Nanotechnology
in Turin and Piedmont

The choice of success
In the heart of North West Italy
At the centre of European development
A favourable environment for nanotech activities.

**PIEDMONT FACTS & FIGURES**
- 4 million inhabitants (7.5% of the national population)
- €151bn GDP (0.4% of the national total)
- 460,000 companies
- €35bn FDI inflows and outflows 2003-2005 (6.2% of the national total)
- 16% of GDP invested in R&D
- 200 public and private R&D centres
- 81,000 R&D professionals (1.6% of national R&D employees)

**STRENGTHS**
- Access to the Central European and Mediterranean areas
- 9th Italian region for private investment in R&D
- 9th Italian region for expenditure on innovation in the manufacturing sector
- Training institutions and R&D centres of international standing
- Europe’s first Degree Course in Nanotechnology at the Politecnico di Torino
- Skilled and flexible workforce at competitive costs
- State-of-the-art telecommunications infrastructure with the first Italian Neutral Access Point (NAP)
- Second centre in Italy for venture capital operations
- Public and private financing resources to fund technological innovation projects
- The Olympic Winter Games in 2006

**R&D INTENSITY**
- 9th Italian region for private investment in R&D
- Over 200 private and public R&D centres active in the region with 17,000 researchers
- Qualified professional services experienced in the full development of intellectual property potential, in terms of patents, trademarks and licensing.

**TRADITION OF INNOVATION**
Piedmont has been a hub for major technical innovations from the electric engine in the 19th century, to the MP3 file format in the software industry, and the common rail for diesel engines in the automotive industry.

**AVAILABILITY OF SKILLED PERSONNEL**
Three major universities (Università di Torino, Università del Piemonte Orientale, Politecnico di Torino) and an extensive network of postgraduate schools provide a steady stream of highly motivated and skilled young people.

**A “five star” region, between Europe and the sea**
With its extensive vineyards, hundreds of kilometres of ski slopes, spa towns, lakes, nature parks and a vast artistic heritage, Piedmont has much to offer. Everything is at your fingertips, from the Alps to the Mediterranean Sea, with Liguria and the Côte d’Azur just an hour away. The region has successfully hosted the Winter Olympics of Turin 2006 and is now equipped with brand-new facilities and further specialized services.
The convergence of nanoscale research with other sciences such as biology, chemistry and physics that link up with engineering, creates vast opportunities to enhance performance.

In Piedmont, industry can benefit from a favourable environment, that combines technology, materials and characterisation know-how with the capacity to develop new applications.

### Piedmont areas of specialization in nanotechnology.

**Nanomaterials**

Different synthesis methods allow the production of nano-structured materials with remarkably improved properties and applications in many fields such as textiles and automotive. The three Piedmont universities carry on research in this field in combination with local research centres dedicated to nano-structured interfaces and surfaces, semiconductors, ceramic and plastic materials.

**Textiles**

Thanks to nanotechnologies textiles and clothing are going to become “smart”. They will be able to give us cold or heat according to our needs, as well as deliver drugs through the skin. Applications for “smart” clothing will include healthcare and telemedicine, but more and more uses for these materials are being identified. Projects in this field are coordinated by the association Tessile e Salute (www.tessileesalute.it).

**MEMS/NEMS**

Micro and Nano Electro Mechanical Systems are micro/nano components and devices merging mechanical and electronic know-how. Public research centres (such as the TLab), dedicated to materials, micro and nano systems, offer the technology and know-how for MEMS/NEMS business oriented research and prototyping. Research centres of both the Fiat Group and Telecom’s Olivetti carry on applied research on MEMS/NEMS with relevance to their businesses. Avago Technologies has developed a related technology with applications to its semiconductors products and lasers.

**Agriculture and food sensors**

Important improvements have been identified in agriculture both directly on field applications and in food packaging. Thanks to chemical functionalization of surfaces a great number of sensors are developed in order to produce smart food packaging. The Cuneo district is strongly involved in these applications.

**Nanometrology**

Nano scale requires specific tools and know-how for measurements, testing and certification. The region hosts the National Institute of Metrological Research-INRIM (www.inrim.it).

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**Invest in Turin and Piedmont**

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Collaborative partnerships.

Research centres are the key to the development of the converging technologies that make up nanotechnology. They offer to companies their research facilities and their skilled personnel. They employ full-time staff and also part-time/temporary staff, generally from both universities and companies.
The National Institute of Metrological Research-INRIM (www.inrim.it) is the national public body born from the merger of the Istituto Elettrotecnico Nazionale “Galileo Ferraris” (www.ien.it) and the Istituto di Metrologia “Gustavo Colonnetti” (www.imgc.cnr.it). With 280 researchers, it has become the focus of most scientific metrology activities in Italy. Its research activities in measurement science, materials science and innovative technologies are recognised at world-wide level. INRIM carries out studies and researches on the realization of primary standards for the basic and derived units of the International System of units (SI), assures the maintenance of such standards, their international comparison and in general provides measurements traceability to the SI. In addition to physical and engineering metrology, its main R&D areas are in fundamental physical constants, materials, metrology for chemistry, nanotechnology, innovation, quantum information, and artificial vision.

ISTEC - Istituto di Scienza e Tecnologia dei Materiali Ceramici (www.istec.cnr.it) is the institute of the National Research Council (CNR) that conducts research to develop advanced ceramic materials with nanometric microstructure, both monophase and composite. The team includes 100 researchers, 15 of whom work in Turin.

Clean NT Lab (www.cleanntlab.com), based at the Environment Park in Turin, is dedicated to experimentation on innovative coatings with high technology content and low environmental impact. The Lab, with a team of 5 people, provides a PVD (Physical Vapor Deposition) plant to carry out PVD coating tests, characterization tests on coated components, functional resistance and life prediction tests and samples.

NIS - Nanostructured Interfaces and Surfaces (www.nis.unito.it) is one of the eight Italian Centres of Excellence, together with Cebiovem (www.cebiovem.unito.it) also based in Turin, recognized by the Ministry of Education University and Research (MIUR). It originates from the joint effort of several research groups of the Università di Torino and of the Università del Piemonte Orientale in the fields of chemistry, physics and biology. The Centre offers a multidisciplinary laboratory equipped with the most advanced techniques in microscopy and spectroscopy. NIS, with its team of 80 researchers, focuses on nanostructured interfaces and surfaces that strongly influence the materials’ final properties.

The Center for the Plastics Engineering (www.cdcmp.it) is promoted by Politecnico di Torino and the Proplast Consortium (www.proplast.it) including 60 companies, many of which operate worldwide, and 8 universities, among which the Università del Piemonte Orientale “Amedeo Avogadro”. The Centre, based in Alessandria and employing 15 researchers, was founded as a point of reference in the field of plastics for professional education within the University, as well as for enterprises. The Centre for Engineering of Plastic Materials has significant experience in the investigation of nanocomposites.
operating temperature lasers.

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to work on challenge fields that include
employees. Technology such as electron
Laser fabrication, with more than 80
Manufacturing Pilot Line for Semiconductor
Optic Product Division and the
networking and imaging applications.
subsystems for electronics, wireless,
range of semiconductor components and
in December 2005, provides an extensive
Technologies (formerly Hewlett-Packard)
which was spun off from Agilent
sensing, information, energy and actuation
nanotechnologies concerning lighting,
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Currently it has a workforce of
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Centre providing R&D services to the
industrial expertise.
Nanotechnology
CRF develops research in micro and
Schottky diode and FRED wafers for use
Novara, which is the site for wafer
production and epitaxial deposition in
Europe.
Olivetti Ink Jet (www.olivettii-jet.it)
is the Telecom Italia Group company
dedicated to the research development
and production of ink-jet technology,
employing 400 people, 70 of whom in
the research area. It is the only European
company (and one of four worldwide) to
run a full-cycle ink-jet production process
and to develop all related components,
from inks to printheads. Years ago, thanks
to the know-how and investment in
sophisticated equipments for the silicon
foundry, Olivetti i-Jet started activities on
MEMS.

Fiat Group Research Centre-CRF
(www.crft.it) was founded as an Engineering
Centre providing R&D services to the
different companies within the Fiat Group.
Over the last ten years CRF has opened
its doors to business with other companies
in and outside the automotive sector.
Currently it has a workforce of
approximately 1,200 of which 800 have
masters equivalent degrees or higher.
CRF develops research in micro and
nanotechnologies concerning lighting,
sensing, information, energy and actuation
applications.

International Rectifier
(www.irf.com), US
company leader in power management,
is holder of 450 technology patents and
has operations in 20 countries. Its Borgaro
facility in the province of Turin, with 270
employees, is certified to produce JANS
Schottky diode and FRED wafers for use
in hi-rel applications, such as commercial
and military aircraft, space-launch vehicles,
satellites and strategic weapon systems.

Avago Technologies (www.avagocom),
which was spun off from Agilent
Technologies (formerly Hewlett-Packard)
in December 2005, provides an extensive
range of semiconductor components and
subsystems for electronics, wireless,
networking and imaging applications.
Turin hosts the R&D Labs of the Fiber
Optic Product Division and the
Manufacturing Pilot Line for Semiconductor
Laser fabrication, with more than 80
employees. Technology such as electron
beam lithography and dry etching are used to
work on challenge fields that include
multi quantum well active layers and high
operating temperature lasers.

MEMC Electronic Materials
(www.memc.com), a leading global
supplier of wafers to the semiconductor
industry has a manufacturing plant in
Novara, which is the site for wafer
production and epitaxial deposition in
Europe.

Sorin Biomedica Cardio
(www.sorin-cid.com), with 1,000
employees, has developed some of
the most clinically important
vascular and cardiopulmonary
devices. Its activity in nanotechnology, in
which 20 researchers are involved,
concerns the treatments of heart valve
surfaces. Research is also aimed at the
development of an innovative drug
delivery system in drug eluting
vascular stents.

Bracco (www.bracco.it)
Core (www.coregroup.com)
Elettro Rava (www.elettrorava.com)
Ferrania (www.ferranaiat.com)
Gpharma (www.gpharma.it)
Novavector (www.novavector.it)
Novara Technology (www.novaratchnology.com)
Ozella (www.ozella.it)

Avago Technologies
Scienc and
technology Parks
Two science and technology
parks are involved in
nanotechnology activities,
the Bioindustry Park Canavese
and the Environment Park.
They are closely linked with the
Universities and the Politecnico.
They have been created with the
aim of supporting research and
development and encouraging
technology transfer. The parks offer
facilities, an extensive network of
skills, contacts with potential
partners and help with financing
for the development of innovative
projects with a high technological
content.

Environment Park
(www.envipark.com)
is devoted to environmental
technologies and ICT. A cluster of private
companies and public research centres
(Università di Torino, Politecnico di Torino,
National Research Council) work within
the facilities of the Park, building
up synergies and sharing experiences.
Environment Park also acts as an
incubator providing support
and facilities for starting up activity.
Besides the Clean NT Lab, the Park
hosts the HySY_LAB (www.hysylab.com),
a centre of excellence for hydrogen
technologies.

Bioindustry Park
(www.bioindustrypark.it)
offers researchers and companies facilities
and R&D services to help locate pilot
research centres and laboratories,
with EU funding for SMEs. The labs
co-ordinated by the Park can deliver
a wide range of scientific, technology
derive and research services.
Over 20 private and public
organisations have already located
in the Park, with 200 researchers,
together with several university
departments (mainly specialised
in Chemistry and Biology and Medical
Genetics) and a CNR (National
Research Council) research group
specialised in proteomics and
food allergens. The Park works
with a number of companies
(Bracco, Cibradis Therapeutics, etc)
and Italian and foreign
university research groups.
Discovery is the Bioincubator
of the Park, specialised
in supporting the start-up
of new companies.
It acts coupled with the seed
capital company Eponge
Ventures.
In Piedmont research activities rely on the solid economic base of the region that produces almost 10% of the overall Italian income. Financing comes from both public and private players with the aim to foster innovation.

**Public Funding**

The European Union considers Nanotechnology one of the most important fields of research and, in the Seventh Framework Programme 2007-2011, it will confirm the aid granted within the previous framework programme (2003-2006).

With the aim to increase the EU’s annual spending, the overall budget for research will be doubled in the period 2007-2013, and it will be about €70 billion.

The National Funds aid companies both in basic research, and in product development, including large projects and large companies. Financial grants are assigned through few strategic lines that include Nanotechnology. For further information: www.miur.it

The new Regional Law for Research (2006) will finance companies for research activities (including Nanotechnology) with €293mln in the period 2006-2008. Part of them, as well, will be solely dedicated to Nanotechnology, considered one of the most important targets of the Regional Plan.

**Non-Profit Foundations** pursue aims of public interest and social use. Over the years, they have refocused their objectives from the wholly charitable to cover a wide range of topics. Within this framework, their actions foster both private and public scientific research.

**Compagnia di San Paolo** (www.compagnia.tonno.it). Since 1563, when it was founded as a charitable brotherhood, it has been serving the local community. Today, it is one of the largest foundations in Europe with its work mainly in the region, but with a significant role in international projects too. The Compagnia di San Paolo had a 2005 budget of around €134m.

**Fondazione CRT** (www.fondazionecrt.it). Since 1991 it has been investing considerable resources in culture, health, welfare, research and education. The Foundation, whose 2005 budget was around €75m, plans and implements a wide range of projects.

**Venture Capital for hi-tech companies**

Piemontech (www.piemontech.it), the holding company of the Torino Wireless Cluster, and Eporgen Venture provide with venture capital the most promising Piedmont-based companies operating in information and communication technologies, biotechnologies, biomedics, advanced mechanics, energy, innovative and high value-added services. Turin ranks second in Italy for venture capital operations.

**Stock exchange for SMEs**

With the aim of supporting the growth of small and mid caps companies, Borsa Italiana (www.borsaitalia.it), the official Italian Stock Exchange, dedicates two special Markets with minimal costs and quick timing of listing: Expandi™ and STAR™. The Expandi market is for those small companies (€1 million minimum capitalization) that wish to take the first steps towards listing in financial markets (offering a minimum floating of 10%). STAR™ is the market dedicated to midsize companies with a capitalization of less than €1 billion, and that voluntarily comply with some strict segment requirements, aligned with international standards.
ITP Invest in Turin and Piedmont,

established by the main public institutions and private business associations, is a non-profit organisation dedicated to securing new investment from overseas.

It responds to inward investment enquiries from all over the world and supports foreign companies expanding within the region.

From finding the most suitable location to sourcing advice on financial incentives for your investment in Piedmont, ITP support will continue as you expand and develop, once your operations are established.

ITP services

We support companies in developing their investment projects in Piedmont through macroeconomic factors and market research, pre-feasibility and feasibility studies, introduction to public and private agents in the region, selection of location opportunities in the target areas (objective 2) funded by the EU, and 360° support for the identification of incentives and fiscal advantages for investments.

Our services are free and confidential.