

Welcome

The University of Western Sydney (UWS) Nanotechnology Project is a unique attempt to transfer knowledge of opportunities in nanotechnology from UWS to the manufacturing industries of the Campbelltown - Camden region.

The Project is generously funded for two years through the federal government Department of Transport & Regional Services Sustainable Regions Programme and will endeavour to identify opportunities for new processes

and products, the creation of new enterprises, the development of new skills and training; to identify and source research and development funding opportunities and to create new employment opportunities.

The Industry Survey conducted in August 2003 indicated that there was very little knowledge or understanding of nanotechnology and the opportunities for business in the region. Part of our task is to raise awareness and identify some of those possibilities. The Nanotechnology Network and

this newsletter are part of our efforts to increase understanding and knowledge of nanotechnology and how UWS can interact and work with local industry to bring innovative practices to help maintain our industrial competitiveness.

The title of the newsletter represents the Campbelltown-Camden region as the '2C' and nanotechnology by its mathematical symbol 10⁻⁹.

Kim Leever
Regional Development Facilitator,
UWS

Under the Microscope

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What is Nanotechnology?

Nanotechnology means just that, nano means 10⁻⁹ metres, (i.e. the size of atoms) and technology means the building of useful things from scientific principles. Because atoms and small molecules are nanosize in

diameter, nanotechnology is often defined as the building of materials and machines from atoms. However it encompasses much more than humankind's recent endeavours, since biology has put nanomachines

together since the beginning of life.

Professor Michael Wilson
Dean, College of Science,
Technology and Environment,
UWS

Coming Soon

- Fully featured website
- e-newsletter
- UWS Undergraduate course BSc (Nanotechnology)

Camden Campbelltown Sustainable Regions Nanotechnology Initiative

The Project is designed to enhance the engagement of industry by the University of Western Sydney (UWS) through the application of nanotechnology to industrial processes. UWS has established the Nanotechnology Network where local industry representatives meet quarterly for general presentations, networking and the opportunity to make linkages.

Over the last ten months there have been numerous visits to member companies where the initiative has been explained to the company representatives. At the same time the company is able to present and explain their

special problems, and with the UWS representative explores research options for product improvement.

Often the UWS representative has been presented with company problems that are soluble by conventional technologies. In such cases cooperation proceeds, as the solution of the conventional problem is the road to more advanced solutions that involve nanotechnology.

The knowledge of nanocomposites, the preparation of materials composed of conventional

polymers but including solid nanomaterials, is of great interest to a number of manufacturers. As this area is well understood by the Nanotechnology Team, there is a solid basis for cooperation and linkage between the companies and UWS.

We emphasise the fact that the greatest advantage to the company is they are able to access all areas of the University for expertise, and therefore they have a powerful research department serving them.

Associate Professor Bob Creelman
Project Manager,
UWS Nanotechnology Team

Nanotechnology and Australia

The field of nanotechnology is just emerging and it is predicted that it will impact all technologies and areas of society. National initiatives are being planned, started, or are in place, in most countries around the world, including China, Korea, and Taiwan, with the exception of Australia. Currently, Australia is one of the few countries that has not yet devised a coherent national strategy as to how it will position itself with regard to nanotechnology. The US National Nanotechnology Initiative is spending US\$400million creating such cross-disciplinary and cross-functional infrastructures. Neal Lane, Assistant to the President of USA for Science and Technology, stated at a Congress hearing "If I were asked for an area of science and engineering that will most likely produce the breakthroughs of tomorrow, I would point to nanoscale science and engineering". A critical part of positioning Australia in this new technology area is

an assessment of Australia's capabilities and potential for uptake, *in the global context and with early industry input*. Suggestions include examining Australia's core capabilities in terms of raw resources and science strength areas, with the key being the ability to create a cohesive network across the nation. The field is critically dependent on utilising a multi-disciplinary approach, which requires re-examination of models currently applied to scientific activities.

Australia's current advantage globally is having multi-disciplinary and multi-functional (science + industry + government) infrastructure already in place, such as CRCs, CSIRO, and university networks.

Professor Mick Wilson

Dean College of Science Technology and Environment, UWS

Case Study: A Nano Encounter

"If I were asked for an area of science and engineering that will most likely produce the breakthroughs of tomorrow, I would point to nanoscale science and engineering"

In July 2003 I attended the UWS introductory dinner for its new Nanotechnology Project. At the end of the dinner I signed off on an expression of interest form and left with the thought that it would be many a long year before nanotechnology had any significant influence on my products - those products being light harness vehicles such as racing sulkies - but that I might as well keep abreast of developments in the field.

Two days later - and unconnected in any way with the UWS dinner - I received an email from the New York office of the Swedish steelmaker, Sanvik, suggesting

that their newly developed nanotechnology-based steel might be ideal for the construction of my vehicles.

As it turns out, the new steel has more than a few fabrication challenges, so that Sandvik were looking more for development partners than simply buyers of their new steel. However, with the prospect of reducing the weight of our tubular steel components (the great majority of the structure of my vehicles) by two thirds, while doubling their strength compared to the T304 stainless steel tube we presently use, we were very keen to pursue the matter.

On November 28 - the same day, coincidentally, on which my company was awarded its, Uniquely Bankstown Award - Sandvik appointed my company as a development partner, and we presently await delivery of the first trial batches of this exciting material. Dr Ken Doolan of the UWS School of Engineering Design has been assisting in this project, and I believe it may be the first nanotechnology-based steel to come before the UWS Nanotechnology Project.

James Walsh

Managing Director, J.R Walsh & Son Pty Ltd.

Opportunities for students in BSc (Nanotechnology) at the University of Western Sydney

Nanotechnology is cross-disciplinary and involves physics, chemistry and biology combined with medicine and engineering. It is regarded as a very important field that will generate the next industrial revolution worldwide. Science-based industries around the world including Australia is going through a period of rapid change and development and as such most of the employment opportunities in the future will lie in the new technology based industries. All new hi-tech fields may benefit from the opportunities offered by nanotechnology. An education in nanotechnology is going to be in great demand on the job market. The fields of application are multiple and employment opportunities are rich, both in the business sector and at

scientific institutions. The new nanotechnology course at the University of Western Sydney (UWS) has been developed to train a new skilled graduate workforce, with a broadly based but flexible approach to the challenges that lie ahead in nanotechnology. Opportunities also exist to work with nanotechnology research group at UWS, which is currently involved in the synthesis and experimental characterisation of nano materials for the usage in local industries.

Dr. S. Maheswaran

Course Coordinator, UWS

Introducing the UWS Nanotechnology Team

The UWS Nanotechnology Team assembled by the University of Western Sydney has a wide range of skills and diverse experience. Lead by Professor Mick Wilson, who has an international reputation in not only nanotechnology but also diverse fields of Chemistry and Chemical Engineering, the team can draw on people that have worked in resources, medicine and health products as well as manufacturing. Professor Bill Price recently appointed to the university from an academic post in Japan brings scientific depth to the team. Dr

Adriyan Milev has an enthusiasm and competence in nanomaterials that is already producing results in our projects. Dr Kamali Kannangara and Dr Mahesh Maheswaran will be teaching the first intake of the Bachelor of Science (Nanotechnology) this year and are both active researchers. Dr Andrew Shalliker and Dr Garry Dennis have extensive expertise in chemical measurement and polymer chemistry. Garry Dennis has had many years experience problem solving for industry. Associate Professor Bob Creelman has had extensive industry experience, and he and Kim Leevers

are making contacts with industry in the Campbelltown-Camden region for the UWS Nanotechnology Project.

Associate Professor Bob Creelman
Project Manager, Nanotechnology Team UWS



L-R: R. Creelman, K. Leevers, S. Maheswaran, A. McCutcheon, J. Hu, W. Price, A. Milev, K. Kannangara and M. Wilson

Industry in Focus

Nanotechnology will have an impact on industry far greater than silicon integrated circuits did because it relates to numerous fields. Nanotechnology bridges physics, chemistry and biology and therefore can be applied to the entire industrial spectrum.

The Key Industry Advisor's role is to assist local industries to recognise the potential of this

emerging technology in their field of activity, and determine how best to use it.

With nanotechnology we can design new materials with different chemical, mechanical and electrical characteristics from the ones we know today.

Together with UWS scientists we hope to simplify introducing the central science, chemistry and

physics of nanotechnology into the industrial world that uses down to earth manufacturing processes. If local industries do not seize the opportunities offered by nanotechnology they may lose a competitive advantage.

Lu Papi
Director, Lu Papi & Associates

"nanotechnology has the potential to provide problem solving technology to industries which produce or design a wide range of materials"

Profile: Professor William (Bill) Price

In 2000 Bill spent a year at the Royal Institute of Technology (KTH) in Stockholm on a senior research fellowship. In 2001 Bill was appointed Professor of Chemistry in the Department of Chemistry at Tokyo Metropolitan University and in 2003 he accepted the appointment of Professor of Nanotechnology at the University of Western Sydney (UWS). Based at the Campbelltown campus, Bill envisions "that there is enormous potential for applying nanotechnology to industries within the Greater Western Sydney region and beyond".

Professor Price is an expert in the

theory, development and application of nuclear magnetic resonance (NMR) spectroscopy with particular emphasis on Pulsed Gradient Spin-Echo



Professor William Price

(PGSE) NMR translational diffusion measurements and magnetic resonance imaging (MRI) techniques for studying

molecular association and molecular dynamics.

With UWS' resources and industry links, "nanotechnology has the potential to provide problem solving technology to industries which produce or design a wide range of materials", Bill said.

The Bachelor of Science (Nanotechnology) degree will be introduced at UWS in 2004 and Bill will be one of the lecturers. According to Professor Price, it is essential that students develop a vision of how nanotechnology can be used, where research can lead, and how the theories can be applied to real life situations. He believes that increased availability of lecturing staff is instrumental in achieving this.

Professor William Price and Alice Story
UWS

Research

UWS has been awarded a grant from the Federal Government for a special project to help industry in the Campbelltown - Camden region develop their potential in the emerging area of Nanotechnology, more specifically, Nanomaterials.

The Australian Research Council (ARC) awarded UWS researchers an ARC Linkage Grant for "Development of a Cost-Effective Organic-Inorganic Nanocomposite for High Quality Gravure Printing" in conjunction with the Kirk Group, a local firm.

The principal aim in this project is to develop hybrid polymer-nano composites for the printing industry. The nanocomposite fillers will be trailed with both the epoxy and the polyurethane raw material bases.

Gravure printing is the process of choice for long-run high quality publication printing. About 3 billion copies of gravure printed magazines are produced annually. Gravure is also used for catalogues, special newspaper supplements, labels, cartons, packaging, gift-wrap, wall and floor coverings, and a variety of precision coating applications.

To satisfy the requests of the conventional gravure print industry, an image carrier has been developed to use as an alternative to the

conventional copper-based, chromium-plated cylinder. Polymer-coated cylinders are technology under development that could be the answer to many of the remaining drawbacks associated with the gravure process. Filled polymers have been used for decades. Talcs, calcium carbonates, kaolins are all big business and cover many applications where additional stiffness, modulus, impact and other properties need to be improved. Generally, though, these minerals go through a minimum of processing before being incorporated through compounding into polymers.

The greater the extent of exfoliation, the thinner the particles are, and a greater surface area is available for interaction with the polymer matrix, resulting in better performance. The process of adding inorganic fillers to polymers is actually an old idea, like making bricks with straw in them. The fibrous straw additive makes the brick more resistant to forces that would otherwise crack it. A hybrid composite with as little as 2.5 percent inorganic nano clay filler is as stiff and much lighter than parts with 10 times the amount of conventional talc filler.

Dr Adriyan Milev
Research Fellow, UWS

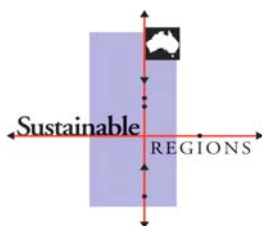
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Nanotechnology Calendar

UWS Nanotechnology Network Meetings

10 February 2004, 5-7 pm
11 May 2004, 5-7 pm
10 August 2004, 5-7 pm
9 November 2004, 5-7 pm

Conferences

The Nanotech 2004: The Nanotechnology Conference & Trade Show
7 – 11 March 2004

Boston Sheraton Hotel & Copley Convention Centre,
Boston Massachusetts USA
Website: <http://www.nanotech2004.com>

3rd Annual NanoBusiness Conference 2004
17 – 19 May 2004

Marriott Financial Centre, New York City, New York USA
Website: <http://www.nanobusiness2003.com>

The 2004 Foresight Conference on Molecular Nanotechnology
21 – 24 October 2004
Crystal City Marriott Hotel Washington, DC USA
Website: <http://www.foresight.org/Conferences/MNT12/index.html>