



# International Union of Pure and Applied Physics

To stimulate and facilitate international cooperation in physics and the worldwide development of science.

- **Meeting of the Nanoscience Working Group in Szeged, will take place on Sept. 7 – 8.**
- **Thursday afternoon Sept. 7 at 2:00  
Room 48, Administration section  
Institute of Biophysics.**
- **Thank to IUPAP, and to its Nanoscience Working Group.**

**Dr. Malik MAAZA**  
**NANOAFNET**  
**Chairman**

**Prof Aboubaker Chedikh BEYE**  
**NANOAFNET**  
**Vice-Chairman**

*Strengthening international science for the benefit of Society*

**Second Regional Consultative Forum  
25 – 27 September 2006 / South-Africa**

**ICSU Strategic Plan of 2006 –11 : the needs of Africa,  
four priority areas identified by The ICSU Regional  
Committee for Africa (Prof Sospeter Muhongo)**

- (a) Health and Human Well-being;**
- (b) Sustainable Energy;**
- (c) Natural and Human-induced Hazards and Disasters;**
- (d) Global Change.**

**Ensure that Nanoscience and Lasers are in all these topics**

**Four Scoping Groups, composed of leading African scientists and engineers, are currently preparing science/work plans on each of these priority areas.**



**Global School for Advanced Studies**  
Training Global Leaders in Science and Engineering

## **Want to perform Advanced Solar Cell Research?**

**Full financial support available!**

**Apply Now as a  
GSAS Scholar!**  
*For advanced graduate students  
and postdocs*

**GSAS Session on Advanced Solar Cell Research**

**Hsinchu and Taipei, Taiwan  
September 19-29, 2006**



Mrs Gugu Mholongo Msc. student from UNIZUL will be attending on the basis of our Dye-Solar Cell Project<sup>3</sup>

## GSAS Fellows: the following experts will serve as lecturers & mentors

- Allan Barnett, *University of Delaware (US)*
- Andreas Hinsch, *Fraunhofer Institute for Solar Energy Systems (Germany)*
- Hwei-Liang Huang, *National Tsing Hua University (Taiwan)*
- Antonio Luque, *Instituto de Energia Solar, Universidad Politecnica de Madrid (Spain)*
- Bruce Parkinson, *Colorado State University (US)*
- Wei-Fang Su, *National Taiwan University (Taiwan)*
- Masafumi Yamaguchi, *Toyota Technological Institute (Japan)*  
...and others to be announced.

## Online Application:

<http://www.gsasprogram.org>

**About GSAS:** GSAS develops global leadership capabilities in young researchers from around the world and establishes global scale research collaborations in critical global challenge areas like energy, environmental protection, and health care. GSAS is funded and operated by international partners.

## Program Highlights:

- Attend a 10-day GSAS Session in Taiwan with lectures in advanced solar cell research, design, manufacturing, and policy
- Join a multidisciplinary Global Research Team to plan a Solar Cell Research project
- Get Expert Mentoring from world-class researchers, industry planners and policy makers
- Compete for a 1-year Team Research Fellowship in Taiwan!

### GSAS is a joint initiative of:



### Sponsored by:



### Contact Information:

[mri@northwestern.edu](mailto:mri@northwestern.edu)



**MATERIALS RESEARCH INSTITUTE**  
NORTHWESTERN  
UNIVERSITY



• International Collaboratives

• Strategic Project Areas

• MWN Component Networks

• Global Research Gallery

• MWN Events

• MWN Partners

**A Symposium of the XIV International Materials Research Congress  
Materials World Network: The Next Ten Years  
In Celebration of the 10th Anniversary of the MWN  
Cancun, Mexico, August 22, 2005**

### Sponsors



[Home](#) • [Program](#) • [Presentations](#) • [Strategic Planning](#) • [Participants](#) • [Photo Gallery](#)

## Program

- 8:30 – 9:00 Opening Remarks**
- Pedro Hugo Hernandez Tejeda, President, Academia Mexicana de Ciencia de Materiales (MRS-Mexico)
  - Jaime Parada Avila, General Director, CONACYT (Mexico)
  - Arden Bement, Jr., Director, National Science Foundation (USA)
- 9:00 – 10:30 Historical Background: Development of the Materials World Network**
- Chair:** R.P.H. Chang, Northwestern University (USA)
- Remarks by Tom Weber, Director, Division for Materials Research, National Science Foundation (USA)
- Overview:** R.P.H. Chang, Northwestern University (USA)
1. Saltillo, Mexico –
    - Mario Lamarca, National Science & Engineering Research Council of Canada (Canada)
    - Miguel Jose Yacamán, University of Texas Austin (USA)
  2. Leuven, Belgium – Horst Czichos, TFH Berlin, University of Applied Sciences (Germany)
  3. Rio de Janeiro, Brazil – Guillermo Solorzano, Brazilian Materials Research Society (Brazil)
  4. Hawaii – Jim Williams, Australian Materials Research Society (Australia)
  5. Pretoria, South Africa – Aboubaker Beye, African Materials Research Society (Senegal)
- 10:30 – 11:00 Keynote Lecture: Materials Science and its Evolution in this Century: One Perspective**
- Praveen Chaudhari, Director, Brookhaven National Laboratory (USA)
- 11:00 – 11:30 Break**
- 11:30 – 12:00 Current Status of the Materials World Network: Programmatic Partnerships**
- Carmen Huber - National Science Foundation (USA)
1. Americas – Colaboracion Interamericana en Materiales (CIAM)
  2. Europe - NSF-Europe and NSF-EC Collaboration in Materials
  3. Africa / Asia - joint programs under development
  4. International Materials Institutes
- 12:00 – 13:30 MWN Success Stories: Global Collaborations in Research and Education**
- Wole Soboyejo, Director, IMI, Princeton University (USA)
  - Luis Fuentes, Centro de Investigación en Materiales Avanzados (Mexico)
  - Thierry Cardinal and Kathleen Richardson, University of Bordeaux (France) & Clemson University (USA)
  - Orlando Auciello, Argonne National Laboratory (USA)
  - Hideomi Koinuma, National Institute for Materials Science (Japan)

SEARCH

NSF Web Site



AWARDS DISCOVERIES NEWS PUBLICATIONS STATISTICS ABOUT FastLane

AWARDS DISCOVERIES NEWS PUBLICATIONS STATISTICS ABOUT FastLane

[Division of Materials Research](#)

## Materials World Network: Cooperative Activity in Materials Research between US Investigators and their Counterparts Abroad (MWN)

CONTACTS

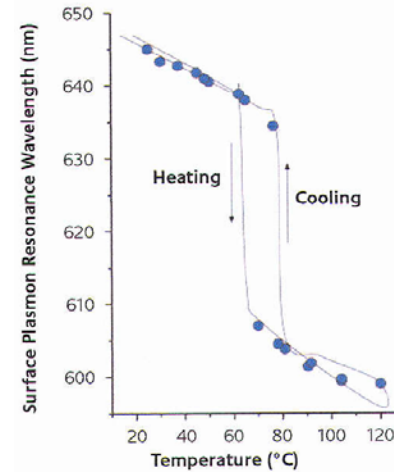
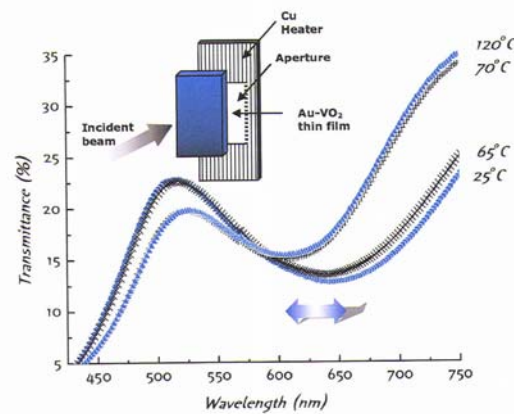
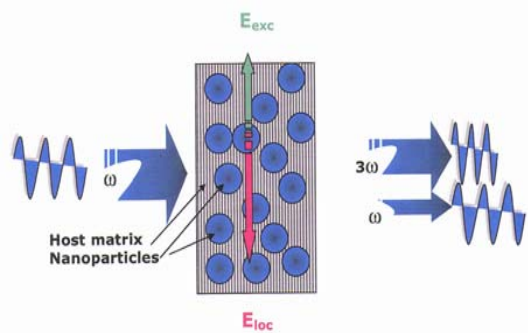
Name	Email	Phone	Room
<b>Dr. Carmen Huber</b>	<a href="mailto:chuber@nsf.gov">chuber@nsf.gov</a>	703-292-4939	<b>Office of Special Programs</b>

Contacts at other organizations:

Contact information in participating countries or regions is provided for the convenience of researchers in those countries or regions. Questions from US investigators should be directed to NSF.

Inter-American Materials Collaboration (CIAM) Contacts:

ARGENTINA **Consejo de Investigaciones Científicas y Técnicas (CONICET)**  
<http://www.conicet.gov.ar/>  
 Rivadavia 1917, 1033 Buenos Aires  
 Dr. Jorge Tezón, Sub Gerente de Fomento Científico y Tecnológico  
 Tel.: 54-11-4951-4673, Fax: 54-11-4953-7483, [jtezon@conicet.gov.ar](mailto:jtezon@conicet.gov.ar)



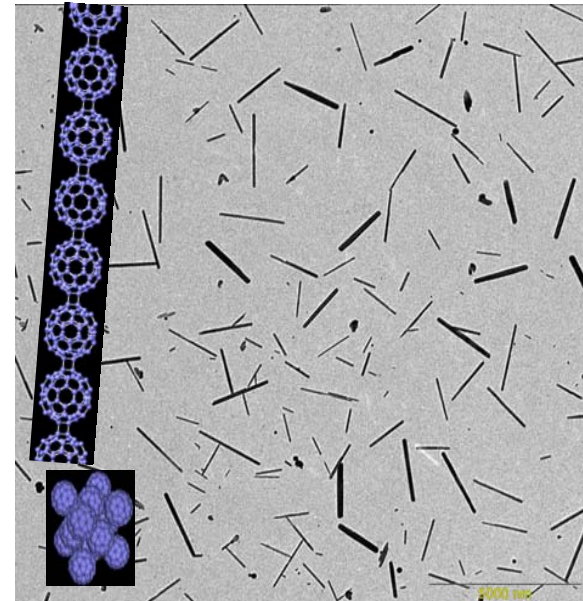
*illustration of a composite nanoplasmonic consisting of metallic nanoparticles embedded in a dielectric host matrix. At the vicinity of the corresponding plasmon frequency, the local field  $E_{loc}$  is enhanced relatively to the excitation electromagnetic field  $E_{exc}$*

*Optical transmission of Au-VO<sub>2</sub> nanoplasmonic structure onto Corning glass substrate below & above the transition temperature  $T_c \approx 68^\circ\text{C}$ . The minima in the 600-650 nm range correspond to plasmon absorption of the nano-gold*

**Clear Mention of the Affiliation to the African Laser Centre as well as of the Nelson Mandela--World Bank African Institutes of Science and Technology. He is one of the initiator of the US--Africa initiative in materials sciences. His research encompasses materials sciences and laser spectroscopy.**

- Nanoprocessing by laser ablation
- Nanophotonics for VIS-IR modulation
- Nano-plasmonics for tunable ultrafast optical switching
- Nanomaterials for solar energy applications
- Nano-TCOs

- Nano-TCOs
- Nano-materials based Carbon
- Nanopolymers & Ultra-porous polymers
- Nano-porous & Nanohybrids materials







## **Proposed Agenda, Room 48, Administration Section Institute of Biophysics, Temesvari krt 62, Szeged Hungary (follow-up)**

### **6. Commission Report Updates**

- a) C15 At. Mol. Opt. Phys. W. v. W.
  - b) C3 Stat. Phys. A. Hansen
  - c) C5 Low Temp. Phys. M. Paalanen
  - d) C6 Biological Phys. P. Ormos
  - e) C8 Semiconductors P. Hawrylak
  - f) C9 Magnetism D. Dahlberg
  - g) C10 Condensed Matter M. Tegze
  - h) C17 Quantum Electronics R. Slusher
  - i) C20 Computational Phys. R. Nieminen
- 7. Recommendation for Future Nanoscience Meetings
  - 8. Terms of Working Group Members
  - 9. Other Business

**NANO AND LASERS ALL ACROSS THESE DISCIPLINES**

### *U.S.–Africa Advanced Studies Institute on Photon Interactions with Atoms and Molecules: Report on Materials Activities*

*Alfred Z. Msezane, Aboubaker C. Beye, and Uwe Becker*

#### Overview

The U.S.–Africa Advanced Studies Institute on Photon Interactions with Atoms and Molecules, held in Durban, South Africa, November 3–12, 2005, brought together approximately 60 advanced graduate students and postdoctoral researchers and 20 lecturers from the United States, Africa, and Europe. The African participants came mainly from the institutions that constitute the African Laser Centre (ALC), a virtual center of excellence that links scientists and laser facilities in six African nations; it is one of the strongest combinations of human and physical infrastructure for science in Africa.

The general theme of the intensive set of lectures was light–matter interactions, incorporating various fields being

studied in the United States and Africa, including atomic, molecular, and optical physics; physical chemistry; and materials science. The lectures addressed the most recent findings in these fields, as well as the theoretical, computational, and experimental tools that will be key to future advances. However, this report focuses only on the materials aspect of the institute: new materials creation, probing and applications.

The institute provided excellent scientific training for young American and African scientists and also helped establish an international network of collaborating scientists, linked through the ALC. Among the positive impacts on Africa were the enhancement of work on industrial and medical applications of photon interactions and acceleration of research on cheaper

## NATIONAL PROGRAMS

### *The Nanosciences African Network: NANOAFNET*

*M. Maaza and A. C. Beye*

#### **Introduction**

The Nanosciences African Network (NANOAFNET), modeled along the lines of the African Materials Research Society (AMRS) and the African Laser Centre (ALC), is an initiative consisting of four regions: North, South, East, and West. It represents a wide multidisciplinary approach to materials science and engineering, as well as the design of novel processes and miniaturized devices. The Materials Research Group iThemba LABS, a large national research facility in South Africa with worldwide memoranda of agreement, represents its geographical central node. NANOAFNET's main aims are to exploit nanoscience for cost-effective and easy implementation of nanotechnologies compatible with African needs, and to enhance the international visibility and capacity of African scientific contributions through world-class research in nanoscience and related technologies.

# ENSURE THAT LASERS ARE COMPREHENSIVELY TAKEN INTO ACCOUNT INTO OUR CURRICULA



## African Association for Teacher Education

**Dr Maureen Killeavy of the UCD School of Education and Lifelong Learning, President of the Association for Teacher Education in Europe, recently headed up a European Delegation to the Constitutive Conference 2006 to establish an African Association for Teacher Education, held at the University of Dakar, Senegal.**

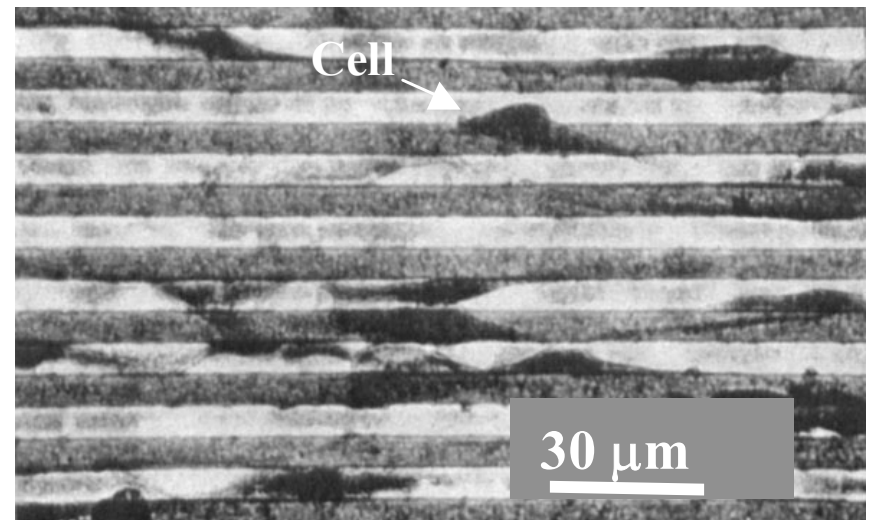
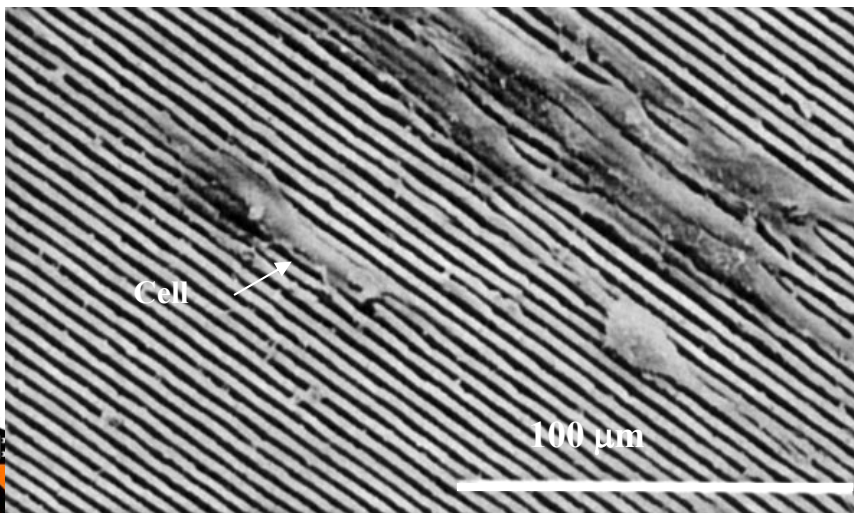
The signing of the constitution and protocol was an event of major significance for education systems in Africa and a truly global gathering of the leaders of research and development in teacher education. It is hoped that these various regional Associations will form a worldwide network on teacher education. The involvement of a UCD academic in these historic developments was a first for a European educator.

*Signing the new constitution and the protocol: (Left to right) Dr Maureen Killeavy, President, Association for Teacher Education in Europe, Senior Research Fellow, UCD School of Education and Lifelong Learning; The Professor of Pedagogy, University of Dakar, representing African institutions; Professor Aboubaker Chedikh Beye, Assesseur de La Faculté des Sciences et Techniques, Université Cheikh Anta Diop de Dakar, ECAD, Senegal; Professor P Rudy Mattai, SUNY Buffalo, New York, President, Association of Teacher Education of America*



# Micro-Groove Geometry and Cell/Surface Interactions

- Cells can undergo contact guidance when in contact with micro-grooved geometries
- This depends on the size of the grooves relative to the size of the cells
- Contact guidance has implications for wound healing and scar tissue formation



# SHEAR ASSAY MEASUREMENT OF CELL ADHESION

- Shear stress for detachment is given by

$$\tau = \frac{6Q\mu}{wh^2}$$

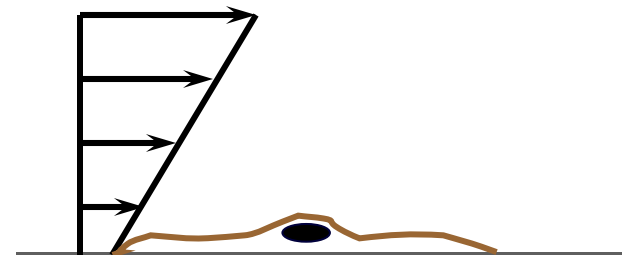
- Where  $Q$  - flow rate &  $\mu$  -dynamic viscosity

- Considering initial onset of detachment to correspond to "adhesion" strength:

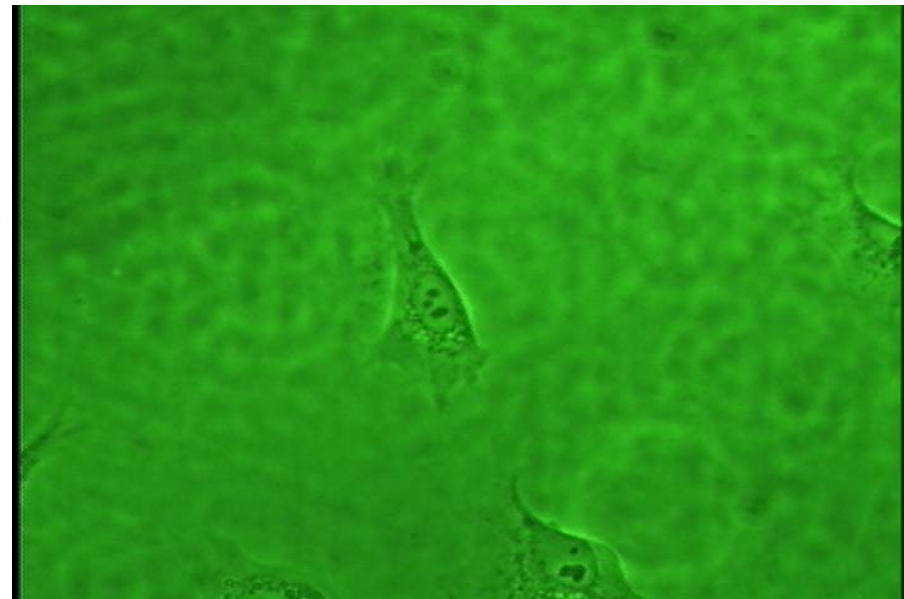
- $\tau = 41 \pm 8$  Pa Polystyrene (PS)

- $\tau = 61 \pm 8$  Pa Ti Coated PS

## Shear Flow Schematic

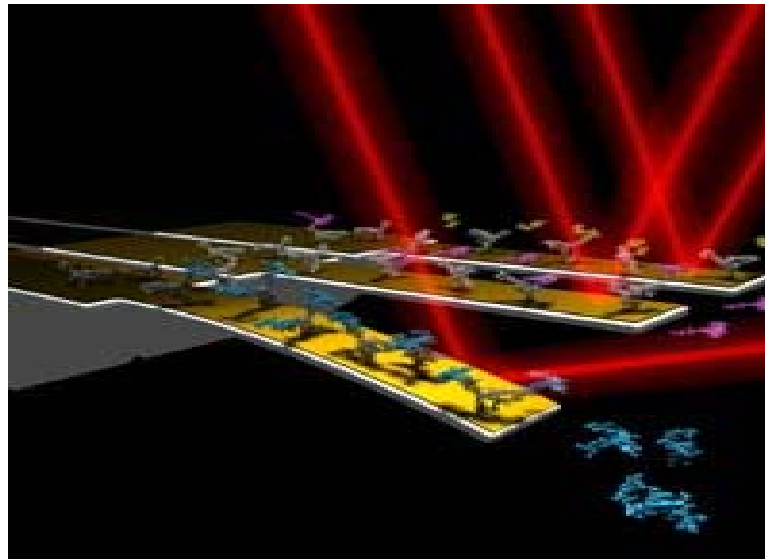


## Cell Detachment



# Antibody/Antigen Interactions

- Antibody/antigen interactions cause surface stresses to develop
- These surface stresses are the result of new conformations of molecular structures at the surface
- Interactions between Vimentin antibodies and antigens gives rise to surface stress and cantilever deflection



# THE FUTURE OF CANTILEVERED BIOMEMS STRUCTURES – BIOMOLECULAR DETECTION

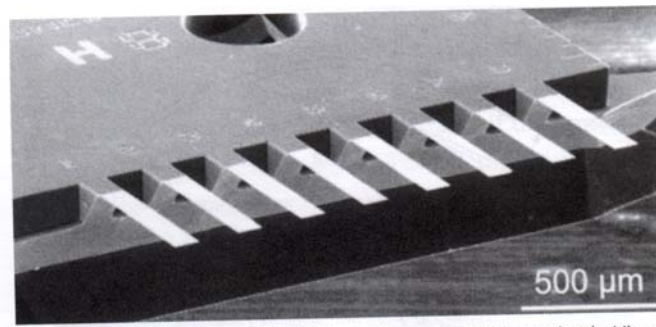
- Research will lead to future cantilevered bioMEMS structures
- Devices may be resonating devices for improved sensitivity
- However, non-resonating devices can also be used
- Multifunctional structures emerging with multiple cantilevers

## Functionalized Cantilever

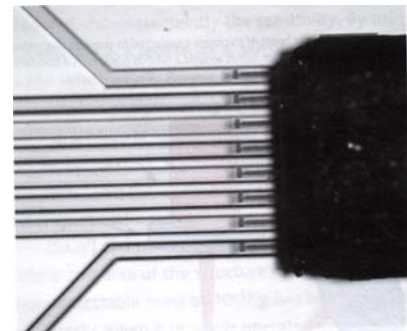


- DNA
- Folic Acid
- Antibodies

## Microcantilever Array



## Packaging







# Our Approach to Early Cancer Detection and Treatment!

A novel use of magnetic fields and magnetic particles to deliver therapeutic drugs at the desired time in the correct dosage to the correct site in the human body.

