

# NANO NEWS - SOUTH AFRICA

Volume 11, December 2010

*Edited by Patience Iyuke*

*Co-edited by Neil Coville*

2010 is now almost behind us. Hopefully it has been a good year for our readers and an even better year lies ahead. Our bi-annual SANi event takes place in 2011 and it will be interesting to see the new developments that have occurred since SANi commenced. The event provides chemists, physicists and engineers an opportunity to get together. It is these interactions that have the potential to lead to cross fertilization of ideas in science and engineering.

Patience and I wish you all a wonderful Festive Season and hope you all come back refreshed and ready to take on the challenges of 2011

**Neil Coville**

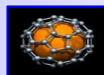
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## Webster Memorial Seminar on Nanotechnology

A seminar to pay tribute and remember the excellent work of Prof. Ian Webster in the area of toxicology was held on the 10th of November 2010, at National Institute for Occupational Health (NIOH), Johannesburg. The seminar, entitled "Webster Memorial Seminar on Nanotechnology, Nanoparticles and Nanotoxicology" was organised by NIOH, and drew participants from South Africa, France, the Netherland and the United State of America. The lectures were stipulating and covered the following topics:

- i) DST and Nanotechnology in South Africa (**Dr. Daniel Adams, DST**).
- ii) Nanotechnology Internationally including OECD (**Mrs. Mar Gonzalez, OECD, France**).
- iii) Nanotoxicology and the NIOH: A tribute to Ian Webster (**Prof. Mary Gulumian, NIOH & Wits, SA**).
- iv) Applications of Nanotechnology (**Dr. Robert Tshikhudo, Mintek, SA**).



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- v) Risk assessment and nanotechnology (**Dr. Rita Schoeny, EPA, USA**).
- vi) Assessing occupational health risk of nanofibres-lessons learned from asbestos (**Dr. Eileen Kuempel, NIOSH, USA**).
- vii) Occupational Risk Management Applied to engineered nanomaterials (**Dr. Henri Heussen, Arbo Unie, The Netherlands**).
- viii) Interpreting signatures of common response: What is needed for interpretation for nanoparticle risk assessment? (**Prof. Elaine Faustman, University of Washington, USA**)

For information on the seminar slides or notes, please contact, **Shanaz Shapurjee**, Marketing and Communications Officer at [shanaz.shapurjee@nioh.nhls.ac.za](mailto:shanaz.shapurjee@nioh.nhls.ac.za)

**Patience Iyuke**

## Case Study: South Africa Uses Nanotech against TB



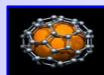
Patients struggle to stick to the routine of taking daily tuberculosis medication for months on end. Andy Crump/ WHO/TDR

**South Africa is using nanotechnology to improve existing tuberculosis drugs. Munyaradzi Makoni looks at a developing country's experience.**

Treating tuberculosis (TB) in developing countries is a problem. Patients struggle to stick to the routine of taking daily tuberculosis medication for months on end — particularly when they must travel long distances for a nurse to ensure they take the drugs. This and the side effects mean many give up before completing the course.

Lack of adherence means the 50-year-old drug regimen is failing as multidrug-resistant strains emerge. Chances are remote that it will be replaced anytime soon with new antibiotics.

But the days of clockwatching for TB patients may soon be over. Researchers in South Africa are working on a way to deliver that half-century old treatment in a new guise — incorporating the drugs into nanoparticles so they are released slowly into a patient's bloodstream, raising the possibility that daily pills could be replaced with a



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single weekly dose.

Nanotechnology research is not cheap but researchers are hopeful that money spent on expensive research and development will be worthwhile when pitched against savings in treatment costs and substantial gains in health.

And those gains are there to be made. TB is one of the leading causes of adult death in South Africa with approximately 460,000 new TB cases in 2007, according to the WHO. South Africa is ranked fifth on the list of 22 high-burden TB countries in the world.

## Old drugs repackaged

First-line treatment for TB consists of a pill of each of four antibiotics — isoniazid, rifampicin, pyrazinamide and ethambutol — taken every day.

South African scientists from the Council for Scientific and Industrial Research (CSIR) have incorporated these drugs into nanoparticles that are invisible to the human eye.

White blood cells take up nanoparticles because they look like foreign objects and, effectively, transport them throughout the body while releasing their cargo, says Hulda Swai, senior scientist at CSIR's Centre for Polymer Technology. "These nanoparticles have superior properties for absorption in the small intestine to improve bioavailability and uptake into the circulation," says Swai.



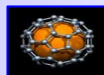
**South African scientists from CSIR have incorporated traditional TB drugs into nanoparticles (CSIR)**

The safety and uptake of the nanoparticles is being tested in TB-infected mice and the effectiveness of the nanodrug is being compared to conventional therapy to see whether a weekly nano dose is as effective as the standard daily treatment regime.

Human trials for the antibiotic, called Rifanano, are scheduled for 2012.

## Affordability rules

But the trials are not spared problems that affect clinical trials in many developing countries.



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"Manpower and animal models are not always available, and where available, the expertise specific for nanomedicine is scarce," Swai told SciDev.Net.

But the potential advantages of the technology make its pursuit worthwhile. If TB treatment is reduced to a once-a-week dose, the overall costs, both of the drugs and of employing healthcare staff, could be significantly reduced.

"Given savings as a result of lower dose and higher efficacy, the consequence of targeted delivery — releasing drugs only after reaching the position required in the body — treatments might actually become cheaper," says Bernard Fourie, chief scientific officer of Medicine in Need, a non-profit research organisation with a base in South Africa that aims to develop treatments and vaccines suited to the developing world.

Nanodrugs, tailored for delivery to the lungs or other sites of infected tissues have the potential to stop cancer cell growth, better protect against infection and more effectively attack and kill viruses and bacteria without affecting healthy cells around them.

"Remarkable benefits to healthcare" could be expected over the next decade with the development of drugs, vaccines and other pharmaceuticals that will specifically target diseased cells, Fourie says. But the major question, is whether such new technologies would also benefit poor populations, such as those in Sub-Saharan Africa where TB, HIV/AIDS and malaria continue to affect millions.

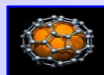
But Fourie believes South Africa's pharmaceutical industry is capable of adopting nanotechnology, and that availability and access to such nanomedicines shouldn't be a problem.

Swai agrees, saying: "Only a small fraction of treatment costs is actually related to the drug itself. The nanodrugs are designed to make use of cost-effective materials that are easily accessible and relatively cheap to manufacture."



**Nanodrugs, tailored for specific delivery to the lungs means they can attack the virus without affecting healthy cells around them. Gary Hampton/ World Lung Foundation.**

And because the technology is home grown it will be less expensive to manufacture



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nanodrugs than to buy imported mainstream drugs, adds Swai.

## **Not just TB**

CSIR researchers are also working on nanoencapsulating antiretrovirals and antimalarials, as well as second-line TB drugs used for resistant cases where the first-line drugs don't work.

For instance, nanoencapsulation can involve coating the anti-malaria drug chloroquine with nanomaterials that include liposomes which can deliver the drug by penetrating cell membranes, making their action on diseased cells more targeted and efficient.

CSIR is collaborating on this research with the African Institute for Biomedical Research in Zimbabwe, and the Kenya Medical Research Institute as well as institutes on other continents including the University of Brasilia and Federal University of Rio Grande du Sul in Brazil; India's Post Graduate Medical Research Institute and Life Care; and the University of Buenos Aires in Argentina.

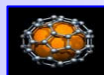
## **Not without risk**

Many researchers warn that the growing number of developing countries interested in nanomedicine need to be aware of the potential risks associated with nanotechnology.

Janice Limson, head of the Biotechnology Department at South Africa's Rhodes University, says: "The potential applications for nanomaterials are phenomenal, but researchers do agree that any developments in this regard must be partnered with research into understanding toxicity."

Materials have different properties at the nanoscale. For example, gold is nonreactive but at the nanoscale it becomes a catalyst for reactions.

While these properties are what make nanotechnologies so useful, they may also have unforeseen adverse effects. Globally, researchers are only just beginning to understand the toxicity of nanostructures and it is the subject of extensive work by a number of groups in South Africa.



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**First-line TB treatment consists of four antibiotics — isoniazid, rifampicin, pyrazinamide and ethambutol — taken every day. Andy Crump/ WHO/TDR**

Andre Nel, chief scientist of the division of nanomedicine at the University of California in Los Angeles' NanoSystems Institute, says that there is a lot of interest in assessing whether the 'nanocarriers' that transport drugs have "hazardous effects that are different and independent from the drugs being delivered".

The former Stellenbosch University student says that so far the only studies on the effects of nanotechnology in animals have focused on industrial nanomaterials rather than those used in nanomedicine. He adds that the same screening methods will be used to look at the safety of nanodrugs.

Though unaware of any specific regulations to monitor the risk of nanodrugs in South Africa, Nel says most countries would like to have specific independent evaluation criteria for nanotherapeutics. But no set of risk factors specifically for nanotherapeutics has been identified yet.

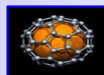
"Most agencies worldwide are basing their assessments on traditional methods of drug safety assessment in which the nanomaterial is regarded as an integral component of the therapeutic substance as there has been no special risk that evolved as a result of nanodrugs," he says.

But these hurdles do not prevent research teams in South Africa from forging ahead. The new TB drug delivery method has been slated for availability in government clinics in 2016.

And Swai and her team are already planning for the future. "We hope to undertake the nanoencapsulation of traditional actives - ingredients granted authorisation used in treating other diseases of poverty around Africa such as sleeping sickness, ascariasis, leishmaniasis, chagas disease, onchocercariasis," she says.

***By Munyaradzi Makoni,  
24 November 2010***

Munyaradzi Makoni is a freelance science journalist based in Cape Town, South Africa.



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This article is part of a spotlight on Nanotechnology for health: <http://www.scidev.net/en/health/nanotechnology-for-health> or <http://www.scidev.net/en/health/nanotechnology-for-health/features/case-study-south-africa-uses-nanotech-against-tb-1.html>

## Lucky and IBSA Appointment



The Department of Science and Technology has appointed Dr. Lucky Sikhwivhilu as the South Africa's National Coordinator for the India-Brazil-South Africa (IBSA) Science and Technology Cooperation in the field of Nanotechnology. This is to recognise his knowledge and experience with respect to the IBSA Dialogue Forum, and South Africa's research strength in the area of Nanotechnology. Dr. Sikhwivhilu is a Senior Scientist at the National Centre for Nanostructured Materials, Council for Scientific Research (CSIR), Pretoria, South Africa.

*Patience Iyuke*

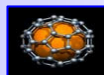
*Submitted by: Dr. Lucky Sikhwivhilu*

## Sessions on Nanotechnology at the SACI Convention



Date: Jan 16-21 2012 at the University of the Witwatersrand. Invited speaker include: Paul O'Brien, Mathius Brust and Vince Rotello

Check the web page for information: There will be sessions specifically on nano at



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the event. The SACI Convention planning is now in full swing.

Also check out the web pages on the **Organic section** of SACI2011 on the web. The RSC will be participating in this section of the conference by sending four keynote speakers to the event.

**INORG2011**: This is to be run in conjunction with the conference. Check the web to see the programme.

*Submitted by Neil Coville*

## Eleventh International Conference on Frontiers of Polymers and Advanced Materials

The eleventh International Conference on Frontiers of Polymers and Advanced Materials will be held at the University of Pretoria Conference Centre, Hatfield Campus, Pretoria, South Africa from the 22nd to the 27 May 2011

### Objectives

The conference provides a unique scope involving a blend of science, technology and business.

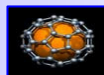
It brings together leading international scientists, engineers, top-level industrial management and business executives for discussions on the status of advanced materials, new technologies and industrial and business opportunities.

The conference is truly multidisciplinary and global with participation of scientists, engineers, industrialists and business representatives.

### The main Conference Objectives are:

- To highlight advances and new findings in polymers and advanced materials and their impact on new technologies;
- To facilitate technology transfer and new business opportunities by bringing together representatives from academia, research centers, industries and business;
- To foster international collaborations and joint ventures;
- To cooperate with the formation of the new generations of scientific and professionals committed to the scientific-technological innovation in the region;
- To promote the growth of scientific and technical infrastructure in the field of polymers and advanced materials technologies.





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## Conference Theme

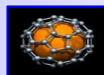
The International Union of Pure and Applied Chemistry (IUPAC) declared 2011 as the International Year of Chemistry. The then President of IUPAC stated: "The International Year of Chemistry will give a global boost to chemical science in which our life and future are grounded. We hope to increase the public appreciation and understanding of chemistry, increase young people's interest in science, and general enthusiasm for the creative future of chemistry". The 11th ICFPAM conference supports this call and will assist in promoting chemistry activities. Consequently the conference theme is to: Celebrate the contribution of Chemistry as an enabling science for polymers and advance materials.

## CONFERENCE FORMAT

The conference will include general plenary talks, tutorials, invited lectures, contributed talks as well as poster sessions. An exhibition on polymers, advanced materials, equipment and recent applications is planned.

## PLANNED SESSIONS

- 1. General and tutorial lectures on New Materials and Advanced Technologies.**  
The lectures will cover the main conference topics, emphasizing their impact on educational, scientific, technological and business trends.  
Symposium Chair: [Prof K S Lee, Hannam University, Korea.](#)
- 2. Advanced Nano-scale and Nano-structured Materials: Glass and ceramics, magnetic and energetic materials, hybrid materials, exotic and super hard materials, dental materials.**  
Symposium Chairs: [Prof J Mark, University of Cincinnati, OH, USA & Prof A Pawlicka, University of Sao Paulo at Sao Carlos, Brazil.](#)
- 3. Environmentally Friendly Materials: Natural fibre composites and polymer recycling.**  
Symposium Chairs: [Prof R Kozlowski, Institute of Natural Fibres, Poznan, Poland, Dr M Rowell, USDA Forest Service, Madison, WI, USA & Dr MI Aranguren, National University of Mar del Plata, Argentina.](#)
- 4. Polymers and Advanced Materials in Electrochemistry and Solar Energy Conversion Systems.**  
Conducting polymers, field effect transistors, light emitting devices; organic light detectors, polymer lasers; organic solar cells.  
Symposium Chairs: [Prof A Pron, CEA – DSM, CEN Grenoble, France & Prof M Zagorska, Warsaw University of Technology, Warsaw, Poland.](#)
- 5. New Nanostructured and Hybrid Materials for Energy Storage.**  
Symposium Chair: [Dr G Bidan, CEA Grenoble, France.](#)



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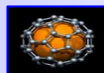
6. **Laser Processing & Photonics: Advanced materials and composites for photonics, nano- and biophotonics.**  
Photorefractive polymers, nonlinear optical materials; materials for image and information processing, optical storage; polymer light amplifiers; liquid crystals and liquid crystalline polymers; materials for integrated optics.  
Symposium Chair: **Prof C Khoo, Pennsylvania State University, University Park, PA, USA .**
7. **Biomaterials and Biotechnology.**  
Polymers and composites as implant in body for structural members and a s replacements of flexible tissue in reconstructive surgery, bioimaging, nanomedicine drug delivery, bioMEMS, biofilms, tissue engineering.  
Symposium Chair: **Prof I Rau, Politehnica University of Bucharest, Romania.**
8. **Fluoromaterials.**  
Symposium Chair: **Prof P Crouse, University of Pretoria**
9. **Carbon-based Materials: Graphene, carbon nanotubes, diamonds and bulk graphites.**  
Symposium Chair: **Prof B Rand, University of Pretoria.**

## Important dates

Registration Opens	1 Sept 2010
Final Date for Submission of Abstracts	13 Nov 2010
Acceptance Notifications	31 Jan 2010
Submission of Extended Abstracts/Papers	25 Feb 2011
Closing Date for Early Bird Registration	25 Feb 2011
Final Date for Registration and Payment	22 April 2011
Opening Ceremony with Keynote Speakers	22 May 2011
Social Event	23 May 2011
Dinner and Dance Closing Ceremony	26 May 2011

Events Website: [www.icfpam.co.za](http://www.icfpam.co.za)

E-mail: [conference@icfpam.co.za](mailto:conference@icfpam.co.za)



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**Submitted by: Prof Walter Focke**  
**Conference Chair, University of Pretoria.**

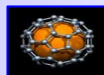
## The Impact of Nanotechnology Funding Boom of the Past Ten Years

Philip Shapira and Jue Wang have scrutinized various parts of the scientific literature to determine the impact of funding over the past decade on Nanotechnology research. The paper states that “Global public investment in research and development (R&D) in nanotechnology reached \$8.4 billion in 2008, with a further \$8.6 billion of corporate funding”.

To read more on this interesting journal article, please refer to the Journal website at: <http://www.nature.com/nature/journal/v468/n7324/full/468627a.html> or the Journal: “Nature”: 628/Nature/Vol 468/2 December 2010

**Patience Iyuke**

**Submitted by: Rudolph Erasmus,**  
**Physics, Wits**



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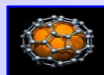
## Forthcoming Nanoscience and Nanotechnology Events

### Local Events

- i) An International Workshop on Advance Materials and Technologies for Global Energy and Environmental Challenges, CSIR, Pretoria, South Africa, 6th-9th December 2010. For more information, please contact Prof. Suprakas Sinha Ray, CSIR. E-mail: [rsuprakas@csir.co.za](mailto:rsuprakas@csir.co.za):  
Website: <http://www.csir.co.za>
- ii) The 4th NanoAfrica Conference, CSIR International Convention Centre, Pretoria, South Africa, 3rd -6th July 2011: <http://www.nanoafrica.co.za> or [www.csiricca.co.za](http://www.csiricca.co.za)
- iii) The 40th SACI Convention Incorporating the 3rd FASC Congress, University of Witwatersrand, Johannesburg, South Africa, 16th-21st January 2011  
<http://www.saci2011.org.za/>
- iv) The Eleventh International Conference on Frontiers of Polymers and Advanced Materials, University of Pretoria Conference Centre, Hatfield Campus, Pretoria, South Africa , 22nd -27th May 2011: [www.icfpam.co.za](http://www.icfpam.co.za)

### International Events

- i) 3rd Bangalore Nano, The Lalit Ashok, Bangalore, India, 8th-9th December 2010: <http://www.nanopaprika.eu/profiles/blogs/3rd-bangalore-nano>
- ii) 2010 International Conference on Nanotechnology and Biosensors (ICBN 2010), Hong Kong, 28th-30th December 2010  
<http://www.goingtomeet.com/97228> or <http://www.icnb.org/>
- iii) LNLS Advance School on structural biology, 3D imaging, magnetism, nanosciences, catalysis, etc. Brazilian Synchrotron Light Laboratory (LNLS – CAMPINAS, SP – BRAZIL) Rua Giuseppe Máximo Scolfaro, 10.000 – Pólo II de Alta Tecnologia – Campinas – SP, 17th-25th January 2011: <http://espca.lnls.br/> or Contact: Roberta Santarosa Colleto ([roberta.colleto@lnls.br](mailto:roberta.colleto@lnls.br))
- iv) Nanoscience Earlybird Conference, Sharm el Sheikh, Egypt, 19th-22nd February 2011: <http://www.zingconferences.com/z.cfm?c=63>
- v) 4th NanoTech Insights Conference, Cairo, Egypt, 27th February-2nd March 2011: <http://www.nanopaprika.eu/profiles/blogs/nanotech-insights-conference>



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- vi) World Congress on Sustainable Technologies (WCST-2011), London, England, United Kingdom, 21st -23rd March 2011:  
<http://www.goingtomeet.com/60073> or <http://www.wcst.org/>
- vii) Advanced Technologies for an Ageing Population, The IET Teaching Building, Glasgow, UK, 23rd-24th March 2011:  
<http://www.nano.org.uk/conferences/ageing2011/overview.htm>.
- viii) Nano and Water 2011: Nanotechnology for the water Sector, Centro Stefano Franscini, Monte Verità, Ascona, Switzerland, 15th-18th May, 2011  
<http://www.iwanano2011.org/> or  
[http://www.iwanano2011.org/IWA%20Nano\\_FirstCircular.pdf](http://www.iwanano2011.org/IWA%20Nano_FirstCircular.pdf)