

**Bilateral scientific conference “Nanotechnology for Electronics, Opto-Electronics, and the Electro-mechanical System - NanoE3” - Margaret River –Western Australia
– 22-24 September 2008**

Nicola Sasanelli

The international conference “Nanotechnology for Electronics, Opto-Electronics, and the Electro-mechanical System NanoE3” was held in Margaret River (Perth) on September, 22-24 2008. The conference was part of the initiatives set by the Scientific Attaché of this Embassy, which contributed to the initiative with financial assistance and support, thus acting as a catalyst for widespread Australian consensus and co-funding at least four times higher than expected. The initiative was funded not only by this Embassy, but also by the Department of Innovation, Industry, Science and Research, the Australian Research Council Nanotechnology Network, ARNAM (Australian Research Network for Advanced Material), the Microelectronics Research Group, and the University of Western Australia. Furthermore, the Western Australian ARIA Association favoured the promotion and spread of the initiative nationally and in particular in Western Australia.

The “NanoE3” bilateral event was actively organized by the University of Western Australia in Perth and saw the participation of more than 50 academics and researchers, 8 of whom were from Italy. Prof. Lorenzo Faraone, Director of the School of Electrical, Electronic & Computer Engineering at the University of Western Australia, Chair of the Western Australian ARIA Association, Director of the WA Centre for Semiconductor Optoelectronics & Microsystems and member of the Australian Research Council board, took care of the organization of the event with great passion and professionalism. In 2006 Prof. Faraone, of Italian origin, was appointed Fellow member of the prestigious Australian Academy of Science as a result of his research activity, and this year was awarded the EUREKA prize as best Australian researcher of the year.

Prof. Faraone’s contribution both at the scientific and technical levels and within the “NanoE3” conference organizational committee was outstanding. He also played a key role in finding specific funds both to organise the event and to guarantee a follow-up through subsequent scholarships granted to PhD students. Thanks to the excellent work done during the last year by the Italian Consul in Perth Giorgio Taborri together with Prof. Faraone, WA University, and probably Curtin University too, will make \$5000 AUD scholarships available to foster future exchange of young researchers between Italy and Western Australia.

The conference was opened by the Italian Consul in Perth, Giorgio Taborri, and Professors Lorenzo Faraone (WA University), Chennupati Jagadish (Australian National University), Andrew Dzurak (University of New South Wales) and David Jamieson (Melbourne University). The event was concluded by the Scientific Attaché of the Italian Embassy in Australia, Eng. Nicola Sasanelli.

The objective of the “NanoE3” conference (see Attachment 1 for the programme) was to foster deeper and more widespread bilateral cooperation in the field of nanotechnologies and microelectronics, presenting the activities of each laboratory and their international cooperation. Some of the topics discussed during the three-day conference were: semiconductors applied to nanotechnologies (Memory Flash, Nanowires, semiconductor nanostructures), photonic devices, quantum computers, nanotubs, organic and inorganic nanostructures, solar cells, superconductors and the characterization of microelectronic components. Speakers from Italy included Stefano Roddaro - National Enterprise for NanoScience and nanoTechnology - Scuola Normale in Pisa, Massimo DeVittorio - National Nanotechnology Laboratory, University of Salento, Guido Faglia - CNR-INFM, University of Brescia, Marco Fanciulli - CNR-INFM, University of Milano Bicocca,

Gaudenzio Meneghesso - University of Padova, Vito Ranieri - CNR-IMM (Institute for Microelectronics and Microsystems), University of Catania and Eng. Livio Baldi, Director of Numonyx (a newly born enterprise which was the result of the merging of STMicroelectronics with Intel in Agrate Brianza - Monza), top researcher in the field of MOS, CMOS components and Memory Flash, and creator of more than 50 patents in the USA and Europe. Paolo Lugli, long-standing researcher at the Tor Vergata University in Rome and currently Director of the Institute for Nanoelectronics at the University of Munich as well as Nunzio Motta and Andrea Capasso, currently researchers at the Queensland University of Technology in Brisbane, took part in the conference.

The importance of nanometric science has soared worldwide over recent years, and its strategic role for future global economic growth is widely acknowledged. The "NanoE3" conference enabled Italian and Australian researchers to present and compare experimental devices from their laboratories, research activities and the latest results attained, as well as to boost new cooperation in the field of microelectronics and nanotechnologies. The main reasons for choosing these topics, which are directly related to semiconductor microelectronic and optoelectronic materials and devices, are that these technologies have revolutionised and underpinned advanced technology, ICT and industrial innovation in the world over the past 50 years. There is no doubt that such technologies will continue to drive advanced economies around the globe for the foreseeable future, and that a nanotechnology revolution is currently underway as related to these topics. In addition, these are areas in which both Italy and Australia have strong research activities, and the conference will provide a unique opportunity to establish basic and applied research links between Italian and Australian participating researchers and organisations. Some of the specific topics will include:

- Semiconductor materials, including materials such as silicon and compound semiconductors
- Semiconductor devices, including electronic, optoelectronic, photonic and micro-electromechanical systems (MEMS) devices
- Semiconductor nanotechnology, including nano-scale materials and devices
- Semiconductor nanostructures, including quantum wells, quantum dots, superlattices, porous semiconductors, nanotubes/wires, etc
- Theory, modelling, characterisation and reliability of semiconductor nanostructures and nano-devices

High value was attached to Italian researchers' speeches. They sparked lively debate on the issues discussed and stimulated the interest of Australian research centres in cooperating in new projects where Italian researchers play a leading role. Furthermore, the conference offered a unique opportunity to share information concerning the financial resources available at European, federal and state level. Following the conference and the numerous meetings between Australian and Italian researchers, a short-medium term (one year) bilateral cooperation strategy was defined, as well as specific and individual cooperation initiatives between research centres. The main features of the strategy are described in Attachment 2, which also contains possible areas of interest for Italian enterprises ready to finance research projects relevant to their interest. Australian researchers showed great interest in this issue, considering both the lack of Australian medium and large enterprises in this sector (for example STMicroelettronica, FIAT, Finmeccanica, etc.) and the growing demand for innovative products and services in areas of national strategic interest such as defence, the mining sector and environmentally friendly energy production.

To conclude, the "NanoE3" conference was extraordinarily fruitful, in particular in setting up new "scientific networks" which can connect scientists from both countries working in similar areas. The conference not only spurred constructive exchange between the two scientific communities in the field of nanotechnologies and new microelectronic technologies, but also offered the opportunity to draw an ongoing plan rich in initiatives, thus favouring greater bilateral cooperation in this research area.

6:00-7:30PM	WELCOME RECEPTION & REGISTRATION Function Room at Margaret River Resort	
MONDAY, 22nd SEPTEMBER 2008		
Function Room		
TIME	PRESENTERS	TITLE OF PRESENTATION
8:30-8:45AM	FARAONE, Prof. Lorenzo Univ of Western Australia	Welcome
8:45-9:00AM	TABORRI, Dr Giorgio Italian Consul, Western Australia	Official Opening of NanoE3
9:00-9:30AM	DZURAK, Prof. Andrew (Invited), UNSW JAGADISH, Prof. Chennupatti (Invited), ANU	The Australian National Fabrication Facility (ANFF)
9:30-10:10AM	LUGLI, Prof. Paolo (Invited) Technical Univ of Munich / Univ of Rome	Advances in molecular electronics
10:10-10:30AM	CAPASSO, Mr Andrea Queensland Univ of Technology	Controlled growth of carbon nanotubes on nanostructured substrates
10:30- 11:00AM	MORNING TEA	
11:00-11:40AM	Roddaro, Prof Stefano (Invited) Scuola Normale Superiore, Pisa	NEST, the Italian National Enterprise for nanoScience and nanoTechnology
11:40AM- 12:20PM	DZURAK, Prof. Andrew (Invited) Univ of New South Wales	Dopant Atom Qubits in Silicon
12:20-12:40PM	TAN, Mr Kuan Yen Univ of New South Wales	Resonant tunneling through individual implanted P donors in Si
12:40-2:00PM	LUNCH	
2:00-2:40PM	FANCIULLI, Prof. Marco (Invited) Univ of Milano-Bicocca and CNR-INFM	Microwave Effects in Silicon Nanostructures
2:40-3:20PM	JAGADISH, Prof. Chennupati (Invited) Australian National Univ	III-V Compound Semiconductor Nanowires for Optoelectronics Applications
3:20-3:40PM	JOYCE, Miss Hannah Australian National Univ	High purity defect free GaAs nanowires for optoelectronics applications
3:40-4:10PM	AFTERNOON TEA	
4:10-4:50PM	BALDI, Dr Livio (Invited) Numonyx, Milano	Materials for Non-Volatile Memories

4:50-5:10PM	LIM, Mr Wee Han Univ of New South Wales	Electrostatically-defined few-electron double quantum dots in intrinsic silicon
5:10-5:30PM	JAMES, Mr Timothy Univ of Western Australia	Nano-Porous Silicon Transmissive Photonics for Spectroscopic Applications
5:30PM onwards	FREE TIME	
TUESDAY, 23rd SEPTEMBER 2008		
Function Room		
TIME	PRESENTERS	TITLE OF PRESENTATION
8:30-9:10AM	DE VITTORIO, Prof. Massimo (Invited) Università del Salento	Quantum Dot Devices and Applications: Epitaxial vs Colloidal Technologies
9:10-9:50AM	WILLIAMS, Prof. James (Invited) Australian National Univ	Nanoindentation-induced phase transformations in silicon: novel nanostructures and devices
9:50-10:10AM	HABERL, Miss Bianca Australian National Univ	Characterization of the Pressure-Induced Phases of Silicon by Indentation at the Nanoscale
10:10-10:30AM	BECK, Miss Fiona Australian National Univ	Tuning surface plasmon resonances for light trapping in solar cells
10:30-11:00AM	MORNING TEA	
11:00-11:40AM	RAINERI, Dr Vito (Invited) CNR-IMM, Catania	Nanoimaging in wide bandgap semiconductors
11:40AM-12:20PM	JAMIESON, Prof. David (Invited) Univ of Melbourne	Top-down pathways to devices for quantum information processing technologies
12:20-12:40PM	VAN DONKELAAR, Miss Jessica, Univ of Melbourne	Configuring matter at the atomic level; arrays of nm spaced single ions
12:40-2:00PM	LUNCH	
2:00-2:40PM	MENEGHESSO, Prof. Gaudenzio (Invited), Univ of Padova	Reverse bias degradation walkout of the gate junction in GaN HEMT's
2:40-3:20PM	DELL, Prof. John (Invited) Univ of Western Australia	MEMS Technologies For Electrically-Tuneable Multi-Spectral Infrared Sensors and Arrays
3:20-3:40PM	MCKERRACHER, Mr Ian Australian National Univ	Photonic crystal filters for quantum dot infrared photodetectors
3:40-4:10PM	AFTERNOON TEA	
4:10-4:50PM	CLARKE, Dr Warrick (Invited) Univ of New South Wales	Advances in Atomically Precise Electronic Devices

4:50-5:10PM	AHARONOVICH, Mr Igor Univ of Melbourne	Fabrication of nickel centers in diamond for quantum optical applications
5:10-5:30PM	KOCAN, Dr Martin Univ of Western Australia	Direct NanoSIMS imaging of Si implantation profiles in AlGaN/GaN HEMT structures
5:30PM onwards	FREE TIME	
7:00-10:00PM	CONFERENCE DINNER AT MARGARET RIVER RESORT	
WEDNESDAY, 24th SEPTEMBER 2008		
Function Room		
TIME	PRESENTERS	TITLE OF PRESENTATION
8:30-9:10AM	FAGLIA, Dr Guido (Invited) Universita' degli Studi di Brescia	Metal Oxide Nanowires for Functional Applications
9:10-9:50AM	BAKKER, Prof. Eric (Invited) Curtin Univ of Technology	From Smart Materials to Selective Sensors
9:50-10:10AM	BULLEN, Mr Craig Univ of Western Australia	High Throughput Production of Precisely Tailored Semiconductor Nanocrystals
10:10-10:30AM	ZIN, Mr Ngwe Soe Australian National Univ	Silicon Solar Cells in Tandem Solar Cell Package for a Mobile Battery Charging Application
10:30-11:00AM	MORNING TEA	
11:00-11:40AM	MOTTA, Prof. Nunzio (Invited) Queensland Univ of Technology	Role of patterning in nucleation on semiconductor surfaces
11:40AM-12:20PM	SASANELLI, Dr Nicola (Invited) Embassy of Italy, Canberra	Australia: big leaps towards the future
12:20-2:00PM	LUNCH	
2:00PM onwards	1/2 day Tour to visit Leeuwin Estate, Voyager Winery, and Watershed Winery	
THURSDAY, 25th SEPTEMBER 2008		
TIME	DEPARTURE	
7:30AM	PLEASE GATHER AT THE RECEPTION, THE BUS WILL BE LEAVING AT 8:00AM SHARP	

Matrice della Cooperazione Bilaterale Italia-Australia nel settore delle Nanotecnologie e della Microelettronica –

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	Roma Tor Vergata	Uni Lecce	Uni. Padova	Uni. Catania	NEST Pisa	Munchen Uni/Tor vegata	CNR Milano Bicocca	Numonyx
QUT (Brisbane)	Organic Solar Cells Nanotubes					Solar Cells		Carbon Nanotubes packaging
ANU (Canberra)		Quantum Dot Laser, Solar Celles Nanophotonics Tuneable Sensors	Compound Semiconductors NanoWires	Ion Implantation Device, Processes and Charateriz. on SiC, GaN, Grapheme	Photonic Crystals Core Shell NanoWires growth mechanism Transport in Nanowires	Solar Cells		
WAUni (Perth)		Nano- photonics QD Solar Celles	Development of new VLSI devices on Si-Mos Techn.			Nanoimprinting NanoWires for sensor Application		
UNSW (Sydney)			Characterization Devices				Informat. Process. Single atom electronics	New Material for Memories
Uni. Melbourne (Melbourne)							Solid State Quantum Devices	

Aree di interesse dell'industria italiana disponibile a finanziare progetti di ricerca congiunta
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Argomenti	Aziende italiane
Solar Cells	ST
Optoelectronics, light emissions	CRF, Pirelli Lab.
Sensor	ST, CRF
RF emission, III-V	Alenia Finmeccanica
Memory materials	Numonyx
CNT for heat transport	Numonyx, ST
SiC, GaN	ST, Alenia (RF), Finmeccanica
Thermoelectric	CRF
Batteries	CRF

ST = SGS Thomsom - Microelectronics

CRF = Centro Ricerca Fiat

Numonyx = STMicroelectronics - Intel

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Scientific Attache'

Original manuscript in Italian