promotion And Tenure Criteria And Procedures
APPOINTMENTS, PROMOTION AND TENURE

CRITERIA AND PROCEDURES FOR THE BIOMEDICAL ENGINEERING DEPARTMENT

Approved unanimously: 09/19/03

Core Faculty of the Biomedical Engineering Center
Signed on behalf of the Core Faculty
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APPOINTMENTS, PROMOTION AND TENURE

CRITERIA AND PROCEDURES FOR THE BIOMEDICAL ENGINEERING DEPARTMENT

1. PREAMBLE

This document is a supplement to Chapter 47 of the Rules of the University Faculty (Additional Rules Concerning Faculty Appointments, Re-appointments, Promotion and Tenure), the Office of Academic Affairs procedural guidelines for promotion and tenure reviews, the Biomedical Engineering (BME) Department Pattern of Administration, and any additional policies established by the College of Engineering and the University. Should these rules and policies change, the Department shall follow the new rules and policies until such time as this document can be updated to reflect the changes. In addition, this document must be reviewed, and either reaffirmed or revised, at least every four years on appointment or re-appointment of the Department Chair. Definitions of terms in this document relating to groups and committees within the BME Department are found in the BME Department Pattern of Administration.

This document must be approved by the Dean of the College of Engineering and the Provost of the University before it can be implemented. It sets forth the Department's mission and, in the context of that mission and the missions of the College and University, its criteria and procedures for faculty appointments, faculty promotion and/or tenure, and rewards including salary increases. In approving this document, the Dean and Provost accept the mission and criteria of the Department, and delegate to it the responsibility of applying high standards in evaluating continuing faculty and candidates for positions in relation to its mission and criteria.

The general criteria specified for appointment, promotion, and tenure consider the traditional areas of teaching, research/scholarship, service, and citizenship/collegiality. An overarching theme of the criteria and procedures set forth in this document is balance among, and integration of, these aspects of faculty performance in the context of maximum impact on the mission of the Department, the College of Engineering, and the University.
2. DEPARTMENT MISSION

The overall mission of the BME Department will be the achievement of excellence in the education of professionals, the dissemination of knowledge and technology, and the development of innovative solutions to problems in the field of Biomedical Engineering.

3. APPOINTMENTS

3.1 CRITERIA: TENURE TRACK FACULTY

Consistent with the goals and mission of the BME Department at The Ohio State University, the criteria for appointment of tenure track faculty must meet high standards of excellence. The expectations for scholarly promise of the successfully-appointed candidate must meet or exceed the Department's official criteria for promotion and tenure. For an appointment at the Associate Professor or Professor levels, the scholarly accomplishments of the candidate must meet or exceed the Department's criteria for promotion to those levels. In general, the successful candidate must demonstrate high promise for performing independent, significant and visible research, excellence in teaching and service, and good Departmental citizenship. The following is a list of criteria that must be met by the successful candidate as determined by the Search Committee and as agreed upon by the Department as a whole:

3.1.1 APPOINTMENT AS A TENURE-TRACK ASSISTANT PROFESSOR

The successful candidate must have an earned doctorate in a relevant field of study, or possession of equivalent experience.

The successful candidate must provide clear evidence of research promise as defined by demonstrated ability to perform, complete and publish a major body of work that is relevant to his/her area(s) of specialization.

The successful candidate must have uniformly outstanding recommendation letters that establish the candidate as one of the top candidates of his/her peer group nationally.

The successful candidate must demonstrate potential for excellence in teaching, and must have excellent communication and writing skills.

The successful candidate must display evidence of potential for good Departmental citizenship.

3.1.2 APPOINTMENT AS ASSOCIATE PROFESSOR WITH TENURE

The successful candidate must meet or exceed the Department’s Criteria for Promotion to
Associate Professor with Tenure.

If the candidate does not currently hold a faculty position, the candidate might not have had the opportunity to engage in teaching or in the training of graduate students, or in independently raising grant support for his/her research program. In this case, evidence of scholarship accomplishments must be presented which demonstrates the candidate's development of a national/international stature in his/her area of research. The candidate's previous research record must be favorably comparable in depth and breadth to that of an Associate Professor within the Department. There should also be a high probability that the candidate will make an effective transition to a faculty position with regard to his/her research program, as measured by relevance to the future of his/her field and by funding potential. There must also be a high potential for success as an instructor at both the undergraduate and graduate levels.

3.1.3 APPOINTMENT AS PROFESSOR WITH TENURE

The successful candidate must meet or exceed the Department's Criteria for Promotion to Professor, with particular emphasis on the requirement that the candidate have national and international recognition as a scholar in his/her area.

If the candidate does not currently hold a faculty position, the candidate might not have had the opportunity to engage in teaching or in the training of graduate students, or in independently raising and continuing grant support for his/her research program. The candidate's previous research record must be comparable in depth and breadth to that of a Professor within the Department. In this case, evidence of scholarship accomplishments must be presented which demonstrates the candidate's development of national/international stature in his/her area of research. There should be strong evidence that the candidate will establish a well-funded, productive, and nationally and internationally-recognized research program that will involve the education and training of Ph.D. and M.S. graduate students. There must also be a high potential for success as an instructor at both the undergraduate and graduate levels.

3.1.4 APPOINTMENT AS ASSOCIATE OR FULL PROFESSOR, WITHOUT TENURE

Appointments at these levels generally entail tenure. However, a probationary period may be granted, according to the Faculty Rule 3335-47-03, by petition of the Department and College, for a period not to exceed four years. It is expected that, during the probationary period, the appointee will satisfy all criteria for the appointment he/she has received.

3.1.5 APPOINTMENT AS INSTRUCTOR

Appointment at the Instructor level should normally only be made if the offered appointment is that of Assistant Professor, with all of the criteria for appointment at that
level being met with the exception that the appointee has not yet completed the Ph.D.
degree at the outset of the appointment. Such an appointment should only be made when
the award of the degree is imminent. Instructor appointments are limited to three years,
with the third year being the terminal year.

3.1.6 APPOINTMENT AS PROFESSOR, ASSOCIATE PROFESSOR, ASSISTANT PROFESSOR, OR
INSTRUCTOR, OF LESS THAN 100% TIME IN BIOMEDICAL ENGINEERING

Criteria for original appointments and re-appointments in this category are the same as
for tenure-track faculty of comparable rank and 100% appointments in the BME
Department. The Department shall be the tenure-initiating unit for core faculty for
appointments of greater than 50%. It may or may not be the tenure-initiating unit for
appointments of less than or equal to 50% in the Department. The Department may not
serve as the tenure-initiating unit for faculty with less than 25% appointments. However,
department-founding, tenured, senior faculty members who had been core faculty in the
BME Center may be grand fathered as core faculty if they so choose, even if they
maintain their TIU unit in another department or have a salary appointment of less than
25%.

3.2 CRITERIA: RESEARCH SCIENTIST AND SENIOR RESEARCH
SCIENTIST

3.2.1 RESEARCH SCIENTIST

The successful candidate must have an earned doctorate and provide clear evidence of
research promise as defined by demonstrated ability to perform, complete and publish a
major body of work that is relevant to his/her area(s) of specialization. In addition to
having authored publications, the successful candidate will have made presentations of
papers to professional societies, and show evidence of fundability.

The successful candidate must have uniformly outstanding recommendation letters that
establish the candidate as one of the top candidates of his/her peer group nationally.

The successful candidate must demonstrate potential for excellence in communication and
writing skills.

The successful candidate must display evidence of potential for good Departmental
citizenship.

3.2.2 SENIOR RESEARCH SCIENTIST

The successful candidate must clearly exceed all of the criteria set forth for Appointment
as a Research Scientist.

The successful candidate must have national and international recognition as a researcher
in his/her area.
Evidence of scholarship accomplishments must be presented which demonstrates the candidate’s development of a national/international stature in his/her area of research. There should be strong evidence that the candidate will establish a well-funded, productive, and nationally and internationally-recognized research program that will involve the education and training of Ph.D. and M.S. graduate students.

3.3 CRITERIA: AUXILIARY FACULTY

3.3.1 VISITING PROFESSOR, VISITING ASSOCIATE PROFESSOR, VISITING ASSISTANT PROFESSOR, AND VISITING INSTRUCTOR

The visiting faculty rank is to be conferred on a person with faculty credentials who typically holds a faculty appointment at another institution. The appointment of the visiting faculty member can only occur if the visiting person will be collaborating with a regular faculty member within the Department. Evidence of the collaboration should be provided in the nominating letter from a core faculty member. Original and subsequent appointments of defined time periods will be at a rank compatible with the person’s qualifications.

3.3.2 LECTURER AND SENIOR LECTURER

The Lecturer position is to be used only when a specific instructional need is identified in the Department. The person appointed to the Lecturer position is expected to have the qualifications to teach the course. Evidence of qualifications includes advanced degrees and/or experience related to the topics in the course.

3.3.3 PROFESSOR, ASSOCIATE PROFESSOR, ASSISTANT PROFESSOR, OR INSTRUCTOR APPOINTMENT, OF LESS THAN 100% TIME IN BIOMEDICAL ENGINEERING

Criteria for original appointments and re-appointments in this category are the same as for auxiliary faculty of comparable rank, with 100% appointments in the BME.

3.3.4 ADJUNCT PROFESSOR, ADJUNCT ASSOCIATE PROFESSOR, ADJUNCT ASSISTANT PROFESSOR, AND ADJUNCT INSTRUCTOR

The adjunct faculty position is a title given to appropriately qualified individuals who provide substantial services to the Department for which a faculty title is needed. These positions are not salaried. Adjunct faculty will work closely with regular faculty in the Department on instructional and/or research activities. In order to receive the adjunct position, there must be a specific need in the Department for a person to perform Departmental duties such as teaching courses, advising graduate students or providing research project leadership, which would bring support to the undergraduate or graduate education program. Adjunct faculty will not, however, be given primary responsibility for advising a graduate student.

The criteria for the adjunct appointment are dependent on the reason for the
appointment. If the person seeks an adjunct appointment for teaching a course, that person must provide evidence that he/she has the capability for good teaching and has a good knowledge of the material taught in the course. Evidence of this includes an advanced degree and/or teaching experience in the subject area. The candidate is expected to demonstrate good communication skills, which can be judged through any appropriate means such as an interview. All candidates for adjunct faculty appointments will present a Department Seminar. If the purpose of the adjunct appointment is for research collaboration and student advising, the criterion for appointment is evidence of research excellence. Some possible means for judging research excellence are publication of books and book chapters, journal and conference publications, letters of recommendation, patents, and experience in performing and directing research within a government laboratory, company or university. The criteria for research excellence should be flexible. For example, the reward systems for researchers in industry do not place the same emphasis on journal publications as is the case for researchers in universities. Therefore, the judgment of research excellence should be on a case-by-case basis.

The rank at which the appointment is made, whether for teaching a course or for advising a student, should be based solely on the record of the applicant.

3.4 CRITERIA: COURTESY APPOINTMENTS

The courtesy appointment is a no-salary joint appointment for regular members of The Ohio State University faculty from other tenure-initiating units. They will be called participating faculty within the BME Department wherein their participation is of vital importance to the mission of BME. The purpose of courtesy appointment is to facilitate research and curricular collaboration between faculty from different departments and to expand the research opportunity for BME students. These appointments will be reviewed on a rotating three-year basis and continuation of the appointment should reflect ongoing contributions to the Department.

3.5 PROCEDURES: TENURE TRACK FACULTY

A Search Committee, appointed by the Department Chair, shall be responsible for conducting searches for new, regular faculty members. The leading candidates will normally be invited to visit the Department to speak with the Department Chair and members of the faculty, and to deliver a prepared lecture at a Departmental Seminar. All faculty members as well as interested students and staff shall be asked to review the candidate’s resume and make pertinent comments to the Search Committee and to the Department Chair. The relevant technical staff of the Department may be asked to provide additional input to the faculty concerning its position with regard to the candidate. The Search Committee will present its recommendations regarding title and tenure to the faculty.

The Department Chair will conduct votes among core faculty members. An offer will be made by the Department Chair only after giving careful consideration to all competing
candidates for the position, and after reviewing the recommendations of the Search Committee, and consideration of the faculty vote. After the successful appointment of a new faculty member, the Department Chair may nominate an appropriate mentor from either the core or the participating faculty ranks to aid the new faculty member with regard to procedures and processes of research, teaching and service within the University.

3.6 PROCEDURES: RESEARCH SCIENTIST AND SENIOR RESEARCH SCIENTIST

A Search Committee, appointed by the Department Chair, shall be responsible for conducting searches for new Research Scientists and Senior Research Scientists. The leading candidates will normally be invited to visit the Department to speak with the Department Chair and members of the faculty, and to deliver a prepared lecture at a Departmental Seminar. All faculty members shall be asked to review the candidate’s resume and make pertinent comments to the Search Committee and to the Department Chair. The relevant technical staff may be asked to provide additional input to the faculty concerning its position with regard to the candidate. The Department Chair will write a letter of recommendation to the Vice President for Research. In this letter, the Chair should request Principal Investigator (PI) status for the candidate. An offer will be made by the Department Chair only after giving careful consideration to all competing candidates for the position and after reviewing the recommendations of the Search Committee and consideration of the faculty input, and only after approval by the Vice President for Research.

3.7 PROCEDURES: AUXILIARY FACULTY

Requests from regular faculty for auxiliary faculty appointments shall be presented to the Chair who will make appointments. These appointments are made for one year at a time and require formal annual renewal if they are to be continued. A request for a continuing appointment must be accompanied by an annual report documenting professional activities and interaction with students and faculty of the BME Department.

3.7.1 VISITING PROFESSOR, VISITING ASSOCIATE PROFESSOR, VISITING ASSISTANT PROFESSOR, AND VISITING INSTRUCTOR

Nominations for appointment to a visiting faculty position are to be submitted, in writing, to the Department Chair by a person holding a regular faculty position in the Department. Normally, this would be the faculty member with whom the visiting faculty member will be working. Final notification of approval will be sent by a letter from the Department Chair to the nominated visiting faculty member and to the regular faculty member making the nomination.
3.7.2 LECTURER AND SENIOR LECTURER

Identification of the need for such a position, and endorsement of an individual to fill the position, will come from the Curriculum Committee, with final written approval by the Department Chair.

3.7.3 PROFESSOR, ASSOCIATE PROFESSOR, ASSISTANT PROFESSOR, OR INSTRUCTOR APPOINTMENT, OF LESS THAN 100% TIME IN BIOMEDICAL ENGINEERING

Original appointments and re-appointments in this category will be handled in the same manner as for regular faculty of comparable rank.

3.7.4 ADJUNCT PROFESSOR, ADJUNCT ASSOCIATE PROFESSOR, ADJUNCT ASSISTANT PROFESSOR, AND ADJUNCT INSTRUCTOR

Each person seeking the position of adjunct faculty must have an advocate who has a regular faculty appointment in the Department. This advocate must detail in writing the specific tasks to be assigned to adjunct candidates during the appointment period. In addition, the home agency of the adjunct candidate must also supply documentation supporting such an appointment. Finally, the candidate must supply a resume.

The Promotion and Tenure Committee will evaluate the adjunct faculty candidate's documentation and make a recommendation to the Department Chair as to the candidate’s suitability for the position and the appropriate rank to be conferred. The Department Chair shall then consult with the regular faculty, and either make the appointment, or reject the candidate’s request. This appointment must be in accordance with the policies and procedures approved by the Office of Academic Affairs. The Department Chair will send letters announcing the decision to the candidate, the internal regular faculty advocate, and the supporting agency.

For re-appointment, the adjunct faculty member must submit an activity report describing the duties performed during the appointment period that relate to the purpose of the original appointment. Additional activities related to the instructional and/or research needs of the Department should also be included in this report. Re-appointment will be based on this report along with reports from both the regular faculty advocate and the supporting agency; the latter must indicate an agreement to continue support for the candidate.

3.8 PROCEDURES: COURTESY (PARTICIPATING) FACULTY APPOINTMENTS

Each person seeking a courtesy appointment as participating faculty must have an advocate who has a regular faculty appointment in the Department. This advocate must provide a letter justifying the need for the courtesy appointment and a resume and any other pertinent information detailing his/her research record. Finally, the participating faculty must have a graduate faculty status M or P.
4. ANNUAL REVIEWS

Procedures for annual reviews of tenure-track faculty are described below. Procedures for tenure-track faculty with appointments of less than 100% in the BME Department are the same if the Department is the tenure-initiating unit, with the exception that the Department Chair will seek input from the Chair(s) of other Department(s) which may be involved. Tenure-track faculty for whom other Departments serve as tenure-initiating units will be evaluated by their tenure-initiation units, with input from the BME Department Chair as appropriate. Also, in all matters involving voting, votes of core faculty members will be counted in full.

4.1 PROCEDURES: PROBATIONARY FACULTY

In order to ensure that probationary faculty are formally aware of the progress of their professional development, during each Spring Quarter they will meet with, and be reviewed by, the Department Chair. Prior to that meeting, they will provide the Chair with a summary of their professional achievements in the Office of Academic Affairs’ P & T dossier format. The past year's activities, the faculty member's strengths and weaknesses, and their progress in professional development will be discussed. A written summary of the meeting will be given to the individual, a copy will be kept on file, and a copy will be forwarded to the Dean of the College of Engineering in accordance with Faculty Rule 3335-47-03 (C)(2). The dossier will also be reviewed by the Department Promotion and Tenure Committee. Their comments will be reported in the Chair's letter.

The Chair’s recommendation to reappoint the faculty member to another probationary year of service is final. Any non-renewal of a probationary appointment (except denial of tenure resulting from review for promotion and tenure) must result from a negative review following the procedures for a fourth year review described below. The Chair may initiate such a review in any year by so notifying the probationary faculty member in writing prior to the end of autumn quarter.

For a fourth year review, material from annual reports, yearly reviews, faculty evaluations of the progress of his/her professional development, and student evaluations of teaching will be considered. To be positive, the fourth year review must amply demonstrate that an untenured faculty member is becoming an effective teacher and developing into a nationally/internationally recognized scholar. It must be concluded that, if he/she continues to develop, there will be a strong case for tenure.

A probationary faculty member eligible for fourth year review is first considered by the Promotion and Tenure (P&T) Committee. The candidate and his/her dossier, including his/her statement of accomplishment, will be reviewed for a recommendation. At the
conclusion of its deliberation, the P&T Committee will prepare a written report for each candidate.

Following the report by the P&T Committee, probationary faculty members being evaluated for fourth year review are next considered by all the tenured core faculty of the Department. A meeting of all tenured core faculty will be held with open discussion of each candidate. Prior to this meeting, the candidate's complete dossier will be available for review by the faculty. At the conclusion of these deliberations, a vote by secret ballot is held on each candidate. The results of these deliberations will be made available to the candidate.

The report of the P&T Committee, modified to reflect the discussion among the tenured core faculty, and the vote of tenured core faculty, act as recommendations to the Department Chair. If the Chair's decision is in disagreement with that of the tenured core faculty, he/she will discuss his/her reasoning with the tenured core faculty. The Chair’s decision will be made known to the candidate. The Chair will forward his/her recommendation to the Dean of the College of Engineering together with the candidate's dossier, the report by the P&T Committee, and the vote of the tenured core faculty. A final decision not to continue appointment after a negative review is made by the Dean after reviewing the dossier, the Departmental faculty vote and the Chair’s recommendation.

A probationary faculty member can request exclusion of time for reasons permitted under the Faculty Rule 3335-47-03. The Department will not require a faculty member to apply for excluded time, nor will a faculty member’s decision to request excluded time prejudice the P&T Committee, the tenured core faculty, or the Department Chair concerning their perception of the faculty member’s performance.

4.2 PROCEDURES: TENURED FACULTY

The Department Chair will meet with each faculty member to discuss that person's work, identify ways in which it might be facilitated or improved, and provide feedback to the faculty member. This will be followed up by a letter to the faculty member from the Chair summarizing the conversation. The letter will include the main points of the conversation, and may be combined with notification of that faculty member’s recommended salary increment for the following year.

4.2.1 DOCUMENTATION

All core faculty members are responsible for providing annual reports to the Department Chair each winter quarter, using the format shown in Appendix A, along with updated curriculum vitae. At a minimum, the annual report shall contain student evaluations of classroom instruction as reflected in SEI reports, peer faculty evaluations, and responses to BME Departmental questionnaires. Contributions to teaching in the form of mentoring
of students or curriculum development should also be documented, along with a self
assessment by the faculty member of his/her teaching activities and philosophy.
Documentation of research activities shall include citations of journal articles and
conference proceedings that appeared during the preceding calendar year; listings of other
publications, and of presentations made during the subject year; and details of externally
funded grants and contracts in force during the year. Professional service activities should
also be included. The annual report will become a part of the faculty member's personnel
file and will be an important part of the salary determination process.

Faculty members are also encouraged, at their option, to document their contributions in
the area of teaching in the form of Teaching Files, as described in Section 6.6.3 and
Appendix B. The Teaching File should be updated once every three years and allows for a
more comprehensive documentation of teaching performance.

5. MERIT SALARY INCREASES AND OTHER REWARDS

Procedures for merit salary increases and other rewards for tenure-track faculty are
described below. Procedures for tenure-track faculty with appointments of less than
100% in the BME Department are the same if the Department is the tenure-initiating
unit, with the exception that the Department Chair will seek agreement from the Chair(s)
of other Department(s) which may be involved. Tenure-track faculty for whom other
Departments serve as tenure-initiating units will be evaluated for merit salary increases
and other rewards by their tenure-initiation units, with input from the BME Department
Chair as appropriate.

5.1 CRITERIA

Merit salary recommendations will be based upon Departmental citizenship, and a
balance of contributions to the graduate and undergraduate academic activities in the areas
of teaching, research/scholarship, and service.

5.1.1 TEACHING

Merit increases will be considered in recognition of excellence in teaching. The diversity
of teaching activities of each faculty member shall be taken into account. Among the
factors to be considered are classroom performance, laboratory and project course
supervision and teaching, program and course development, development of pedagogical
materials, supervision of doctoral, masters' and honors undergraduate students, and
related activities outside the classroom.

5.1.2 RESEARCH/SCHOLARSHIP

Merit increases will be considered in recognition of excellence in research/scholarship
leading to significant publications. Among the factors to be considered are articles

\[100,\]
accepted by, or published in, refereed journals, invited or reviewed conference presentations, research grants, review papers, monographs, and seminar and colloquium presentations, and disclosures of research results for consideration of patenting and licensing.

5.1.3 SERVICE

Merit increases will be considered in recognition of the strength of service to the Department, the University, and the bioengineering profession. In addition to administrative service and service on Department and university committees, other meritorious service includes unusual or difficult special assignments, participation on national and international advisory committees, governing boards, and organization of conferences and workshops.

5.2 PROCEDURES

Annual salary adjustments will be based upon merit as reflected in the yearly contributions of a faculty member to the academic activities of the Department in the areas of teaching, research/scholarship, and service. Since the Department has responsibilities for both graduate and undergraduate educational activities, individual faculty contributions to both areas are evaluated. For a given professional rank, comparative norms of contributions in the areas of teaching, research/scholarship, and service are established by the Department Chair. Annual salary adjustments are based upon such comparative evaluations.

In order to help in evaluations of teaching performance in cases where it is documented by teaching files, the Department Chair may periodically appoint a teaching evaluation panel composed of BME core faculty members, graduate students, alumni and external academics to review the teaching files and issue brief summary reports on the faculty members. The teaching panel shall be convened approximately every three years. A recommended panel membership selected by the Chair on availability is as follows:

- One or more faculty members from the Department, one of whom will serve as Chair of the panel
- One or more alumni employed in industry, who received their M.S. or Ph.D. at OSU and graduated between 5 and 10 years prior to their panel service
- One peer from another academic institution, who may be a participating faculty member in BME
- One representative from the Office of Faculty and TA Development at OSU
- One or more student representatives from the BME graduate student body
After reviewing the annual reports of the faculty members, other relevant documentation, and other pertinent information (equity and market factors, promotions, etc.), the Department Chair will make recommendations to the Dean regarding salary adjustments.

5.3 DOCUMENTATION

It is the responsibility of each faculty member to submit an annual report of his/her activities, as described in Section 4.3. Faculty will also be invited to provide in writing any additional information relevant to salary adjustments. In all cases, it is the responsibility of the faculty member to see that his/her professional achievements are brought to the attention of the Department Chair.

6. REVIEWS FOR PROMOTION AND/OR TENURE

6.1 GENERAL CRITERIA FOR PROMOTION AND/OR TENURE

The BME Department hereby establishes general criteria for promotion and tenure, which are intended to promote the following attributes in terms of faculty performance:

- Excellence in teaching
- Excellence in scholarship
- Effectiveness of service to the academic and professional communities and society
- Responsible departmental citizenship and collegiality in the fulfillment of one’s responsibilities to students and colleagues

Criteria are enumerated below for each of the areas of teaching, scholarship, service, and Departmental citizenship/collegiality. The measures of quality/effectiveness which will be used for evaluation, as well as the manner of documentation of performance, are described in Section 6.6. Though the evaluation of faculty performance shall consider the different aspects enumerated above, it is our intent to consider performance in any of these areas with regard to its relationship to performance in the others. The integration of different aspects of faculty performance to maximize the impact on the mission of the Department and the institution is highly valued, as is balance between contributions in the different areas. For instance, the forging of synergistic links between creative scholarship and effective teaching strengthens both activities, and is consistent with the goal of The Ohio State University to become a premier research institution. We expect also that the balance between contributions in the different areas will vary between different faculty members, given the differences in aptitude, opportunity, and need in the different areas of research and instruction in a field as broad as BME. Evaluation of faculty performance for purposes of tenure and/or promotion shall, therefore, reflect this awareness.
6.1.1 TEACHING

Each faculty member is expected to teach courses at both the undergraduate and graduate levels in consistence with their individual expertise and the needs of the departmental programs. Differences among the different technical areas of the Department, Departmental needs, scheduling matters, enrollment considerations, and other factors are expected to impact the degree of diversity represented in the candidate faculty member's teaching history. Since some of these factors may lie beyond the candidate's control, the candidate's teaching record should exhibit variety subject to these constraints.

The successful candidate for promotion and/or tenure is expected to demonstrate excellence as a teacher in terms of:

- Teaching of undergraduate and graduate courses
- Mentoring of graduate and undergraduate students in research, and academic advising of students
- Curriculum development, including course and lab development
- Involvement in graduate exams, theses, and dissertations, in a capacity other than that of advisor

Evidence of commitment to teaching, and effectiveness as a teacher, should be presented. Student and peer evaluations of teaching are important measures used for evaluation of teaching performance for all faculty. Appropriate documentation of teaching activities is required and is described in Sections 6.6.1, 6.6.2, and 6.6.3.

6.1.2 RESEARCH/SCHOLARSHIP

The successful candidate for promotion and/or tenure is expected to:

- Conduct scholarly research
- Disseminate the research findings and knowledge produced, by contributing to the scientific and technical literature
- Involve graduate students in the research activities
- Attract external funding to support the conduct of the research and involved graduate students

Candidates for promotion at either level must provide clear and compelling evidence that they are building and/or maintaining an active, productive research program, and can be expected to continue to do so. The conduct of the research may involve either the candidate and his/her graduate students primarily, or significant collaboration with other
researchers. In either case, the record must clearly indicate the nature of the candidate's research contributions and his/her scholastic identity. Evidence of accomplishments must be presented which demonstrates the candidate's development of a national/international stature in his/her area of research. Evaluation of the candidate's research/scholarship accomplishments will primarily be based on his/her publication and funding records, and the external peer evaluation letters, which are elaborated upon in Sections 6.6.4, 6.6.5, and 6.6.6.

6.1.3 SERVICE

The successful candidate for promotion and/or tenure is expected to demonstrate a history of effective service, which may include service to:

- Professional societies, and organizations such as funding agencies
- The Department, college, and university communities
- Student groups and organizations
- Other public and private entities beyond the University

Appropriate documentation of service activities is required, using the measures described in Section 6.6.7.

6.1.4 CITIZENSHIP/COLLEGIALITY

The success of an institution's operation depends on the dedication, cooperation, professionalism, ethical behavior, and the collegial attitude of its members. Therefore, it is appropriate to consider the candidate's attitude and performance in fulfilling Departmental and other university-related responsibilities as part of the evaluation, as described in Section 6.6.8. From a somewhat broader perspective, members of the BME faculty are expected to adhere to the Code of Ethics of their professional and or research society.

6.2 CRITERIA FOR PROMOTION TO ASSOCIATE PROFESSOR WITH TENURE

This section describes requirements, in addition to those in Section 6.1, which are specific to promotion to Associate Professor with tenure. The essence of these requirements is that the candidate's performance should provide compelling evidence that he/she will continue to develop professionally, and can be expected to bring credit to The Ohio State University in the future.

6.2.1 TEACHING

The general aspects of teaching effectiveness, as well as measures for evaluation, are
described in Section 6.1.1. Expectations specific to promotion at this level with tenure are discussed here.

Classroom teaching by the candidate should show evidence of commitment to teaching and development as an effective instructor. This may be in the form of good student/peer evaluations and/or a clear trend of consistent improvements in classroom performance. The candidate is expected to have taught both undergraduate and graduate courses if so assigned by the Chair.

The candidate is expected to show evidence of development as an effective mentor of graduate and undergraduate students in research. It is expected that there will be a transient period when the candidate establishes the necessary facilities to support his/her research, establishes his/her identity among graduate students, and attracts student researchers. It is expected that the candidate would have guided several M.S. students to the completion of their theses, and that he/she would have some Ph.D. students well along in their programs of study. It is also expected that the candidate would be serving, or have served in, a number of thesis/examination committees for graduate students advised by other faculty members, especially in the area of the candidate’s research interest.

While there are no specific requirements in the area of curriculum development, candidate contributions that would be valued include the introduction/modification of graduate courses in the area of the candidate’s research interests, and enhancement/revisions of undergraduate courses/laboratories as part of an overall plan of curriculum revision.

6.2.2 RESEARCH/SCHOLARSHIP

While general expectations are elaborated earlier in Section 6.1.2, some aspects specific to promotion at this level with tenure are discussed in this section. The successful candidate is expected to present the evidence of the following characteristics for a well-developed research program: the clear establishment of a research identity; the demonstrated ability to develop graduate students as apprentice researchers and to advise them effectively through the program; the ability to identify and secure funding at some reasonable level to support these research activities and graduate students; and consistency. There must be clear and compelling evidence that the candidate has actively undertaken the building of a research program and will continue to build and maintain that program for the foreseeable future.

The quality and quantity of scientific publications in refereed archival journals will be considered in the evaluation. The quality of the contribution will be regarded highly, while the quality of the journal will be considered as a factor. For a variety of reasons, it is difficult to define a specific number of expected archival publications that would be deemed satisfactory. Yet, the successful candidate is clearly expected to have an average of two refereed publications per year or more at this level. It is both expected and
appropriate that the candidate will include publications co-authored with the doctoral advisor. However, some of the archival publications should be authored by the candidate with his/her own research team members, including graduate students.

It is natural that a transient period will occur as the candidate builds interest in his/her work, acquires and develops graduate student researchers, builds a laboratory, and new collaborations. It is also clear that the significance and duration of such transients is a function of the number of colleagues and the degree of infrastructure in place to support and assist the candidate, according to the research area, upon arrival. Moreover, there is a marked variation in the delay of the peer review process from one journal (or one area) to another. However, once a reasonable period of adjustment is past, the research program of the candidate should begin to produce in a fairly steady manner.

For successful promotion to associate professor with tenure, the Department must be confident that an appropriate scholarly level of performance on the part of the candidate can reasonably be expected to continue. This confidence will derive from such factors as the nature and extent of work in progress, number and status of graduate students under the candidate's direction, funding in place and proposals submitted, and papers accepted and under review. The candidate's own plans for future research directions should also be clear and feasible.

6.2.3 SERVICE

The well-rounded member of the faculty of a premier institution such as The Ohio State University aims to become, is expected to assume a leadership role in his/her research community and its professional activities. While it is understood that junior members of the faculty must wait their turn for some of the responsibilities, the Department does expect to see the evidence of high quality contributions to Department administration and to other areas as defined by the Department; and the candidate's involvement on the national level. Thus, the evaluation of service will encompass administrative and committee service within the university, as well as professional society activities that utilize the candidate's expertise.

6.2.4 CITIZENSHIP/COLLEGIALITY

The successful candidate is anticipated to be a colleague for the rest of the careers of the faculty members in the Department. It is therefore necessary that the faculty member carry out his/her teaching, research, and service activities in a manner that instills in the faculty a high degree of confidence in terms of expectations for future working relationships. The candidate's performance with respect to the citizenship issues outlined in Section 6.1.4 will be evaluated in this context.

6.3 CRITERIA FOR PROMOTION TO PROFESSOR

This section describes requirements, in addition to those in Section 6.1, which are specific
to promotion to the rank of Professor. The essence of these requirements is that the candidate's record is one of excellence in teaching and research/scholarship, and of effective service.

6.3.1 TEACHING

The general aspects of teaching effectiveness, as well as measures for evaluation, are described in Section 6.1.1. For promotion to Professor, the candidate should demonstrate excellence in teaching, as documented by student and peer evaluations. The candidate is expected to have a record commensurate with the duration of his/her employment, with particular emphasis on the period since the last promotion. The candidate is expected to have:

- A record of consistently effective classroom teaching of undergraduate and graduate courses, with particular emphasis on the preceding five years. Measures of quality, which may be used to demonstrate excellence, are the successful use of innovative techniques or third-party evaluations of classroom performance to improve teaching effectiveness, teaching awards for classroom instruction, and variety of courses taught.

- A record of effective mentoring of graduate and undergraduate students in research. The candidate shall have graduated at least some Ph.D. students, and usually, a greater number of M.S. students. Consistency in the area of mentoring students over the period of interest is important, a steady stream of students being indicative of a continuing and sustained effort. It is also expected that, at the time of consideration for promotion, the candidate will have a number of Ph.D. and M.S. students at various stages of their programs of study.

- A record of significant contributions in the area of curriculum development, in the form of development and/or modifications of courses and labs.

- A record of meaningful and consistent involvement in graduate exams, theses, and dissertations, in a capacity other than that of advisor.

6.3.2 RESEARCH/SCHOLARSHIP

While general expectations are elaborated upon in Section 6.1.2, some aspects specific to promotion to Professor are discussed in this section. The candidate should demonstrate, over the duration of his/her research career, excellence in research/scholarship, as documented by external peer evaluations, the publication record, and funding history. The candidate is expected to have:

A record of acknowledged excellence in the conduct of scholarly research. The excellence of the candidate’s research efforts and scholastic accomplishments must be recognized nationally and internationally by acknowledged scholars in his/her area. Such a record is
usually accompanied by a coherent research program, which has produced important results relating to one or a few central research issues of acknowledged significance in the academic community. Furthermore, consistency of the research effort is important as well, it being highly desirable that the candidate maintain an active research program at the time of consideration for promotion.

A record of consistency and excellence in contributions to the technical literature, especially during the period after the last promotion. The candidate shall have produced a significant body of publications in refereed journals, particularly in high quality archival journals appropriate to the research area, refereed conference proceedings, book chapters and other forms. Other measures of the quality, which may be used, include invited talks and research seminars given by the candidate. It is difficult to place absolute numerical requirements on the publication record, given the wide variability in acceptance rates, prestige and visibility within journals and other publications. However, it is essential that the publication record be commensurate with a sustained record of research, and dissemination of research results, over the duration of the candidate’s research career. The publication record in archival journals is of primary importance for promotion to Professor.

A record of excellence involving graduate students in research. This aspect of research/scholarship overlaps with the mentoring aspect of the candidate’s teaching performance, which has been described previously in the document. In addition to the comments relating to graduation of Ph.D. and M.S. students as part of such mentoring, it is expected that the candidate will have co-authored a number of publications with his/her graduate students, and that he/she will have facilitated research presentations by graduate students at technical conferences. Awards and honors secured by graduate students, such as best paper/presentation awards and university/national fellowships based on research progress and results, reflect positively upon the candidate’s involvement of graduate students in research, and will be so treated. Also, honors and fellowships awarded to Ph.D. students after graduation, as well as placement at prestigious institutions, will be similarly treated.

A record of sustained funding at a reasonable level to support the research activities of the candidate. Each faculty member is expected to create and maintain an externally supported research program. The funding history of the candidate, including the seeking of the funding, should be consistent with this requirement, especially for the period since the last promotion.

In addition to demonstrating a record of excellence in the different areas of research/scholarship, the candidate should provide evidence of ongoing research activity in the form of papers in review for publication, continuing grants/contracts, submitted proposals, and Ph.D./M.S. students at different stages in their programs of study.
6.3.3 SERVICE

For promotion to Professor, the candidate faculty member is expected to have compiled a record of effective service, as described below:

A record of effective service to professional societies, and organizations such as funding agencies, often in leadership roles. Such service may take the form of editorships of prestigious journals, conference proceedings, and symposium proceedings; organization and/or Chairing of sessions at/of technical conferences or workshops; committee Chairmanships in/of societies and federal agency committees; service as reviewer of proposals for governmental funding agencies; and as reviewer of conference and journal papers.

A record of effective service to the Department, college, and university, again involving leadership roles often. Service in Departmental committees in leadership roles is expected of the candidate. Service to the Department may also take the form of faculty advising of student groups and organizations by the candidate. It is expected and natural that candidates for promotion at this level would have had significantly more opportunities for service to the college and university, and would have availed themselves of such opportunities.

6.3.4 CITIZENSHIP/COLLEGIALITY

For promotion to Professor, the candidate shall have demonstrated responsible Departmental citizenship and collegiality in the fulfillment of his/her teaching, research, and service responsibilities, in the ways outlined in Section 6.6.8.

6.4 CRITERIA FOR PROMOTION TO SENIOR RESEARCH SCIENTIST

The criteria for promotion from Research Scientist to Senior Research Scientist shall be equivalent to the criteria for promotion to Professor in the BME Department.

6.5 PROCEDURES FOR PROMOTION AND/OR TENURE

Procedures for promotion and/or tenure review are described in this section. In all matters involving voting by tenure-track core faculty, votes of tenure-track core faculty who have appointments of less than 100% in the Department will be counted in full only if the BME Department is their tenure-initiating unit or if they have been core faculty with voting privileges in the BME Center and have transferred into the new BME department as core faculty members with full voting privileges (grandfather clause).

6.5.1 COMPOSITION AND RESPONSIBILITIES OF THE PROMOTION AND TENURE COMMITTEE

The Promotion and Tenure (P&T) Committee consists of all eligible core faculty who are appointed by the Chair and who normally serve three year terms. One of those is appointed as committee Chair. The BME Chair shall also appoint members to the
committee with the rank of professor from the BME participating faculty. These additional members shall represent the respective areas of expertise of the candidates to be evaluated and they serve for that year. This second group of members shall help in the appreciation of the poly-disciplinary nature of BME.

The P&T Committee is responsible for initial screening of candidates for promotion and/or tenure, and for working with the candidates to ensure that their promotion dossiers are complete and in the required format. The P&T Committee, working with the Chair, is responsible for soliciting and collecting letters of evaluation from outside the University, as is required by the review procedure and as described in Section 6.5.2. The Committee is responsible as well for the arrangement of classroom visits for peer evaluation of classroom teaching, as described in Section 6.5.3. Finally, it is the responsibility of the P&T Committee to verify the details of the overall record of the candidate.

The Chair of the P&T Committee is appointed by the Department Chair, and serves as Chair of the meetings of the eligible faculty held to discuss promotion and tenure cases. The P&T Committee Chair is the Procedures Oversight Designee required by the university Guidelines and Procedures document. The eligible faculty consists of all tenured core faculty in the Department, for consideration of cases for promotion and/or tenure at the Associate Professor level. For consideration of cases for promotion to the Professor level, the eligible faculty consists of all of the core Professors in the Department, who, at this point in time are all members of the P&T Committee. The P&T Committee will present an initial report assessing the candidates at the meetings of the eligible faculty, and will revise this initial report to include the comments and assessments made by the eligible faculty at these meetings. The P&T Committee will also be responsible for conducting and reporting the results of voting by the eligible faculty, as required by the promotion and tenure process.

6.5.2 SELECTION OF EXTERNAL REFERENCES

Recognized authorities in the candidate’s area of research, at other peer institutions, will be asked to evaluate the quality of the candidate’s research. Peer institutions include peer universities, national laboratories, and reputable industrial research organizations. It is essential that the credentials of the external references be outstanding, and that they have deep appreciation of the criteria used by major research universities in evaluating research contributions of faculty.

The P&T Committee shall compile a list of five or more external referees. The committee may solicit the input of the Chair and other faculty in compiling this list. The candidate shall also compile a list of five or more external referees. The candidate is offered the chance to view the list compiled by the P&T Committee, and indicate if he/she has objections to any of the persons named in that list. The candidate may object to up to two of the names on the P&T Committee’s list. If there are objections, additional names are provided by the P&T Committee to ensure that there are five or more names in its list.
at the end of this process.

6.5.3 Classroom Visits for Peer Evaluation of Teaching

Student evaluations of classroom instruction will be supplemented by multiple classroom visits to the candidate's classes, in the autumn quarter of the candidate's promotion/tenure review process or the spring quarter of the candidate's fourth-year review process. The visit(s) will be conducted by Departmental faculty who are familiar with the courses involved, at the request of the P&T Committee. The candidate will be informed about the period in the quarter over which the visit(s) will occur. The visiting faculty members shall document their evaluation of the candidate's classroom teaching, using the evaluation form included as Appendix C, supplementing it by additional written comments submitted to the P&T Committee, if necessary.

6.5.4 Departmental Review Procedures

The procedures to be followed for the consideration of candidates for promotion and/or tenure at the Associate Professor level, and for promotion to Professor are similar and are outlined below. The evaluation criteria and expectations are described in Sections 6.1, 6.2, and 6.3.

Procedures for promotion from Research Scientist to Senior Research Scientist will be equivalent to the procedures for promotion to the Professor level in the Department, the only difference being that in this case the recommendation of the Department will be forwarded to the Vice President for Research for final approval.

During the spring quarter of each year, the P&T Committee will review the performance of faculty members with respect to their teaching, research, and service, for purposes of promotion and tenure consideration. Past annual reports from the faculty members, as well as their updated curriculum vitae, shall be used for this purpose. Student evaluations of teaching shall also be used, as well as the Teaching File and its evaluation by the Teaching Evaluation Panel, if available for the faculty member. The P&T Committee shall recommend to the Chair that the faculty members under review either be considered or not considered for promotion and/or tenure the following academic year. For those faculty members not considered for promotion and/or tenure the following academic year, the committee shall provide constructive feedback to the faculty members concerned, with the active involvement of the Chair. In case the P&T Committee is unable to reach a clear consensus on a faculty member, the Chair may call for a meeting of the eligible faculty to provide additional input before proceeding further.

For those faculty members to be considered for promotion and/or tenure, complete dossiers will be compiled by the beginning of the autumn quarter. Appendix D includes the format of the core dossier to be completed by the candidates. The candidates are responsible for the compilation of the dossiers, with assistance from the P&T Committee.
as needed.

External evaluation of each candidate's scholarly work will be requested from authorities in his/her field of expertise. The P&T Committee will select the external references from lists compiled by the committee and the candidate, as described in Section 6.5.2. The completed dossier should contain at least five letters from external references, with more than half of these letters being from persons named by the P&T Committee and the Chair. The P&T Committee should solicit letters from appropriate numbers of references from the two lists, to ensure this result. A sample letter, to be used for requesting external evaluations of the candidate's research, is attached as Appendix E. All letters received in response shall be included in the dossier.

Peer evaluation of the candidate's classroom teaching is based on the completed evaluation forms (Appendix C) used by faculty members for classroom visits, as well as additional comments provided by them. All of the completed evaluation forms, as well as the additional comments provided, shall be included in the dossier.

The candidate's dossier, including his/her statement of research and teaching accomplishments, will be reviewed. At the conclusion of this evaluation, the P&T Committee will draft a document to accompany the candidate's dossier during its consideration by the eligible faculty of the Department. This document shall assess the candidate's performance and record in the areas of teaching, research/scholarship, service, and collegiality.

All the candidates are next considered by all the eligible faculty of the Department. A meeting of all eligible faculty, chaired by the P&T Committee Chair, will be held with open discussion of each candidate. Prior to this meeting, the candidate's complete dossier will be available for review by the eligible faculty. The P&T Committee shall prepare a written report on the candidate discussing the qualifications of the candidate and reflecting the faculty discussion. This report shall accurately characterize the views of the eligible faculty as articulated at this meeting, and will serve as the report of the eligible faculty on the candidate.

The P&T Committee shall conduct a vote of all eligible faculty concerning the promotion and/or tenure for each candidate, by secret ballot. The Committee will forward the report of the eligible faculty, and the recommendation of the eligible faculty as indicated by the results of their vote, to the Department Chair. Normally, a majority of at least two thirds of the faculty casting votes would be considered satisfactory. The Department Chair shall then prepare a separate letter assessing each candidate's performance, and recommending either for or against promotion and/or tenure. The Department Chair will report in this letter the number of votes cast in favor of the promotion and/or tenure, and the number against. The vote of the eligible faculty, and its report, act as recommendations to the Department Chair. If the Chair's decision is in disagreement with that of the eligible faculty, he/she will discuss his/her reasoning with the group.
Consistent with Chapter 3335-47 of the Faculty Rules, as soon as the report of the eligible faculty and the Chair's letter are completed, the candidate should be notified in writing of the completion of the Departmental review and of the availability of the report and the letter. The candidate may provide the Department Chair with written comments on the review for inclusion in the dossier, within ten calendar days of notification of the completion of the review. The P&T Committee and/or the Department Chair may provide written responses to the candidate's comments, for inclusion in the dossier. Only one iteration of comments on the Departmental level review is permitted.

The Chair will forward the candidate's dossier including the report and vote of the eligible faculty, and his/her own letter, along with candidate comments and Departmental responses if applicable, to the Dean of the College of Engineering.

Procedures for appeal of the results of the above review are described in Section 7.

6.6 DOCUMENTATION

It is essential that faculty members fully document their accomplishments relevant to the expectations described in Sections 6.1 and 6.2 of this document for promotion to Associate Professor with tenure, and in Sections 6.1 and 6.3 for promotion to Professor.

The candidate shall provide, in support of his/her case for promotion and/or tenure, a core dossier carefully and accurately completed, following the standard format determined by the Office of Academic Affairs and described in Appendix D. If requested, the candidate should be prepared to supply copies of his/her publications, and original letters of acceptance for publications that are unconditionally accepted without any further revisions, but not yet printed. If requested, the candidate should be able to provide copies of the student evaluations, course syllabi and other appropriate course materials, descriptions of any courses developed, and documentation of awards and citations.

Measures to be used to characterize faculty member performance and record in the areas of teaching, research/scholarship, service, and citizenship/collegiality are described in the following subsections, along with procedures for documentation.

6.6.1 STUDENT EVALUATIONS OF CLASSROOM INSTRUCTION

Student evaluation of classroom instruction is an essential measure of the quality of teaching performance. A mandatory component of such student evaluation is the use of the Student Evaluation of Instruction (SEI) questionnaire (or other equivalent instrument) provided by the Office of the Registrar for each course taught by the candidate faculty member. In considering the student evaluation information, student responses to different questions and the pattern of their responses over all the courses taught by the candidate should be examined, rather than reducing the information to a single number and judging the quality/effectiveness of teaching by that number.
While a faculty member may distribute SEI forms to his/her class, the faculty member may not handle the completed questionnaires. The normal procedure is for a student volunteer to collect the questionnaires and deliver them to the undergraduate/graduate advising office. Faculty members may use Department-approved web-based software packages such as Course Sorcerer to conduct these surveys instead, if class schedules do not permit timely distribution of the forms to the classes. In such cases, the faculty members need to notify the Department Chair or Associate Chair in advance. Faculty members may also use the computer-based surveys in addition to distributing the surveys in class, at their option.

Additional student evaluations of classroom instruction, which are not mandatory, may also be obtained from other sources such as letters from recent alumni who have taken courses from the candidate faculty member. Such letters may be sought in cases where they are deemed helpful to a more complete assessment of teaching performance. All responses to such solicitations shall be considered in performing the assessment, regardless of the nature of the responses.

6.6.2 Evaluations By Peers And Others

Peer evaluation of classroom instruction, and of other aspects of teaching by the candidate faculty member, is mandatory, and will follow the procedures described in Section 6.5.3. The variety of courses taught by the candidate will also be taken into account in this evaluation. Furthermore, successful use of innovative educational techniques to improve teaching effectiveness will be recognized. Peer evaluation of the quality of the candidate's contributions in the following areas of teaching shall also be performed:

- Mentoring of graduate and undergraduate students in research, and academic advising of students.

- Curriculum development, including course and lab development. Examples of contributions in this area are the introduction of graduate courses, significant revision and updating of the undergraduate and graduate curricula, upgrading of laboratory component of courses, and updating of graduate courses by incorporation of research results.

- Involvement in graduate exams, theses, and dissertations, in capacity other than that of advisor. Meaningful involvement implies that the candidate provides appropriate guidance to the graduate students involved, by sharing his/her expertise and perspective.

- Additional measures of the effectiveness of teaching, involving evaluation and recognition by others, including academic peers in some instances, are listed below, and will be used if they are available. By their nature, these measures are not mandatory.
• Authorship of or significant contributions to textbooks, wide use of such texts implying a significant measure of positive peer recognition.

• Teaching awards for classroom instruction.

• Grants for teaching and course development, especially if they involve significant peer evaluation.

• Refereed publications in journals dedicated to bioengineering education.

• Successful and properly documented use of classroom visits by colleagues, or other parties such as the Office of Faculty and TA Development, to improve teaching effectiveness.

• Letters from alumni with graduate degrees, advised by the candidate, commenting on the quality of the mentoring received by them.

6.6.3 Teaching File

The teaching file allows for more comprehensive documentation of teaching performance. It would contain course conduct and student performance information, in addition to student and peer evaluations of the faculty member’s teaching performance, and is described in Appendix B. Faculty members are encouraged, at their option, to use this form of documentation of teaching performance.

6.6.4 Publication Record

The successful candidate’s publication record should document consistency of scholarly endeavor, and be commensurate with that of leading scholars in his/her field, when they were at a similar stage in their careers. While a publication record appropriately consists of several components apart from archival papers, it is the archival journal papers that serve as the foundation on which the remainder of the record should be built and evaluated. Thus, a reasonable representation of the candidate’s work is required to appear in the most reputable journals in his/her research area.

In view of the wide variability in acceptance rates, prestige, and visibility within journals and other publications, it is difficult to define absolute numerical requirements on the publication record. However, it is essential that this record be commensurate with a sustained record of research and dissemination of research results. Collaborative research efforts are encouraged where appropriate. When work is co-authored, the faculty member must be able to indicate what his/her contribution to the work was in terms of both effort and substance.

A complete publication record will include more than archival journal papers. Conference papers (both refereed and otherwise), book chapters, magazine articles, and patents are all
worthy products of the faculty member's research activities. While these are generally considered to be secondary to the archival publications, in some research areas more consideration may be warranted, especially for patents and refereed conference publications. It is important, however, that the conferences should be widely recognized as refereed, selective, and of high quality. The visibility of these conferences as focal points for research in the area must also be established.

The candidate should be able to show that the publication record has been built and/or sustained during his/her tenure at The Ohio State University. Consistent with the Department's educational mission, the publication record of the candidate is expected to have the graduate student involvement. The candidate will also have facilitated research presentations by graduate students at technical conferences.

The quality of the papers, and of the journals in which the papers appear, will be assessed. The external evaluators will also be specifically asked to comment on the quality of the research presented in the papers.

6.6.5 Funding Record

In addition to publications, a productive faculty member is expected to acquire and maintain external resources to support his/her research activities. The external funding should allow the candidate to build the infrastructure to support such activities, eventually generating high quality results. The funding (and the seeking of funding) should be documented as an ongoing, consistent activity. It is recognized, however, that it is the quality of the product and the consistency of the effort that are regarded highly, rather than the amount of funds received.

6.6.6 External Peer Evaluation Letters

External letters will be solicited from recognized authorities at peer institutions and in the candidate's areas of research, for critical evaluation. It is understood that, in addition to universities, peer institutions include reputable government and industrial research organizations.

Measures of research/scholarship accomplishments also include invited research seminars, research awards, and professional honors. Fellowships and honors awarded to graduate students, such as university/national fellowships and best paper/presentation awards, reflect positively upon the candidate's involvement of graduate students in research. The placement of graduated Ph.D. students in prestigious organizations and/or evidence of success of former students reflects favorably on the mentoring they received from the candidate, and on the institution they graduated from. Letters seeking information on the nature of mentoring they received may also be sought from alumni with graduate degrees who were advised by the candidate.
6.6.7 Service Measures

Measures of service to professional societies and organizations include, but are not restricted to, the following:

- Editorships of journals, conference proceedings, and symposium proceedings.
- Organization and/or Chairing of sessions at technical conferences or workshops.
- Leadership roles in societies, including technical committee memberships.
- Service as reviewer of conference and journal papers.
- Service as reviewer of technical proposals.

Measures of service to other public and private entities beyond the University include, but are not restricted to, the following:

- Service on panels and commissions.
- Professional consultation to governmental and educational organizations.
- Service to the Department, College, and University takes the form of participation in committees at these various levels, the significance of the service being greater if the candidate assumes a leadership role. Faculty advising of student groups and organizations by the candidate is also a significant form of service, especially if such advising is shown to contribute to improved effectiveness of operation of these groups.

6.6.8 Manifestation of Citizenship/Collegiality

BME faculty have exposure to and interact with a wide spectrum of patrons beyond students, faculty and administrators within the university. Such patronage usually includes professional engineers, physicians/researchers, public media representatives, and industrial partners to name a few. It is therefore entirely appropriate to consider the candidate’s attitude and professional conduct in the discharge of his/her Departmental (and other university-related) responsibilities as part of the evaluation. It is stressed here that citizenship/collegiality is not a fourth criterion independent of performance in teaching, research, and service, but rather a dimension of performance in each of these.

A good citizen/colleague will:

- Demonstrate prompt and consistent attendance at assigned committee and other Departmental meetings, as well as effective and efficient completion of the work external to the meetings necessary for the committee, or other body, to fulfill its responsibilities.
• Satisfy the need of the Department to participate in activities that reach beyond the Department, such as faculty governance, outreach, and service.

• Treat Departmental staff and faculty with professionalism and respect.

• Treat students with professionalism and respect both in the classroom, and individually.

• Be available for a reasonable period of time each week to meet with students.

• Make good use of Departmental resources.

• Treat members of the public with whom he/she interacts as a representative of the university, professionally and with respect.

• Practice fiscal integrity in all interactions with funding agencies/sponsors and other external patrons.

7. APPEALS (FACULTY RULE 3335-5-05)

Faculty Rule (3335-47-05A) sets forth general criteria for appeals of negative promotion and/or tenure decisions. Further detail on appeals alleging improper evaluation is contained in Faculty Rule 3335-5-05.

8. SEVENTH YEAR REVIEWS (FACULTY RULE 3335-47-05B)

Every effort should be made to consider new information about a candidate's performance before a final decision is made, if the new information becomes available before a decision is rendered. In rare instances, a tenure initiating unit may petition the Dean to conduct a seventh year review for an Assistant Professor who has been denied promotion and tenure. Both the eligible faculty of the unit and the Chair must approve proceeding with a petition for a seventh year review. The petition must provide documentation of substantial new information regarding the candidate's performance that is germane to the reasons for the original negative decision. Petitions for seventh year reviews must be initiated before the beginning of the last year of employment, because the seventh year review, if approved, would take place during the regular university review cycle of the Assistant Professor's seventh and last year of employment.

If the Dean concurs with the tenure initiating unit's petition, the Dean shall in turn petition the Provost for permission to conduct a seventh year review. If the Provost approves the request, a new review will be conducted equivalent to the one that resulted in the non-renewal of the appointment. The conduct of a seventh year review must stand on its own and does not presume a positive outcome. In addition, should the new review
result in a negative decision, the faculty member's last day of employment is that stated in the letter of non-renewal issued following the original negative decision.

A faculty member may not request a seventh year review, appeal the denial of a seventh year review petition initiated by his/her tenure initiating unit, or appeal a negative decision following a seventh year review, since the faculty member has already been notified that tenure has been denied at the conclusion of the sixth year review.
APPENDIX A

ANNUAL REPORT FORMAT

ANNUAL REPORT FOR PROFESSOR (YOUR NAME)

20xx CALENDAR YEAR

RESEARCH ACTIVITIES IN CALENDAR YEAR 20xx (insert appropriate year)

I. Publications

List your publications under one of the four Departmental foci:

Biomaterials and Tissue Science & Engineering

Micro & Nano-Science & Engineering

Biomedical Imaging

If you feel the publication does not belong to any of the three focus areas, please indicate ‘Other’ within parentheses.

a) Editorial Boards

List all editorial board appointments (journal editor or associate editor) that were active at any time during the 20xx calendar year. If the appointment was only active during part of the year, list the date of appointment, or the date of completing the term.

b) Books and Monographs

b1) Books you authored that were in print during calendar year 20xx. Give the authors, title, publisher, edition, year of publication, and number of pages. If the book first appeared during 20xx, give the month of publication.

b2) Books you edited that were in print during calendar year 20xx. Give the editors, title, publisher, edition, year of publication, and number of pages. If the book first appeared during 20xx, give the month of publication.

b3) Book chapters you authored that appeared in print during calendar year 20xx. Give the authors, title, editors, publisher, and page numbers.

b4) New book projects you have under contract with a publisher that were under contract during calendar year 20xx. Give the authors, title, publisher, and expected year of publication.
b5) Book chapters you authored that were accepted for publication during calendar year 20xx. Give the authors, title, editors, and publisher.

c) Journal Articles

c1) Papers that appeared in archival journals. Include only papers that appeared in print during calendar year 20xx. Also, include only those printed in journals with a formal review process. Give authors, title, journal, volume, number, month, and page numbers. Please include the month of the issue since we may have to prepare academic year data from this material.

c2) Papers that were accepted by archival journals. Include only papers for which you received a formal letter of acceptance during calendar year 20xx. Also, include only those accepted by journals with a formal review process. Give authors, title, and journal name.

c3) Papers that appeared in magazines or non-refereed journals. Include only papers that appeared in print during calendar year 20xx. Also, include only those printed in journals or magazines that do not have a formal review process. Give authors, title, journal, volume, number, month, and page numbers.

c4) Papers that were accepted by magazines or non-refereed journals. Include only papers for which you received a formal letter of acceptance during calendar year 20xx. Also, include only those accepted by journals that do not have a formal review process. Give authors, title, and journal name.

c5) Abstracts, and extended abstracts. Include only abstracts that appeared in print during calendar year 20xx. Give authors, title, journal, volume, number, month, and page numbers.

d) Conference Proceedings

d1) Papers that appeared in refereed proceedings. Include only papers that were presented during calendar year 20xx. Also, include only those presented in conferences with a formal review process. Give authors, title, conference, volume, editors (if applicable), month, and page numbers. Please include the month of the conference.

d2) Papers that were accepted for refereed proceedings but have not yet been presented. Include only papers for which you received a formal letter of acceptance during calendar year 20xx. Also, include only those accepted by conferences with a formal review process. Give authors, title, and conference.

d3) Papers that appeared in non-refereed proceedings. Include only papers that were presented during calendar year 20xx. Also, include only those presented in conferences and workshops that do not have a formal review process. Give authors, title, conference,
volume, editors, month, and page numbers.

e) Other Publications

All other publications such as videotapes, web based materials, book reviews, reports etc. Include only material published during 20xx and provide, as nearly as appropriate, the same information as for the above categories.

f) Patents

Patents on which you are listed as an inventor that were granted during calendar year 20xx.

II Presentations

g) Meetings and Conferences

Include only presentations you made yourself, not papers presented by co-authors. Include only presentations made during calendar year 20xx. Give title, conference or meeting and month of the presentation.

h) Workshops and Short Courses

Include only presentations you made yourself, not papers presented by co-authors. Include only presentations made during calendar year 20xx. Give title, conference or meeting, and month of the presentation.

i) Seminars

Include only seminars presented during calendar year 20xx. Give title, location, and month of the presentation.

III Graduate and Undergraduate Students Advised

a) Ph.D. Dissertations completed during calendar year 20xx

Give student's name, dissertation title, program (BME, MSP, One of a Kind etc.), any co-advisors, month of completion, and student's current employment (if known).

b) M.S. Theses completed during calendar year 20xx

Give student's name, thesis title, program (BME, dual BME/CIS etc.), any co-advisors, month of completion, and student's current employment (if known).

c) Non-thesis M.S.'s completed during calendar year 20xx

Give student's name and program and month of completion.
d) Undergraduate honors projects completed in calendar year 20xx

Give student's name, thesis title, and month of completion.

e) Current doctoral students in calendar year 20xx

Give student's name, program, expected quarter of completion, and source(s) of support during calendar year 20xx.

f) Current master's students in calendar year 20xx

Give student's name, program, thesis or non-thesis, expected quarter of completion, and source(s) of support during calendar year 20xx.

g) Current undergraduate honors students in calendar year 20xx

Give student's name and source(s) of any support.

IV Sponsored Research and Development Programs in Calendar Year 20xx

Include only projects that were active during calendar year 20xx. Give project title, principal investigator, co-investigator(s), other investigators, sponsor, amount of current award, start and finish dates of current award.

V Awards and Honors Received During Calendar Year 20xx

Include professional society grade promotions, particularly promotions to fellow grade, as well as awards and prizes. Give the title of the award, society or sponsor and activity for which the award was made, if appropriate. Include also university, college, and Department awards.
TEACHING ACTIVITIES IN CALENDAR YEAR 20xx

I Classroom Teaching Performance

Courses taught in calendar year 20xx

List courses taught including the quarter of offering. If multiple sections of a course were taught by you, indicate the number of sections taught, as well.

b) Student evaluations for courses taught

Attach materials representing student evaluation of classroom teaching in calendar year 20xx. This may include SEI summaries provided by OSU to course instructors. In this context, note that SEI summaries are not available to the Department Chair, unless the instructor chooses to present them. Student comments on the Departmental comment form that is normally distributed with the SEI form are available to the Department Chair and need not be submitted.

c) Third party evaluations of classroom performance in calendar year 20xx (Optional)

Materials relevant here include documentation of consultations with the Office of Faculty and TA Development, or of peer consultation on teaching techniques.

d) Involvement in graduate student exams and theses in capacity other than advisor

List graduate student exams and theses defenses, during calendar year 20xx, in which you participated in a capacity other than advisor or co-advisor.

II Self-Assessment by Faculty Member

This statement should be limited to three pages, and should include the following items as appropriate:

a) Statement of teaching philosophy of faculty member, including teaching goals for the next few years

b) course content modifications or enhancements in calendar year 20xx.

Significant revision and updating of undergraduate and graduate courses, updating of graduate courses by incorporation of research results, introduction of new courses. Introduction of new experiments or laboratory courses. Revision of existing laboratory courses.
c) novelty and innovation in instruction in calendar year 20xx,

d) accommodation of the changing nature of professional practice,

e) measures taken to improve effectiveness of instruction in calendar year 20xx,

III Other Teaching Activities

List the following activities as appropriate:

a) Authorship of textbooks published in calendar year 20xx,

b) conference activities and presentations related to teaching in calendar year 20xx,

c) publications in journals devoted to engineering education in calendar year 20xx,

d) teaching awards and awards for textbooks received in calendar year 20xx,

e) grants for teaching and/or course development in calendar year 20xx.
SERVICE ACTIVITIES IN CALENDAR YEAR 20xx

I Professional Service Activities During Calendar Year 20xx

Include professional society and other professional service activities such as conference Chairpersonships, or organizing/program committee memberships, journals and funding agencies for whom reviewing was done, professional society committees, government advisory panels etc.

II University Service During Calendar Year 20xx

Indicate term since most university assignments are on an academic year basis. Also indicate committee Chair assignments.

a) Administrative assignments in the Department

b) Departmental committees

c) College committees

d) University committees

III Consulting Activities in Calendar Year 20xx

Indicate companies or individuals for whom consulting work was done, and the nature of the work done (e.g. engineering analysis, expert witness, engineering design etc.).
APPENDIX B

THE TEACHING FILE

The teaching file prepared by each faculty member would contain course conduct and student performance information, which would enable subsequent evaluation by members of the teaching evaluation panel. It would also offer an opportunity for self-assessment by the faculty member. These two components are intended to supplement student and peer evaluations of the faculty member and to enable a comprehensive evaluation of teaching performance.

Course conduct and student performance information

The information in this part of the file will include the following:

- Detailed course syllabus, reading assignments etc.,
- Samples of graded student performance (anonymous) in each course:
  - Homework assignments,
  - exams,
  - design projects and project evaluations if applicable,
  - course project reports if applicable,
  - laboratory reports if applicable,
- Distribution of grades assigned to students for courses.

Self-assessment by faculty member (W)

This statement will be limited to three pages, and should include the following items:

- Statement of teaching philosophy of faculty member,
- course content modifications or enhancements over the period covered,
- novelty and innovation in instruction, where appropriate,
- accommodation of the changing nature of professional practice,
- teaching goals for the next 3 years,
- measures taken to improve effectiveness of instruction,
- conference activities related to teaching,
• Publications in leading journals of your primary field of expertise and/or in the field of bioengineering.

Student Evaluation of Instruction
Student evaluation of instruction is an essential part of the evaluation of teaching performance, and the following procedures are proposed:

• Distribution and collection of course evaluation forms will be administered by the graduate studies office. Students will be advised of the importance attached to the process, so that they will be thoughtful in their responses. They will also be advised to respond to the Departmental questionnaire first, so that they can collect their thoughts and impressions before responding to the SEI questionnaire.

• Results from the Departmental questionnaire will be maintained by the Department, as is the current practice, and will be made available to the teaching evaluation panel.

• The SEI report generated by the University will be made available to the teaching evaluation panel.

Peer Evaluation of Instruction
Peer evaluation of classroom instruction and of other aspects of teaching by the faculty member will address the following areas of teaching:

• Successful and properly documented use of classroom visits by colleagues, or other parties such as the Office of Faculty and TA Development, to improve teaching effectiveness.

• Mentoring of graduate and undergraduate students and academic advising of students. One method of evaluating this will be soliciting letters from alumni with graduate degrees and advised by the faculty member, commenting on the quality of the mentoring received by them.

• Curriculum development, including course and lab development. Examples of contributions in this area include: significant revision and updating of the undergraduate and graduate curricula, upgrading of the laboratory component of courses, updating of graduate courses by incorporation of research results, and the introduction of new courses.

• Meaningful involvement in graduate exams, theses, and dissertations, in capacity other than that of advisor. Meaningful involvement implies that the faculty member provides appropriate guidance to the graduate students involved, by sharing his/her expertise and perspective.

• Involvement with undergraduates in research.
- Advising of undergraduate honors theses
- Confidential statements on student preparedness by colleagues who teach subsequent required courses, which will be solicited by the teaching evaluation panel

Evaluations by Office of Faculty and TA Development
Additional measures of the effectiveness of teaching, involving evaluation and recognition by others, including academic peers in some instances, are listed below, and will be used if they are available. By their nature, these measures will not apply to all faculty members.

- Authorship of textbooks, wide use of such texts implying a significant measure of positive peer recognition.
- Awards for textbooks
- Teaching awards for classroom instruction.
- Grants for teaching and course development, especially if they involve significant peer evaluation
- Mentoring of other teachers by providing guidance, sharing notes etc.

Benefits of Review
The results of the teaching evaluation will be used to reward faculty members who excel in teaching. As such, it will be a significant factor in the determination of raises and the promotion process, and it will provide input into various teaching awards (Department, college, university, ASEE). In addition, it will provide relief to some faculty concerns about using student evaluations as the only means of evaluating teaching.

Ultimately, it is hoped to have named professorships for faculty members providing outstanding teaching, and the teaching reports will provide a basis for the selection of the recipients.

The results will also be used for diagnostic purposes to identify problems in teaching. If the problems in teaching effectiveness are general, we will organize workshops through the Office of Faculty and TA Development. If problems are identified with a specific course, the interest area will be asked to propose changes to improve the course. If there are problems associated with the teaching effectiveness of an individual faculty member, the faculty member will be referred to the Office of Faculty and TA Development.

Summary
The teaching file will require each faculty member to assemble appropriate documentation. Much of it will be accumulated over a period of three years. Also, some of the written material will be included in the individual faculty member's annual reports.
and resume. Therefore, creating the teaching file at three-year intervals will involve mainly assembling course material collected annually and editing other material that was provided for annual reports.
APPENDIX C

BIOMEDICAL ENGINEERING DEPARTMENT
CLASSROOM TEACHING EVALUATION FORM

DATE: COURSE: INSTRUCTOR: VISITOR:

The following questions, condensed from the university SEI list, are provided as possible guides for comments. Use the back of the form for additional comments.

Preparation:
Well prepared for class?

Has a thorough knowledge of the subject?

Communication:
Speaks clearly and audibly?

Writing/drawing at the board legible?

Presentation at an appropriate pace/level?

Explanations clear/concise?

Encourages questions/discussion?

Questions answered clearly?

Proportion of basic and applied material appropriate?
Effectiveness:
   Holds class attention?

   Stimulates interests in the subject?

   Has a good relationship with students?

General Comments:
APPENDIX D

Core Dossier Outline
(For the most current version, go to the Office of Academic Affairs web site at http://oaa.ohio-state.edu/handbook/xi_dossier.html)

Biomedical Engineering Center Faculty Evaluation
July 1, 2002 to June 30, 2003

Please note that this evaluation is for one year. Not from date of hire as stated in the University's original dossier.

Faculty Name:

Undergraduate, Graduate, and Professional Courses Taught since Date of Hire

<table>
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<tr>
<th>Quarter</th>
<th>Number</th>
<th>Title</th>
<th>Credit</th>
<th>Enrol.</th>
<th>% taught</th>
<th>Role</th>
<th>Eval?</th>
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1. Involvement in Graduate/Professional Exams, Theses, and Dissertations
   a.) Graduate student programs:
   b.) Noteworthy accomplishments of Graduate Students:
   c.) Senior Honor Theses:

2. Extension and Continuing Education Instruction

3. Curriculum Development since July 1, 2003
   a.) Development of new courses:

4. Brief Description of Approach and Goals of Teaching (Teaching Philosophy)

5. Evaluation of Teaching since July 1, 2003

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<tr>
<th>N =</th>
<th>My rating</th>
<th>Comp. (coll.)</th>
<th>Comp. (univ)</th>
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<td>1. Well organized</td>
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Peer Reviews:

6. Awards and Formal Recognition for Teaching

7. Academic Advising
   Graduate students:
   Undergraduate Honor students:

8. Advisor to Student Groups and Organizations

9. Student Affairs Committees, Task Forces, and Other Student Services

10. Student Services Awards or Formal Recognition

11. Chronological Listing of Books, Articles, and Other Published Papers
   a) books
   b) edited books
   c) chapters in edited books
   d) peer-reviewed journal articles
   e) editor-reviewed journal articles
   f) reviews and abstracts
   g) papers in proceedings
   h) potential publications in review process (authorship, date of submission, journal)
   i) unpublished scholarly presentations
   j) potential publications in review process (authorship, date of submission, journal)
12. Chronological Listing of Creative Works Pertinent to Professional Focus

13. Focus of Research, Scholarly Work, Major Accomplishments, and Plans for the Future

14. Quality Indicators of Research (citations and quality indicators of publications)

15. Research Funding
   a.) Funded research on which I am or was the principal investigator
   b.) Funded research on which I am or was co-investigator
   c.) Proposals for research funding that were submitted but not funded

16. Prizes and Awards for Research or Scholarly Work

17. Editorships or Reviewerships for Journals or Other Publications

18. Offices Held or Service to Professional Societies

19. Consultation

20. Clinical Services

21. Other Professional/Public Service

22. Administrative Service
   a. Departmental committees
   b. College or university committees
   c. Other administrative services to/for the University

23. Major Academic/Professional Awards and Commendations
APPENDIX E

SAMPLE LETTERS TO EXTERNAL REFERENCES <date>

Dear < >

Dr. < > is currently being considered for promotion to the rank of Associate Professor with tenure in the Biomedical Engineering Department at The Ohio State University. It is our practice to request evaluations of the quality of the research of a candidate and of his/her professional standing from recognized authorities in the candidate's field such as yourself.

Our criteria for such a promotion are similar to those of most other research universities. We do evaluate the candidate's achievements with respect to research contributions, teaching performance, and service to the university and the profession. Specifically, I wish to receive your comments regarding Dr. < >'s:

1) Professional reputation;
2) The impact of his/her work and publications;
3) His participation in professional organizations and activities.
4) How you would compare him/her to leading individuals in his peer group?

I am enclosing a copy of < >'s current resume and selected publications. Your discussion of any of these papers that are in your area of expertise would assist this review.

Any additional comments that you may wish to make regarding < >'s professional career would be appreciated. We are constrained by the college and university time schedules for processing promotion requests. Accordingly, I must request your response <date>.

It is my duty to inform you that, under the provisions of the Ohio Open Records Act all documents relating to P&T reviews, including letters of evaluation, are public records. Therefore we are unable to guarantee confidentiality.

I would like to thank you for taking the time to provide us with your opinion in this most important matter. We do recognize the time and effort needed to respond to these requests and we very much appreciate your assistance.

Yours sincerely,
Professor and Chairperson

Enclosures

*136*
<date>

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I would like to thank you in advance for taking the time to provide us with your opinion in this most important matter. We do recognize the time and effort needed to respond to these requests and we very much appreciate your assistance.

Yours sincerely,

Professor and Chairperson

Enclosures
NOTES TOWARD FUTURE REVISIONS: