



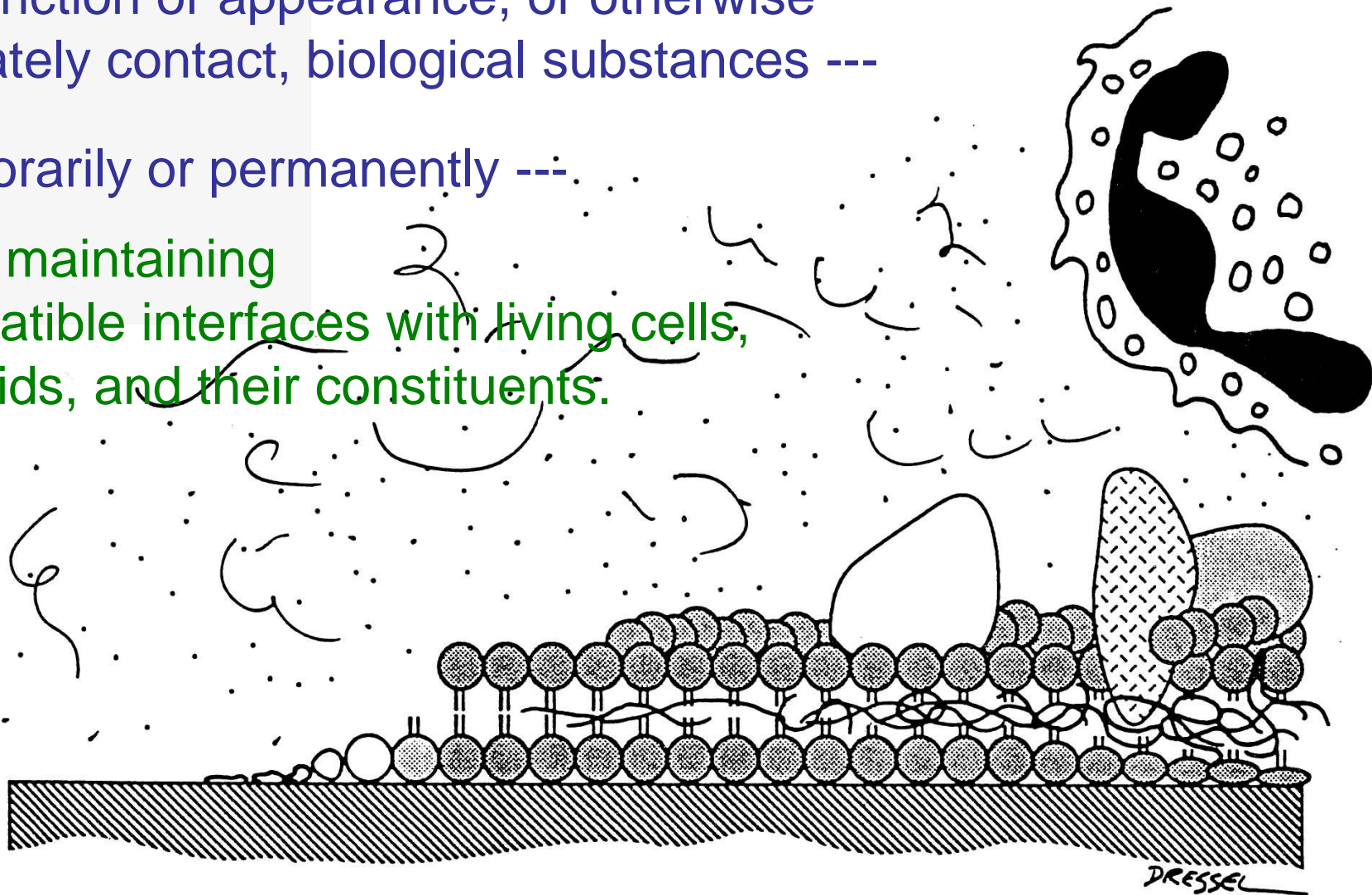
# *BIO* *Materials*

**...an interdisciplinary Masters degree program focusing on the use of synthetic and natural materials in biomedical engineering, dentistry, and environmental engineering**

**Biomaterials** replace, duplicate, or augment the function or appearance, or otherwise intimately contact, biological substances ---

temporarily or permanently ---

while maintaining compatible interfaces with living cells, biofluids, and their constituents.





**Bob Baier**, Mike DuVal, Saravana Karunagaran, Sheela Shrestha, Brindha Subramanian, Meg Martin, Mallika Chary, Payal Shroff, Ranjani Muralidharan, Jim Fick, Sam Mehta, Carrie Buckley, Prashant Nagathan [12sep2003]

m a t e r i a l s   s c i e n c e  
+   b i o m e d i c a l  
e n g i n e e r i n g

***BIO***  ***Materials***

Others areas of biomaterials study and research:

- environmental engineering
- food processing
- sterilization technologies
- biophysics

# Biomaterials Graduate Program: Requirements for M.S. Degree

[minimum: 30 credit hours]



## Core Courses: 12 credit hours

BMA 501 – Biomaterials Sci of Cell-Surface Phenomena (3 credit hours)

BMA 507 – Biomaterials Seminar (4 semesters x 0.5 credit/semester)

BMA 513 – Polymeric Biomaterials (3 credit hours)

BMA 520 – Evaluation of Biomedical Materials (4 credit hours)

## Electives: 6 credit hours or more

Selected from other Biomaterials (BMA) courses and from other courses offered at the university. Electives must be approved by Program Director.

Maximum transfer credits from another university: 6 credits.

## Research: usually 6 credit hours or more

BMA 651 – Research

BMA 653 – Thesis Guidance

Approved Application to Candidacy

Approval of Outside Reader

Approved Research Thesis and Successful Public Defense of Thesis

## Continuous Registration and 3.0 Grade Point Average

Example:

## Evaluation of Biomedical Materials course: class project



- Small company platform
- Individual roles in areas outside of existing strength
- Roles include
  - Regulatory Affairs
  - Marketing/Finance
  - Manufacturing
  - Sterilization/Packaging
  - Clinical Trials/Animal Trials
  - Mechanical Testing
  - and others...

**Product:** R&D, Marketing,  
Finance Plan up to product  
launch

# UB's Biomaterials Graduate Students and the Industry/University Center for Biosurfaces

- When they arrive

- chemists
- chem/mech/elec engineers
- biologists
- pre-med
- clinicians
- social scientists

- Where they go when they leave

- **industry** (small; large)
- **professional school**
- **government** (USPTO, FDA)
- **advanced research education** (biophysics, mech. eng.)



- **Science is a knowledge-based industry**
- **Biomaterials is a platform technology**
- **Competence is key**



# Bhavani Venkatachalam – Surface Features Affecting Performance of Temporomandibular Joint Articulations

(2001) Robert Baier, Richard Hall, Anne Meyer

*Outside Reader*: Robert Pilliar, University of Toronto,  
Faculty of Dentistry (Biomaterials)



➔ **16 explanted devices:**

>> polymer-on-metal

>> metal-on-metal

**surface analysis of devices**

& approaches for friction/wear reduction

Ahmad Ekrouf –

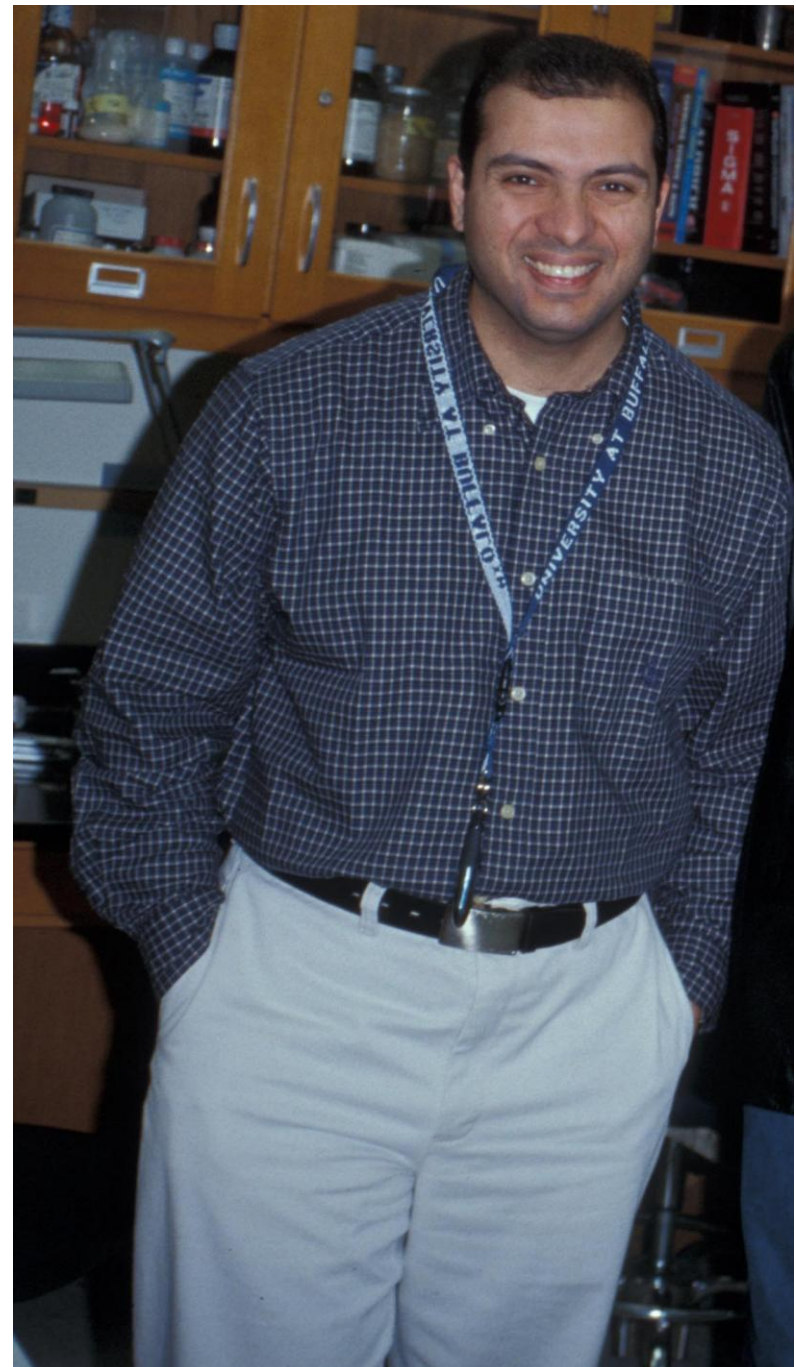
## Influence of the Mode of Sterilization on Surface Reactivity of Glass-Ceramic Tissue Engineering Scaffolds

(2003)

Robert Baier, Rosemary Dziak, Anne Meyer  
*Outside Reader:*

Alexis Clare, NYS College of Ceramics at  
Alfred University, Dept. Glass Science

- 3 “bioactive” glass formulations:
  - particle form (2) [e.g. PerioGlas®]
  - fiber form (1)
- 1 nonabsorbable glass (fiber form)





# invasive species!!

**Robert Forsberg -  
SURFACE CHARACTERIZATION  
OF NATURALLY FORMED  
BALLAST BIOFILMS AND  
DISTRIBUTIONS OF “BENCHMARK”  
BACTERIA  
(2003)**

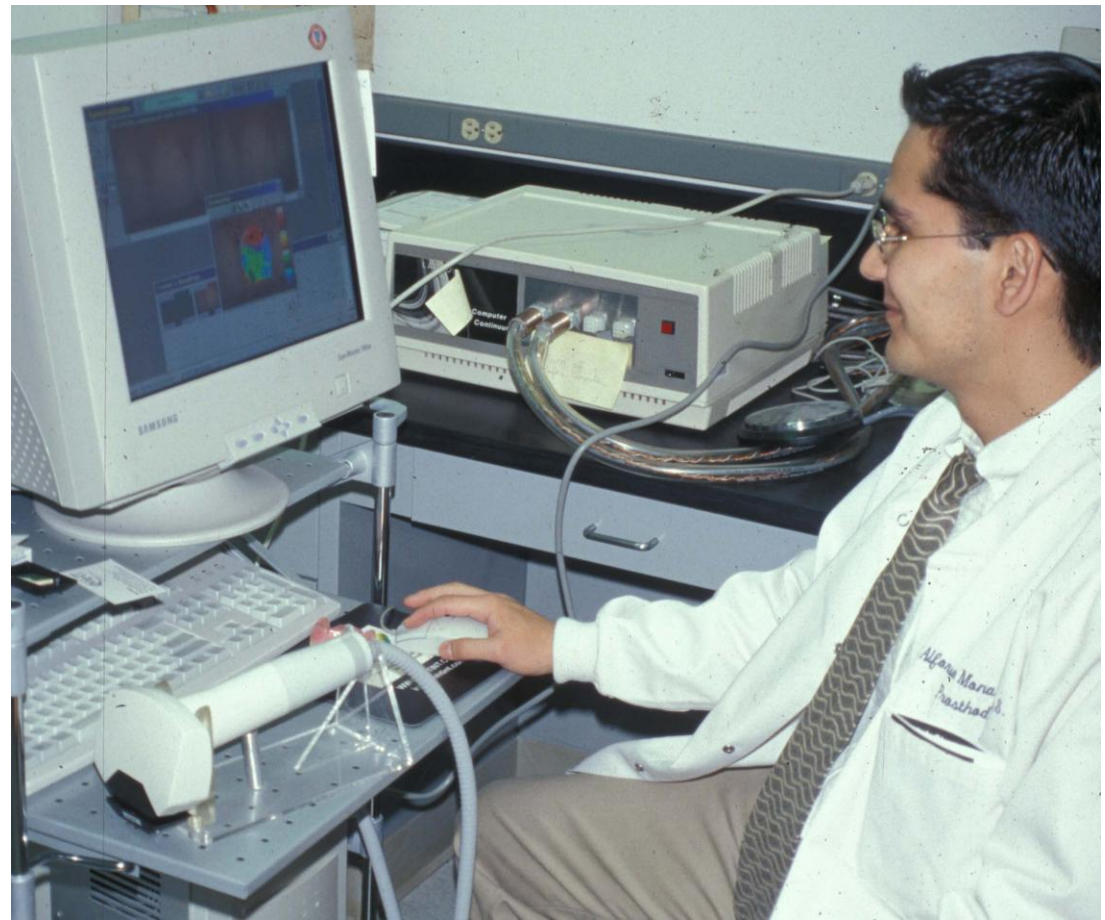
Robert Baier, Joseph Zambon, Anne Meyer  
***Outside Reader.***

Hermann Gucinski, USDA Forest Service,  
Southern Research Station

Alfonso Monarres

Surface Features  
Affecting Color  
Stability of  
Dental Composite  
Restorations

ATC approved,  
second complete draft  
of thesis in review



Robert Baier, Fred McIntyre, Thomas Mang, Ellen Vossler

*Outside Reader:* Francisco Imai, Rochester Institute of Technology,  
Munsell Color Science Laboratory



# **BIO/Materials**

*...where materials science  
and bioengineering meet!*

*lipids, carbohydrates,  
proteins,  
micro- and  
macro-organisms*

*cell adhesion  
biofluids, biofilms*

*biophysics*

*surface modification*

*biocompatibility*

*implants*

*sterilization tech.*

*drug delivery*

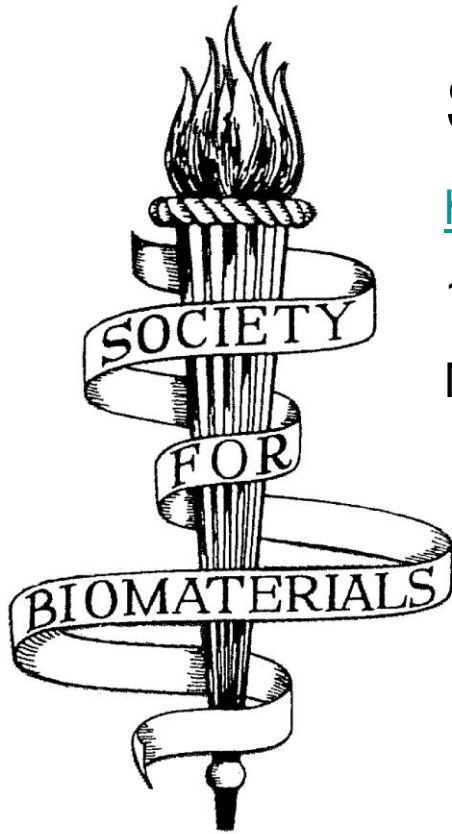
*tissue scaffolds*

*polymers, metals,*

*prosthetics*

*regulations*

*ceramics*



# Society For Biomaterials

<http://www.biomaterials.org>

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Industry/University Center for Biosurfaces,  
and Biomaterials Graduate Program  
University at Buffalo

