

Invest  Italy



## Business Opportunities

Locations Fact-Sheet

  
SviluppItalia

  
Italian Trade Commission

## Foreword

With a burgeoning presence of Life Sciences multinationals successfully operating in the country, Italy is traditionally welcoming to foreign companies.

Life Sciences is going through a period of transformation that places ever greater emphasis on innovative offshoots connected with biotechnology developments in the Health field. Yet, location options scattered throughout the country mainly specialize in fields such as Genomics and Genetics Engineering, Diagnostics, Biomedicine, Oncology, Neurosciences, Hematology, Infectious Diseases and Cardiology.

The present publication serves the purpose to get the foreign Life Sciences business community acquainted with a spectrum of Italian locations viable for investment projects. Each location fact sheet earmarks location specialism in Life Sciences and key data nailing down areas of investment opportunities.

The locations herewith included were selected by InvestInItaly.

*To explore more business opportunities in the Italian buoyant Life Sciences sector, contact [info@investinitaly.com](mailto:info@investinitaly.com)*



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# Cagliari.

## A Unique Off-shore Location for Genetic Research



Sardinia's dynamic economic and entrepreneurial landscape hosts a number of important businesses in high technology sectors, particularly Life Sciences and ICT. Today, thanks in large part to its highly qualified workforce and the unique scientific importance of the island's Genetic Heritage, the emerging Cagliari Cluster is of exceptional interest globally in the field of Biotechnology. There is particular scope for applications in the fields of Genomics, Biomedicine, Diagnostics, Bioinformatics and Computational Medicine.

The unique combination of high quality research (by the likes of the University of Cagliari, Neuroscienze PharmaNess and Center for Advanced Studies Research and Development - CRS4), extremely dynamic companies (such as Axxam, Bio-Kerr, BCS Biotech, Medinest), and technology transfer centers (mainly the Science and Technology Park of Sardinia) characterizes Sardinia as an important Biotechnology District. Over 40 million Euro has been allocated by the regional Government and the Ministry of University and Research (MUR) for the development of the District, particularly for companies carrying out research or production in the Biotechnology sector.

### Why Cagliari

- A Genetic Heritage (human, animal and vegetable) of unique and incomparable global interest both in terms of its characteristics and its typology. Sardinia has the only population in the world for which 32 units of Mendelian Inheritance have been identified and studied. This provides an ideal foundation for research into Genetic Isolates and related applications in Pharmacology.
- The setting up of the "Biomedicine and Health Technology District" with initial funding of 42 million Euro.
- The presence of an important nucleus of skills and scientific knowledge in ICT and Life Sciences, capable of interaction (between Medicine, Computational Medicine, Bioinformatics, Bioengineering and Epidemiology) in the development of technological applications of industrial interest.
- A highly qualified workforce with a growing critical mass of researchers developing Biomedical and Surgical Technology applications for human health.
- Internationally renowned centers for technology transfers such as the Science and Technology Park of Sardinia, capable of attracting finance and personnel in support of starting up and consolidating Biotechnology companies.

### Qualified Skills Base

The huge opportunity thrown open by the birth of a new class of entrepreneurs and researchers involved in Biotechnology is increasing the range of qualified local human resources. Over 3,000 students and an average of 700 graduates per year in Pharmacy, Medicine and Biotechnology provide business with an important pool of qualified human resources. The number of researchers is also growing. Sardinia has some 500 researchers engaged mainly in the fields of Genomics and Proteomics, Pharmacology and Computational Medicine. Furthermore, there's a strong effort to enhance the availability of qualified human resources through the implementation of specific training programs supported by the regional Government and by the local research network "Sardegna Ricerche". The presence of potential for innovation, extremely high given the limited size of the island's population, has been a major factor in attracting finance and researchers and promoting new start-ups. The high quality of life, vibrant local culture, absence of criminality, distinctive countryside and nature, all help to make Cagliari an ideal place in which to live and work.



## Industry Focus

Cagliari's entrepreneurial base is strongly oriented towards the Knowledge Economy, with a unique combination of international excellence in both Biotechnology and ICT.

The main specialized areas of Sardinian companies in the Cagliari Cluster (Kerios, BCS Biotech, Medinest, Consorzio Farma) are Pharmaceuticals, Biotechnology, Diagnostics and Bioinformatics.

Starting up and developing new business initiatives are boosted by the presence of a Genetic Heritage of enormous scientific importance, the result of thousands of years of geographical isolation, which is particularly useful in the study of the genetic factors linked to Multifactor Diseases and the study of the most important Neurodegenerative Diseases. The Science and Technology Park of Sardinia plays an important role in the founding and consolidation of industrial production as a business incubator as well as an ideal catalyst for new start-up initiatives. As a consequence of the strong business dynamism, a Swedish firm, EDX Diagnostics located in the Park, as well as Bioflag, a spin-off of Milan's San Raffaele Scientific Institute.

This vitality will be further reinforced by the establishment of the "Biomedicine and Health Technology District" where specific financial support for Biotechnology companies is already planned.

- **BCS BIOTECH**

BCS (Bioanalisi Centro Sud) was set-up in Cagliari in 1989 by a group of researchers with twenty-years experience in Biotechnology. The company has undertaken scientific work with many Italian and foreign universities and research centers including those from Cagliari, Genoa, Milan, Zurich, Berlin, Athens and Philadelphia. BCS operates in Biotechnology and Biochemicals in the Biomedical, Veterinary and Agricultural fields. Now a European leader, BCS Biotech produces diagnostic kits on microchips for laboratory work and for the diagnosis of viruses and other pathogens.

- **BIOFLAG**

Bioflag is a genomics-based discovery private company focused on the identification and development of Novel Biomarkers through the application of Bioinformatics, Biology, Chemistry and Medicine. Its activities are focused on integrated biological experiment-based and in silico-based technology platforms that permit the identification, selection, prioritization and validation of novel targets for biopharmaceutical companies.

- **CONSORZIO PHARMA GEN**

Consorzio Pharma Gen is a grouping of three SMEs operating in Sardinia in Pharmacogenetics, Biotechnology and on various diagnostic and therapeutic applications.

- **KERIOS**

Kerios is Milan's leading private pharmaceuticals company and was founded in 2001. It has recently moved its main Sardinian research facilities to the Science and Technology Park of Sardinia. Consequently it is now structured in two areas:

- Pharmaceuticals, focused on informing about and promoting important Cardiovascular, Urological and Anti-infectious Medicines in partnership with the main pharmaceutical multinationals operating in Italy
- Biotechnology, R&D on Therapeutic Proteins and Plasmids for DNA Vaccination; these moves in the fields of Pharmacogenetics, Gene Therapy and Recombined Protein Therapy have helped to bring scientific strengths in Biomedicine, of undisputed excellence, to Sardinia.

- **MEDINEST**

Medinest is a company dedicated to developing, producing and commercializing pharmaceutical and diagnostic products for both human and veterinary use. It has particular specialization in the study of molecules used in the treatment of Neoplasia, Autoimmune Diseases and Microorganism Disorders.

- **PRIGEN**

Prigen, founded in 2003, carries out R&D and the production and commercialization of biotechnology and pharmaceutical products using their own advanced technologies. It is also active in the areas of Molecular Diagnostics and Biopharmacy.

## Research Centers and Expertise

Businesses that invest in Sardinia can benefit from a wide range of skills and a network of technological services for applied research in the fields of Pharmacology, Biotechnology, Microelectronics, New Materials and Environmental Protection. Its main avenues of research are: new Etiopathogenetic bases; Phase I development of New Medicines, active principles or biotechnology products; evaluating the toxicological impact of the discovery and use of Biomarkers for Clinical Diagnosis and Therapy; Bioinformatics; (and) Computational Medicine and its clinical applications. Pharmacologists Gaetano di Chiara and Gianluigi Gessa and Geneticist Mario Pirastu, all from the University of Cagliari, are among the top twenty best known Italian researchers in the world, according to David A. King's classification in the respected British science and technology journal "Nature".

- **Center for Advanced Studies, Research and Development in Sardinia (CRS4)**

CRS4 is an inter-disciplinary center of applied research situated in the Science and Technology Park of Sardinia. The center develops and applies innovative solutions in a vast array of important research areas making good use of its qualified expert researchers' skills and experiences gained in an international setting. The center's President and Founder is Prof. Carlo Rubbia, the Nobel Prize-winner for Physics. Its many areas of interest include ICT, Environment, Computational Methods, Calculus and much beyond. Its Biomedicine work is focused primarily on applying IT for Analyzing Medical Data, Image Processing and Physical Simulation. For the IERAPSI Project, which was partly financed by the European Union, CRS4 has focused its efforts on Electro-biomedical R&D through the development of an interactive computer environment for Bone Surgery Simulation and instrumentation for conducting interactive 3D analyzes of angiographic test results. Last but not least CRS4 also created Italy's first ever internet site.

- **Consortium for Biotechnology Research and Development (Biotecne)**

Biotecne carries out scientific research, education and technological mediation with a strong focus on Biotechnology. It promotes the diffusion, publication and utilization of results even through the creation of specialized centers that manage the transfer of Innovation. Active in Biomedicine, Agro-food, Environment and Biomass Energy, the Consortium's range of Biomedicine projects includes the production of Monoclonal Antibodies in batteries, recombinations for Pharmacological and Diagnostic use and Molecular and Diagnostic Probes for the identification of Salmonella and for resistance to antibiotics.

- **Neuroscienze PharmaNess (The Neuropsychopharmacology Research Center)**

Pharmaness is a public-private financed company run by Sardegna Ricerche involving the University of Cagliari and the National Research Council (CNR). Based in the Biotechnology area of the Science and Technology Park of Sardinia, PharmaNess conducts pharmacological research on the Central and Peripheral Nervous Systems, specializing in addictions, pain, depression, schizophrenia, nervousness and a number of peripheral disorders. The main aim is to widen knowledge of these illnesses and identify new therapeutic strategies through the use of Neurobiology. PharmaNess carries out research in Molecular Biology, the Neuroanatomy, Cellular Biology and Receptor and Behavioral Pharmacology. Presently the company employs some 20 researchers most of which completed their training at prestigious foreign research laboratories. Having produced over 70 publications for international scientific journals, the center's modern, well equipped laboratories frequently cooperate with other important research centers, including the CHR Institute of Neurogenetics and Neuropharmacology in Cagliari, the Chemical Sciences Department of the University of Cagliari, the Pharmacy Department and the Toxicological Chemicals Department of the University of Sassari, ENEA, CNR-ICRM from the Polytechnic of Milan, the Pharmaceuticals Department of the University of Pisa, the Inter-university Consortium of Systems and Large Interfaces (CSGI), and CRS4.

- **Science and Technology Park of Sardinia**

The Park is Sardinia's network of research and technology transfer centers, infrastructure and services and is present in four locations on the island: Cagliari-Pula, Alghero-Tramariglio, Nuoro and Oristano. Cagliari is its main center and is ideally situated on a 160 hectare property, of which 25,000 sqm is indoors, located next to the Sulcis National Park. The Science and Technology Park possesses multifunctional laboratories well equipped for research and development, a specialized biotechnology incubator and a Pilot Projects Center for the Agro-food sector. The Park is managed by the Sardegna Ricerche and was set-up with the backing of the regional Government and the European Union. It has three main divisional centers: Shardna (Genetics), PharmaNess (Neurosciences), and CRS4 (Bioinformatics and Electro-biomedicine). These research structures manage to attract new business and also provide high value added scientific services to



other companies. The Park has also become a strategic link in various European networks, including IRC-CIRCE and Patlib that deal with access to Technology Data Bases and BIO-LINK, integrating 5 special European Biotechnology Incubators (Oxford, Paris, Munich, Jerusalem and Cagliari-Pula).

- **Shardna**

Shardna SpA conducts research and provides services in applied Biotechnology and the Life Sciences, specializing in Genomics and Biopharmaceuticals. Its research is based on the identification of so-called Genetic Isolates and is possible thanks to the unique character of parts of Sardinia's hinterland, whose demographic evolution has protected it from 'contamination' of any kind. The first phases of research have already led to extremely important discoveries, including the identification of a new gene and a resulting protein, named Talanina. The protein is predisposed to a specific Renal Pathology typical to villagers from Talanina (in Ogliastra province), who voluntarily gave DNA samples for study and thanks to whom the new gene was discovered. The Shardna scientific project, supervised by Prof. Mario Pirastu, involves the combined efforts of 3 programmers, 8 bioinformaticists, 2 statisticians, 6 doctors, 10 biologists, 3 genealogists and 2 PhD student researchers. It occupies 1,900 sqm of laboratories in the Science and Technology Park, over half of which contain laboratories for Molecular Genetics, with the rest given over to a 450 sqm Bioinformatics laboratory or used as office space. Shardna has been awarded some 15 million Euro in funds to develop its studies in Genetics.

- **University of Cagliari**

With 54 departments and centers, 20 of them dedicated to the Life Sciences, the University of Cagliari provides invaluable support developing skills and innovation for the sector. The most notable contributors include the Departments of Biochemistry and Human Physiology, Hygiene and Public Health, Cytomorphology, Applied Biosystems Sciences, Chemical Sciences, Technological Pharma Chemicals and Toxicology. The university has been shaped by its high pedigree of scientific output in the fields of Biology, Medicine and Chemistry with over 1,000 articles published and 20 patents filed from 2001 to 2003. It offers a wide range of courses, increasingly aimed at meeting business needs, including degree courses in Industrial Biotechnology, Biomedical Engineering, Chemical Sciences and Chemical Technologies.

## Investment Support

Sardinia is a phasing-in "competitiveness" objective Area according to EU Regulation and offers companies significant financial support through a system of facilities and incentives for research and development, for taking on training personnel and for purchasing machinery, plants and equipment.

For decades now, the regional Government has been investing strongly in research. As far back as 1994 it helped to set-up regional support mechanisms for research that led to the founding of the Sardegna Ricerche and the CRS4 among others. Biotechnology, in particular, is a strategic priority for the regional Government. Its Strategic Plan for Research, Innovation and Development of Technology in Sardinia highlights Biotechnology, Pharmacogenomics and ICT as strategic sectors. The creation of the "Biomedicine and Health Technology District", endowed with 42 million Euro, is intended to encourage cross fertilization between the sciences, skills and technologies active in the three sectors. The initiatives funded through the District are raising the potential of research, with the creation of new laboratories and of technology transfer services, as well as promoting financial support for start ups. In this respect, efforts aimed at supporting new businesses through a Bioincubator and the launch of an assistance program (Programma Bio Fama) to Biotechnology business start-ups, particularly stand out. A total funding of some 90 million Euro has been allocated for research aimed at aiding business start-ups, with specific measures for Biotechnology firms. Furthermore, regional financing through the Sardinia Industrial Finance Company (SFIRS) has made credit available for Biotechnology companies and participates to the companies' risk or seed capital. The industrial convergence of ICT and Biotechnologies is particularly supported by the strong commitment of the Sardegna Ricerche network, which is promoting the "ICT Technologies in Biomedicine" program within the project for the creation of a pole of excellence of Bioinformatic technologies applied to personalised Medicine. It is aimed at mid-sized and large ICT and Biomedicine businesses with the support of a wide range of financial incentives. A further and latest effort of local as well as of central Government (including the regional Government and the National Drug Agency) to support Biotech in Sardinia is proved by the newly established company "Fase Uno", aimed at selection, development and evaluation of projects in pre and post patent phases for new agents or Diagnostic procedures and new drugs. The activities include the transfer of know-how and procedures and finally the assistance for the development, registration, production and commercialization of products.

# Milan. Italy's Nerve Center



Milan is Italy's leading business location (the Province of Milan accounting for over 10% of national value added) and among the most competitive in Europe. The area is well known as an economic center of excellence as well as a strategic hub for international activities. Drawing strength from a long-standing technological tradition, most hi-tech companies, whatever the market, have a presence in the area.

With more than 200 businesses, Lombardy and Milan are the central players in the Italian Life Sciences sector. The region hosts a considerable share of pharmaceutical companies while attracting some 50% of the country's biotech firms. The latter are largely active in developing Therapeutic Products and high value added Technological and Diagnostic Platforms that fortify the processes used in pharmaceutical R&D.

The region's deep-rooted, extensive production base is strengthened by its globally progressive research institutes in Biomedical Research, leading hospitals in Clinical Trials and technology transfer centers that markedly reduce times to market.

An exceptionally well qualified workforce with high levels of productivity provide business with a pool of essential skills that feed into innovative processes. Not forgetting the vigorous support of the regional Government, the existence of a vast network of venture capitalists and business service providers and a favorable business climate that all contribute to making Milan a leading European Life Sciences destination.

## Why Milan

- A robust, dynamic and highly creative production base: all major pharmaceutical companies (Amgen, Aventis Pharma, Bayer, Boehringer Ingelheim, Dompé Biotec, Italfarmaco, Roche, Pfizer) as well as most of those in the biotech sector (Areta, Axxam, Biofin Laboratories, BioRep, BioXell Clonit, Newron Pharmaceuticals, Polymekon, Primm) have bases in the Milan Cluster. Biotechnology firms in Milan (over 35% of the national total) are frequently industrial spin-offs that are registering increasing levels of R&D investment while demonstrating a high capacity for innovation. Pharmagenomics, Immunology, Oncology, Molecular Biology Diagnostic Systems, Nervous System Diseases, Technology Platforms, Agro-food and Environment are among just some of the specialized areas of production and research.
- A system of innovation excellence with research centers and science hubs, institutes and hospitals engaged in Clinical Trials (Scientific Institute San Raffaele, European Institute of Oncology, San Raffaele Hospital, Mario Negri Institute, San Matteo Polyclinic), 12 universities (University of Milan, University of Milano-Bicocca, University of Insubria and of Pavia) science and technology parks (San Raffaele Biomedical Science Park), and incubators. On top of dedicated research know-how, foreign investors can tap into a network of service providers and suitable and readily available facilities.
- The Milan Cluster draws upon a pool of highly-qualified human resources with some 5,000 researchers at public and private institutes and regional universities with specialized degrees followed by some 30,000 students, producing 5,000 graduates each year in Biotechnology, Pharmacy and Medicine.
- The sector's strategic importance for regional policy is confirmed by the creation of a "Biotechnology District", the availability of substantial funds for innovation and the high incidence of Biotech projects in Lombardy. The Center for Advanced Biomedical Research (CERBA), is fit to become the most important biomedical research complex worldwide for research training and treatment.





## Qualified Skills Base

The Milan Cluster is a reservoir of highly skilled human resources, Italian as well as foreign. For proof of the Lombardy region's robust R&D character, one need only consider its almost 32,000 R&D personnel (equal to 21.5% of the total national R&D work force), of which 14.3% operate in public institutions, 15.5% in universities and some 30% in private companies.

The important concentration of a suitably qualified workforce in Life Sciences – 5,000 researchers in both public and private institutes, 30,000 students and 5,000 graduates per year in Biotechnology, Pharmacy and Medicine – is made possible by the quality of education provided by local seats of learning and the strong orientation of business toward innovation.

Three of the 12 major universities in Lombardy (University of Milan, University of Milano-Bicocca, San Raffaele University Institute) offer a range of high quality courses in areas such as Medical and Pharmaceutical Biotechnology, Cellular and Molecular Medical Biotechnology, Cognitive Neurosciences, Biotechnology for Industry and the Environment, Functional Genomics and Bioinformatics.

The high skill levels are confirmed by the fact that Lombardy is among the top 20 regions in Europe in terms of its patenting power in the areas of Biotechnology, Organic, Pharmaceutical and Polymer Chemistry.

## Industry Focus

Milan is one of Europe's main Life Sciences Clusters with a strong and long-standing presence of biotechnology and pharmaceutical businesses: 200 companies creating jobs for some 31,000 individuals.

The Cluster has the highest share of dedicated biotech companies in Italy, many of which are industrial spin-offs. This vibrant and innovative production base has recorded increasing rates of R&D spending as well as patent filing, presently owning the rights on some 350 registered patents. Moreover, the average size of the companies is remarkable, employing just over 40 workers per company, comparable with clusters in cities such as Cambridge, Munich and Evry.

Some of the main areas of specialized production and research include Pharmagenomics, Immunology, Oncology, Molecular Biology Diagnostic Systems, Nervous System Diseases.

One half of all Italian firms engaged in developing therapeutic products, among them Areta, BioXell, Cell Therapeutics, Keyros Molmed and Nicox are based in Lombardy. Many others are involved in Diagnostics (a third of all Italian companies) such as Clonit, which has been developing, producing and exporting diagnostic kits since 1978. Other prominent companies, such as Axxam, Nikem research and Primm, are actively developing technology platforms or providing research support services. BioRep, a newly constituted Private Italian Company, aim with the goal to provide Biorepository services to the European scientific community. It will provide the following services: Cryopreservation of Biological Materials, Cell Biology services, Molecular Biology services, diagnostic kits and reagents.

The importance of Applied Biotechnology in the Agro-food sector is significant accounting for 43% of all Italian companies in the sector.

Last but not least, Lombardy's pharmaceutical sector includes many of the largest national and international operators (Amgen, Aventis Pharma, Bayer, Boehringer Ingelheim, Dompé Biotec, Italfarmaco, Roche, Pfizer, to name a few), which have all chosen to locate in Milan's area for research centers (amounting to about 30) and specialized medicine production facilities.

- **ARETA INTERNATIONAL**

Areta International is as a biotech services company operating in Cell Culture Technology. Its technology platform comprises in-house developed methods for the generation and production of Monoclonal Antibodies, the adaptation of all kinds of cells to serum free media, the development of rapid and efficient techniques for the production of Monoclonal Antibodies, Recombinant Proteins and cells in large quantities. The company's product portfolio consists of Monoclonal Antibodies and related Hybridoma Clones specific for non conventional antigens including: HIV envelope, core and regulatory proteins; Fibrinolytic, Angiogenic Factors; Haemopoietic Factors; Bacterial Endotoxin; Bacterial Protein Synthesis regulation factors; Alzheimer's Disease related proteins; Cancer Surface Antigens.



- **AXXAM**

Axxam is a biotechnology company launched in mid-2001 as a spin-off from the Bayer group. The team consists of more than 50 qualified people having a solid expertise in the drug discovery processes. The company's mission is to be a "discovery partner" for the Life Sciences industry. In order to better evaluate, in a comprehensive manner, the pharmaceutical potential of a particular gene, Axxam has generated a large mRNA expression profiling database called GeneTrawler™. This database contains the expression data for nearly all human G protein coupled receptor (GPCRs) genes and nuclear hormone receptor (NHRs) genes, explored in more than 70 different human tissues using the TaqMan® technology (Applied Biosystems). GeneTrawler™ also includes an increasing amount of in situ hybridization data. In order to allow a more efficient planning and a better understanding of pharmacological experiments on rats, GeneTrawler™ contains expression profiling data for a large number of rat genes orthologous to human GPCRs. In addition, two complementary platforms are available, GeneChip® (Affymetrix) and in situ hybridization. The company, in collaboration with a number of important businesses in the sector (Altana Pharma, Bayer HealthCare, BioXcell, Chiesi Pharmaceuticals, Dompé, GlaxoSmithKline, Grünenthal, Newron Pharmaceuticals, NicOx, Recordati and Rottapharm) boasts a diverse portfolio of products covering a wide range of fields, from novel gene targets to novel fluorescent and luminescence read-out systems.

- **BIOXELL**

BioXcell, recently listed at the Zurich Stock Exchange, is a private research and development biopharmaceutical company integrating industry experience with a competitive edge in immunology. Starting from two strong technology platforms based on TREM receptors System and Vitamin D3 analogues. The company has identified molecules to be developed in Secondary Hyperparathyroidism and Benign Prostate Hyperplasia. In addition, the company has research programs on Inflammatory Diseases including Asthma, Psoriasis and Rheumatoid Arthritis.

- **CELL THERAPEUTICS**

Based in Seattle (USA) and with a European branch based in Bresso (Italy), Cell Therapeutics is a biopharmaceutical company committed to developing an integrated portfolio of oncology products aimed at making cancer more treatable. Trisenox was approved for marketing in 2000 by the US Food and Drug Administration and in March 2002 by the European Commission to treat patients with relapsed or refractory APL, a rare, life-threatening form of leukemia. The company is developing inhibitors to HIF-1, a transcription factor known to play a role in regulating tumor cell survival, proliferation and angiogenesis. It has identified a number of lead HIF-1 inhibitors which are currently undergoing lead optimization.

- **DIALECTICA**

Dialectica originates from the "Laboratory of Stem Cell Biology and Pharmacology of Neurodegenerative Diseases", Department of Pharmacological Sciences and Center of Stem Cell Research at the University of Milan. Created in July 2004 as an independent company, it focuses on the development and optimization of several Stem Cell Based Assays with more pathological targets which meet major, unmet medical needs related to disorders of the CNS.

- **MOLMED**

MolMed is a highly integrated company with a strong orientation on research, production and development of new therapies in the field of Molecular Medicine. Its current focus is aimed at developing innovative therapies for cancer and AIDS, such as Gene Therapy, Antitumor Vaccination and Vascular Targeting. Founded in 1997, the company relies on the invaluable input of its 52 strong staff, most of them graduate level, as well as external collaborators. The scope of technologies the company uses includes Fermentation, Cell Cultivation, Stem Cells, Monoclonal Antibodies, Gene and Cell Therapy and Recombined Proteins.

- **NERVIANO MEDICAL SCIENCES**

Founded in 2004 as a spin-off of Pfizer, the center today employs nearly 700 highly skilled and experienced scientists, technicians and managers from Italy and abroad. Nerviano Medical Sciences is the largest pharmaceutical R&D facility in Italy and one of the largest oncology-focused, integrated discovery and development companies in Europe. It is committed to discovering and developing novel anticancer therapies.



- **NEWRON PHARMACEUTICALS**

Newron Pharmaceuticals, recently listed at the Zurich Stock Exchange, is a clinical stage biopharmaceutical company focused on the discovery and the development of small molecule drugs for the treatment of Central Nervous System (CNS) Diseases. Its focus is on Parkinson's Disease, Epilepsy and Pain. Through continuous research, diligent scientific breakthroughs and ethical use of emerging new technology, Newron Pharmaceuticals aims to provide patients with debilitating CNS disorders effective therapies that significantly improve their quality of life. The company has two products in clinical trials: Safinamide and Ralfinamide, an innovative treatment for neuropathic pain conditions in Phase II clinical development. Newron's clinical pipeline is supported by a broad portfolio of early stage proprietary compounds generated by Newron Pharmaceuticals' channel drug discovery platform.

- **NICOX**

Nicox Research Institute is the Italian-based research center of NicOx SA, whose headquarters are at the Sophia Antipolis Science and Technology Park near Nice, France. NicOx, though an Italian company in origin, is listed on the Paris stock exchange. The research center in Bresso carries out R&D on nitric oxide-bearing medicines. Of the company's 39 employees, 33 are science-technology graduates. The range of technologies the company deals with includes the synthesis of new products to Pharmacological Characterization and Pharmacokinetics and Metabolism.

## Research Centers and Expertise

The Milan Cluster has a high concentration of research centers at the cutting edge of European and worldwide Biomedical Research. The core of these skills is occupied by the 12 Lombard universities, three of which are particularly notable in terms of the intensity of their research efforts and for the high presence of laboratories and research organs dedicated to Life Sciences fields. There is a particularly strong presence of both public and private research centers as well as research-oriented hospitals, among them the Italian Institute of Auxology and the Maggiore Hospital of Milan, in the field of Clinical Trials. The Scientific Institute San Raffaele is among the world's leaders in Gene Therapy. Furthermore, one of the most promising AIDS vaccines is the result of research carried out at the Italian National Institute of Health also based in Milan. Oncology centers such as the Mario Negri Institute for Pharmacological Research and the European Institute of Oncology (IEO), both in Milan, are renowned throughout the world for their advanced therapies. These centers work in cooperation with the National Institute of Tumors and with a number of university clinics. Milan is home to 26 institutes and centers of the National Research Council (CNR) of which 10 in the area of Biotechnology and Health Sciences specializing in Neurology, Biophysics, Macromolecules, Chemicals, Biomedical Technologies, Nanotechnologies and Photonics. In the last 5 years throughout the Cluster of Milan a large number of incubators and science and technology parks have been set-up in response to the growing demand for skills suitable for start-ups and spin-offs.

- **Carlo Besta National Institute of Neurology (INN Besta)**


INN Besta is an internationally recognized leading neuroscience center that is owned by the HPH (Health Promoting Hospitals) network, a World Health Organization project promoting healthcare. Major areas of expertise of the institute include: Neurological Disorders in adults and children, Surgical and Oncological Pathologies, Chronic and Rare Diseases. Moreover, the institute has dedicated centers devoted to specific Neurological Diseases.

- **European Institute of Oncology (IEO)**

IEO is a comprehensive cancer center with research laboratories, clinical facilities and 226 beds for patients. Like other cancer institutes of international note, it is a comprehensive center, not only offering the most modern and effective treatments and diagnostic services for many of the major cancers, but also committed to research, clinical trials, cancer prevention, training and education.

- **FIRC Institute for Molecular Oncology (IFOM)**

A non-profit research center that provides a single site for many exceptional Milanese institutes for advanced studies in Post-genomics applied to Oncology. The Department of Experimental Oncology of the European Institute of Oncology and the Institute for Molecular Oncology of the Italian Foundation for Cancer Research are undergoing a major expansion and integration of their scientific activities. The interests of the two institutions include Cell Cycle Regulation, Signal Transduction, Cancer Genetics, Cancer



Immunology, Angiogenesis and Structural Biology. Their success relies on competitive fund raising that allows them to create state-of-the-art shared facilities and resources for Imaging, DNA and Tumor Micro-array, Mass Spectrometry, DNA Sequencing, Bioinformatics, Protein Expression and Model Organisms.

- **Mario Negri Institute of Pharmacological Research**

This non-profit biomedical research organization has been a full and active member of the international scientific community since its founding in 1961. The institute works in close collaboration with Italy's most important national institutions and undertakes ongoing cooperation with foreign universities and numerous international organizations such as the World Health Organization, the European Union, the European Organization for Research on Treatment of Cancer (EORTC and of which the institute is a founding member), the EMEA, the American National Institutes of Health (particularly the US National Cancer Institute), and the Weizmann Institute in Israel. The institute's research is mainly concentrated on the fight against cancer, Nervous System and Mental illnesses, Cardiovascular and Kidney Diseases, Rare Diseases and the Toxic effects of Environmental Contaminants. The institute is also involved in research on pain relief and drug addiction. Along with its research activities, the institute also provides professional training to laboratory technicians and graduate researchers.

- **National Institute of Tumors (INT)**

The institute was founded in 1925 for cancer study and treatment. Following several expansions today it is devoted to day hospital, diagnostic services and therapy. In 1995 a new section was added with a number of units for Experimental Oncology, Radiotherapy and Intensive Care and Cardiology.

- **San Matteo Polyclinic**

The San Matteo Polyclinic in Pavia is one of Italy's best qualified and most important Institutes for Research, Hospitalization and Health Care. With some 1,000 annual publications and over 50 departments, institutes, centers and laboratories, San Matteo is also the seat of numerous professors from the University of Pavia and of the Degree course in Medicine and Surgery with its 4,000 students and 500 graduates each year. Research, both basic and experimental, is concentrated on the Biology of Tumors, the mechanisms of Cerebral Ischaemia, Neurotraumatology and Neurotransplantation. Clinical research at the Polyclinic focuses on Neurooncology, Spinal Pathology, Infant Tumors and Malformations and Neuroendoscopy. Among its many excellent departments are those of Clinical Engineering, the Specialized School in Neurosurgery (among the oldest and most prestigious in Italy), and the Biotechnology and Biomedicine Technology Laboratory. The Polytechnic's biotechnology studies of particular interest include Molecular and Cellular Biology, especially its research into diagnosing and treating Genetic Diseases, the Analyses of Protein and of Functional Peptides and research on Immunology and Biomedical Technology.

- **San Raffaele Biomedical Science Park**

The San Raffaele Biomedical Science Park is among the largest science and technology parks in Europe entirely focused on Biomedical and Biotechnology research. It has ties to the San Raffaele Hospital, the largest Italian private hospital and recognized the world over for its expertise and support in the organization and carrying out of clinical trials. Present on the Park site are the private University Vita-Salute San Raffaele, several pharmaceutical, diagnostic and biotech companies and start-ups and the DIBIT Department of Biotechnological Research, a facility of 12,000 sqm entirely devoted to research on AIDS and Infectious Diseases, Biomedical Technologies, Cancer Immunotherapy, Genetics and Gene Therapy, Molecular and Cellular Pathology, Neuroscience and Stem Cells. The Park also hosts a PhD program in Cellular and Molecular Biology and other Foundations such as the Cystic Fibrosis Association and Telethon. The latter is comprised of 3 research institutes: the Telethon Institute of Genetics and Medicine (TIGEM), which is devoted to the study of human inherited diseases (with a particular emphasis on gene identification and function) such as eye development diseases and different neuromuscular, developmental and metabolic disorders; the San Raffaele-Telethon Institute for Gene Therapy (HSR-TIGET), a joint venture with the San Raffaele Foundation of Monte Tabor, is focused, among others, on developing gene therapy protocols for inherited diseases; and TECNOTHON, a technology laboratory focused on developing highly innovative aids for the disabled. In addition to organizing and managing DIBIT research the Park offers Technology Transfer support through the Office of Biotechnology Transfer, technical and logistical support to third-parties for setting up laboratories and accessing the Park's scientific equipment and facilities and organizing training through the Congress Center.



- **University of Milan**

The University of Milan has 15,000 students, over 2,000 graduates yearly and 1,200 researchers in the Life Sciences. The University's Department of Biology and Genetics for Medical Sciences carries out inter-disciplinary research projects for studying biological and genetic problems, in particular those dealing with the alteration of human genetic material, as well as the cell differentiation, transformation and proliferation, both in-vitro and complete organisms. The Department of Food and Microbiological Science and Technology publishes some 150 scientific works annually and is one of the most important specialized Italian public research centers in the Food sector. The Department of Biology, itself the host to the CNR Study Center for Molecular Biology and Plant Cells, is responsible for organizing scientific research in the area of Animal and Vegetable Biology.

- **University of Milano-Bicocca**

Milano-Bicocca was the first Italian university to run a Biotechnology degree program. Currently, the University offers degrees in Biotechnology, Bioinformatics and Industrial Biotechnology as well as three specialized Masters programs in Molecular Immunopathology, Bioinformatics and Biocommunications. Among its research activities of international note, the Department of Biotechnology and Biosciences is behind Bioforum, Italy's first exhibition-cum-convention initiative dedicated to Biotechnology and a point of reference for Italian and foreign companies and researchers.

## Investment Support

Milan is the financial center of Italy and home to the highest share of venture capitalist companies aimed at supporting business ventures in Biotechnology. The range of companies stretches from business angels such as the **IBAN Association** (Italian Business Angels Network Association) to financial companies devoted to innovation and venture capitalists such as 3I Europe, Apax partners, LIB Incubator, Z-Cube and Genextra. **Z-Cube** is under the management of the Zambon Group while the Advisory Board Chief is Prof. Dulbecco, the Nobel Prize for medicine. **Genextra** is a holding company investing in start-ups in the fields of Pharmacogenomics and Biotechnologies that has financed, among others, Congenia, a company active in the study of ageing processes.

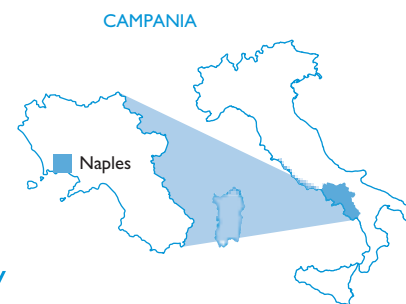
Support for Life Sciences from the region takes the form of a number of initiatives and projects. Most notable among them is the creation of "Biotechnology District" with financial support worth 26 million Euro over a three-year period that will involve a series of concrete steps for industrial research, advanced training and evaluating research results.

**Finlombarda**, the finance company of the Lombardy region, has recently launched Fondo Next, a closed-end fund, dedicated to institutional investors. It has been set-up to develop a Venture Capital market in Lombardy, specifically dedicated to innovation, R&D and new technologies. Alongside Fondo Next, the region is also developing a Fondo Seed Lombardo, an additional financial instrument for facilitating the initial phases of setting up spin-offs.

Among the most important projects, a new Center for Advanced Biomedical Research (CERBA) is to be established in Milan, next to the European Institute of Oncology thus creating a science city similarly to **Bethesda's National Institute of Health**. A multidisciplinary center for Oncology, Cardiology, Neonatology and the Neurosciences will be set-up and will benefit from a common technology platform, that will integrate experimental and clinical research with therapeutic and diagnostic services and facilities dedicated to training and scientific culture.

**Biopolo** is another noteworthy private nonprofit company that has made it its business to back the development of Biotechnology in Italy through technology transfers, support for research networks and promoting new biotech companies. The Scouting Bioiniziativa program launched by the Lombardy region through its Assolombarda and Finlombarda subsidiaries, has already helped spawn a number of attractive university spin-offs: Dialecta which produces IT platforms for Stem Cell Modeling which allow faster, lower-cost screening; LeaBiotech in the Agro-Biotech sector; and Genespin for special Reactive Diagnostics.

Investors locating in Milan can also rely upon the full range of companies offering services dedicated to businesses operating in the Life Sciences industry. These include companies such as CIRC, a service company supporting R&D for chemicals and biotechnology SMEs and AB, a Bio-Communication Agency.



## Naples. A Harbor of Biotech Opportunity

Biotechnology in Campania, particularly in Naples, is a wide-ranging, cross-cutting discipline which has had a strong impact both on traditional industries such as Agro-food, Chemicals and Pharmaceuticals and on new innovative areas like Public Health.

Naples and Campania can draw upon an extensive pool of qualified labor as well as a research framework of exceptional excellence. With 8,000 researchers working in public research centers and universities, some 90 research centers and 7 universities, Campania ranks third among Italy's regions for public research.

Furthermore, among them there is a high concentration of international caliber researchers and centers in Life Sciences fields such as Genetics and Molecular Diagnostics. This emerging Naples Cluster plays host to a number of pharmaceutical and biotechnology companies mainly active in Oncology.

Strong support for R&D from the regional Government as well as the particularly favorable range of incentives available underpin the excellent growth prospects in the Life Sciences sector.

### Why Naples

- A competitive and well-developed skill base that feeds several centers of excellence (CNR Institutes in Naples, TIGEM), science and technology parks and a network of high quality universities. The Federico II University in Naples was the first in Italy to establish its own Faculty of Biotechnology.
- A deep pool of qualified personnel with 20,000 students, 2,300 graduates annually and over 2,100 researchers in Biotechnology, Pharmacy and Medicine.
- A production base of pharmaceutical firms (Novartis, DSM Pharmaceutical) and a dynamic network of small enterprise that is extremely active, mainly, in oncological research.
- Life Sciences is central to Campanian regional policy which backs up research through the creation of competence centers and a system of incentives that are particularly favorable to innovation.

### Qualified Skills Base

The extensive, young and highly motivated workforce makes Campania and Naples in particular, such an ideal destination for companies investing in knowledge intensive sectors.

An average of 2,300 graduates per year, 20,000 students and 2,100 researchers provide the support to enhance the region's competitiveness in Life Sciences.

This workforce is fed by a university system offering education increasingly oriented toward the business needs. Three Campanian universities – Federico II University in Naples, Second University also in Naples and the University of Sannio – alone run 12 specialized degree programs in Industrial Biotechnology, Molecular Biotechnology, Medical Biotechnology, Health and Pharmacy, among others. These courses provide the right scientific skills and knowledge acquisition for entry onto the labor market.

One further element making a vital contribution to raising the skill base of young people is evident from the region's support – comprising regional, national and EU incentives – for firms that invest in education and lifelong learning for their employees.



## Industry Focus

The emerging Naples Cluster rests on a number of small companies active in the health-oriented Biotechnology sector. These companies, operating in close collaboration with local universities, mainly carry out oncological research.

In Campania these biotech companies are well integrated with the pharmaceutical industry, which itself employs 1,400 people directly and many more along the value chain. These companies, such as Novartis and DSM Pharmaceutical, research and produce pharmaceutical raw materials and medicines, with a specialization in active principles through fermentation.

Growth prospects in the Life Sciences are extremely encouraging when considering the scope for Biotechnology applications in traditionally strong sectors of the Campanian economy such as the Leather, Dairy Products and Agro-food industries.

- **DSM PHARMACEUTICAL**

Revenue from the pharmaceutical branch of this well known Dutch multinational company exceeded 470 million Euro in 2004 alone. Its plant in Campania is mainly involved in the production of the Lactoferrin molecule, a multifunctional protein that forms naturally in human milk as well as in other endocrine secretions and has an extremely important role in stimulating the Immune System to act against cancerous cells, infections, asthma and other allergic diseases.

- **INBIOS**

Inbios is a new biotechnology company specialized in the chemistry of peptides or, more precisely, the custom synthesis of peptides, the distribution of amino acids and reagents for synthesizing peptides and producing active antibodies to peptides and proteins. It is also engaged in a number of projects on biologically active and immunogenic peptides. Its highly qualified research team is supported by experts from the pharmaceutical industry and partner universities that bring considerable experience and knowledge in the areas of Genomics and Proteomics to the set-up.

- **NOVARTIS**

The production center of the Novartis Group, the multinational whose Pharmaceutical Division generated 730 million Euro in 2004, is the largest pharmaceutical plant in southern Italy. In recent years its role in the group's international strategy has been reinforced with production now reaching 82.6 million packets of solid drugs (in tablet, capsule and granulated form), amounting to 4.4 billion units, destined for 83 worldwide markets. With over 400 employees, it is accounted as one of the most productive Novartis plants worldwide and one of the most efficient in Italy.

At present a new class of Hypertension drugs is being developed, with clinical trials carried out in cooperation with regional research centers and hospitals.

- **OKAIRÒS**


Okairòs is a Merck Inc. spin-off founded in 2006 by a team of experienced scientists. Headquartered in Rome, its laboratories are located at the CEINGE, the Naples based center of genetics engineering. Its main objective is to develop genetic vaccines to fight infectious diseases against which no classical vaccine is available. It has developed a proprietary genetic vaccine platform; its front line products are prophylactic and therapeutic vaccines against HCV.

- **TECNOGEN**

Formed from a pre-existing consortium, Tecnogen researches, develops and manufactures biotechnology products for use in clinical trials. The company is active in the preparation and supply of reagents for the Agro-food and Pharmaceutical sectors and has specific experience in the study of proteins with pharmacological properties. It is involved in several Sigma-Tau research projects, most notably in the development of new Radioimmuno medicines for treating tumors. Set-up in 1987, the company employs 39 workers, of which 23 are graduates, with annual turnover of between 1 and 5 million Euro.

- **XEPTAGEN**

Xeptagen is a biotechnology company dedicated to identifying and evaluating new marker molecules for the development, production and commercialization of advanced diagnostic and therapeutic systems, particularly in the field of oncology. The company has already developed and patented an innovative



technology, Combinatorial Proteomic<sup>®</sup>, which allows the rapid and efficient identification of marker molecules in degenerating human tissue. Xeptagen's product portfolio aims at sectors open to the introduction of innovative diagnostic and therapeutic methods. It is a market of some size and is experiencing considerable growth. The company, certified under UNI EN 2001 for setting up, producing and commercializing diagnostic products, is based in Pozzuoli close to the Sviluppo Italia Campania Incubator and has laboratories for Biotechnology and Nanotechnology research at its disposal in the VEGA Science and Technology Park in Venice.

## Research Centers and Expertise

Companies investing in Campania can rely on a large and well qualified network of innovation support providers with 90 centers (80% of them in the Naples area), 7 universities and a number of incubators and science and technology parks. Research in Campania has long been oriented toward applied science (more than 70% of centers carry out applied research) and has a sound record for technology transfers with 60% of centers linked to business.

The nucleus of Life Sciences skills is concentrated in the research centers within the university system and the Biotechnology Cluster centered on the CNR Institutes. The latter have an excellent international reputation thanks partly to cooperation with Italian and foreign companies and centers such as the University of Hamburg, the University of Paris, Northeastern University (Boston), La Sapienza (Rome), and the University of Milan.

- **Adriano Buzzati Traverso Institute of Genetics and Biophysics (IGB)**

The 30 or so research groups that make up the IGB carry out research in the fields of Molecular Biology, Genetics, Biotechnology and Biophysics with a particular focus on the functional and structural characterization of human, murine and other animal genomes. Its other research strands of particular interest include studying hereditary diseases and the processes of cell regulation and differentiation with an emphasis on the Nervous System and Immune Responses. The institute boasts a striking work rate in terms of scientific output, having published 200 scientific works between 2002 and 2004.

- **BioGeM**

The BioGeM consortium was founded to contribute toward developing Biotechnology and Molecular Genetics in southern Italy, the "Mezzogiorno", through the setting up of a center of scientific excellence and providing modern equipment in the Campania hinterland (the Ariano Irpino-Avellino Municipality). Its scientific partners include the Stazione Zoologica Anton Dohrn, IGB, the Department of Biochemicals and Biotechnology Medicine and the CEINGE. In addition, BioGeM initiated the GenUfita Project, that looks at human genes, in particular those responsible for common diseases.

- **Biomedicine and Biotechnology Center of Excellence, Study of Animal Models for Human Diseases**

This new center possesses the skills and specialized equipment required for analyzing genetically-modified Anatomofunctional and/or Molecular Phenotypes and for the high-level training of research staff for manipulating genes and for the functional and molecular analysis of laboratory animals. It plays a key role in the latest industrial Biotechnology research strategies of the Pharmaceutical and Diagnostics sectors as a potential partner for industrial research. This is the result of its research groups' considerable experience and preexisting close cooperation with industry and technology transfer centers. The center has also developed close ties with other important research centers such as the CNR Institutes in Naples, the Stazione Zoologica Anton Dohrn, also in Naples, the CEINGE non-profit research company and BioGeM.

- **Ceinge Biotecnologie Avanzate**

The Ceinge Biotecnologie Avanzate is a no-profit consortium that promotes and coordinates research in the Naples area, in conjunction with the Federico II University in Naples, the Campania Region and the Province of Naples, on Advanced Biotechnology and its Applications (Bioinformatics, Molecular Diagnostics and Gene Therapy). The Center is recognized as the reference point for Clinical Molecular Biology and the Laboratory Diagnostics of Metabolic Diseases by the Campania Region and as a Center of Excellence for Biomedicine and Biotechnologies by the Ministry of Education, University and Research (MUR). It was recently identified by the European Union as one of only four Oncogene Centers in Europe.





The Ceinge set-up, characterized by a high level of scientific skills, acts as a magnet for specialized research groups and institutions and hosts a bank of biological samples (immortalized cells, blood cord, DNA, RNA, etc.). The Center currently plays host to the Center of Excellence for the Study of Genetic Diseases of the Federico II University in Naples, the Competence Center for Structural and Functional Genomics (GEAR), the European Higher Institute of Molecular Medicine. As of June 2004 it is also the site of Arterra Bioscience, an innovative biotech company involved in developing Eco-friendly Agro-goods, an example of a research spin off.

- **CNR Institute of Biostructure and Bioimaging (IBB)**

The IBB, comprising two main sections (Biostructure and Bioimaging), was set-up in 2002 to pursue an interdisciplinary approach to biochemical and biostructural technologies, biochemical technologies used in diagnostic imaging and diagnostic technologies for imaging and radiotherapy. The research projects carried out by the Biostructure section focus mainly on the design, synthesis, expression and structural characterization of biomolecular systems, in both solutions and solids, involving peptides and proteins and developing new diagnostic products. The Bioimaging section deals with research in a number of areas paying particular attention to experimental Oncology and clinical diagnostics, covering a range of specialties from cardiovascular imaging to neuroimaging and image processing, radiotherapy and radioprotection. The institute is an active partner in cooperation with numerous national and international research centers.

- **Institute for Composite and Biomedical Materials (IMCB)**

The Institute focuses on applied research of Tissue Engineering and Life Sciences. Such technologies are related to both soft and solid tissues. The Institute is partner of a number of research programs, both national and international. It boasts a significant scientific production with 57 papers and 9 patents registered only in 2005.

- **Institute of Protein Biochemistry (IBP)**

The IBP is the largest CNR Institute engaged in the study of proteins and enzymes using the latest technology (from Genetic and Protein Engineering to Molecular Modeling) and interdisciplinary approaches in Microbiology, Biochemicals, Genetics, Biophysics and Molecular, Cellular and Structural Biology. The IBP's main research activities involve the study of the biochemical, genetic and physiological mechanisms of organisms when adapting to extreme life conditions (extremophile microorganisms and polar organisms). Some of IBP's other principle areas of activity include Microbiology, regulating gene expressions, duplicating DNA at high temperatures; Immunology and molecular recognition, biocompatibility and biodegradability; and exploiting the potential applications for enzymes and proteins. The institute has lengthy experience of participating in the European Union's various Research Technology and Development Programs and the European Fishes of the Antarctic Ocean Network. Its scientific output is impressive with 55 articles published in journals in 2004 alone. Collaboration with internationally important laboratories has proven tremendously productive; over 60 universities and research institutes from Europe, the United States, Japan and Israel are involved in cooperation with IBP.

- **Salerno and Inner-Campania Science and Technology Park (S.c.p.A)**

The Science and Technology Park provides consultancy services and commissions research in support of innovation and the scientific and technological development of SMEs.

- **Stazione Zoologica Anton Dohrn**

Founded in 1872, this institute is a key national player in biology research as well as in interdisciplinary fields such as Biochemicals, Molecular Biology, Neurobiology and Ecophysiology, cooperating with numerous other Italian research institutes in Applied Biotechnology for Healthcare.

- **Technapoli Consortium**

The Science and Technology Park located in the Naples area is a regional innovation system charged with organizing and integrating activities to make industrial and scientific processes more innovative. It pursues this objective by strengthening and developing cooperation between operators that embrace technological and organizational innovations. These include universities, research centers, training centers, business services, small and medium-sized enterprises and other related categories. Set-up in 1992 and located at the Sviluppo Italia Campania Incubator in Pozzuoli, the Science and Technology Park is active throughout the region and involved in multiple sectors including Biotechnology Medicine and Agro-food.

- **TIGEM**

Since its establishment the Telethon Institute of Genetics and Medicine has been a point of reference in Italy and internationally for research on Genetic Diseases and developing new technologies in Functional Genomics and Gene Therapy. Recently, having contributed to the identification of portions of the human genome, the institute was nominated as leader of the EU-funded EURexpress Project that aims to create a comprehensive description of gene expression; twelve research groups from around Europe are involved in the Project. It carries out many of its research programs in cooperation with the Federico II University and the Second University, both in Naples and the UK's Open University.

## Investment Support

The Campania region, through its new development program for regional economic development – PASER – supports Biotechnology as a priority sector. The establishment and funding of Regional Competence Centers (RCCs) in seven research areas to act as an interface between universities and business and to transform research projects into successful business ventures.

Three of these centers are already active in the Life Sciences sphere: the Center for Industrial Biotechnologies (BioTekNet), the Center for Diagnostics and Molecular Pharmaceuticals (DFM), and the Center for Genomics (GEAR).

BioTekNet seeks to create an integrated network of scientific, technological, experimental, economic and management skills to ensure the effective transfer of knowledge to industry. The center is largely focused on the development of industrial processes for new fermentation technologies, innovative biosensors, biosystems for water purification and advanced biotech applications in the food sector.

DFM is a scientific reference point for firms intending to develop new concepts for medicines and diagnosis. The center's fields of interest are wide-ranging covering, among others, the development and synthesis of molecules for pharmacological use and of new diagnostic agents, the molecular characterization of human pathological processes, the screening of natural substances and Pharmacogenomics.

GEAR is a regional initiative that aims to sustain the development of human healthcare research and to promote the transfer of research results and the strengthening of the industrial base. Furthermore, GEAR set-up an industrial spin-off program, which aims to identify disease-causing genes, standardize protocols for Gene Therapy and develop diagnostic instruments. This initiative seeks to convert experimental modeling used in pre-application or basic Functional Genomics research for industrial instruments and/or for prototypes of commercially viable products.

Due to its status of "convergence" objective area under EU Regulation and under the Regional Operation Plan, Campania qualifies for substantial amounts of financial support available for research purposes through promoting business innovation, supporting technology transfers and training for researchers.





## Rome. Italy's Life Sciences Heart

Lazio region and Rome in particular, is one of the most competitive Italian clusters in the Life Sciences sector. With almost 500 foreign companies and an innovative industrial base, Lazio boasts a highly diversified economy with a dynamic entrepreneurial culture. In terms of Life Sciences, there are around 100 firms that can rely on a broad and qualified workforce and on the relevant innovation capacity of 10 universities (3 of which are education and research hubs specializing in Life Sciences fields), over 50 public and private research centers of international renown, as well as high quality hospitals.

The Cluster's R&D and product specialization focuses on Pharmaceuticals, Hematology, Oncology and the treatment of Neurodegenerative Diseases.

With overall pharmaceutical investment above the national average and a public and private hospital and healthcare system boasting a total of 28,000 beds, the Cluster clearly provides a dynamic and attractive backdrop.

Quality of life, infrastructure and services as well as a large market (5 million inhabitants with an ever-increasing ageing population) make Lazio and especially Rome, ideal for Life Sciences investments.

### Why Rome

- A strong share of Life Sciences companies, with prestigious international names such as Abbott, Sanofi-Aventis, Baxter Healthcare, Bristol Myers-Squibb, ElanPharma, Merck Sharp & Dohme, Pfizer, Merck Serono, Servier, Wyeth, employing over 12,000 staff and a focus on Pharmaceuticals, Hematology and treatments for Oncological Diseases.
- Cutting edge research with centers of excellence (San Raffaele Biomedical Science Park, University Bio-Medical Campus, Regina Elena Institute, the Gemelli University Polyclinic, the Hematology Center of La Sapienza University) for Hematology, Oncology and the treatment of Neurodegenerative Diseases.
- Numerous highly-qualified human resources: 3,000 researchers, over 30,000 students and almost 5,000 graduates per year in Biotechnology, Pharmaceuticals and Medicine, as well as a further 1,000 employed in private research and development.
- A very broad network (28,000 beds) of excellent healthcare centers and private and public hospitals. There are also around 100 clinical trial centers working with companies in the area on an everyday basis.

### Qualified Skills Base

With over 245,000 students and over 38,000 graduates every year, Lazio and Rome in particular, can offer companies a large, high quality and versatile workforce, able to satisfy ever-higher demands for expertise.

The Life Sciences skill-base has been reinforced by three educational and research hubs specializing in broad-based high-quality training with courses in Pharmaceutical Biotechnology, Pharmaceutical Science and Technology, Medicine and Surgery. Over 30,000 students and almost 5,000 graduates per year make Rome a particularly attractive destination for Life Sciences companies.

The strong accent on innovation (Lazio accounts for over 20% of research carried out in Italy) is reinforced in the Rome Cluster by over 3,000 people engaged in private R&D. This is further enhanced by 3,000 high-level post-graduate researchers specializing in Biological, Chemical and Medical Sciences.



## Industry Focus

Life Sciences is one of the most important sectors in the regional economy, accounting for 20% of employment and over 10% of regional manufacturing turnover, a strong multinational presence, high specialization in Pharmaceuticals and the growing prominence of Healthcare Biotechnologies. Around 70 pharmaceutical plants employ over 12,000 staff, of which more than 1,000 are involved in research activities. With a broad market, Rome plays host to the world's leading pharmaceutical firms (Abbott, Sanofi-Aventis, Baxter Healthcare, Bristol-Myers Squibb, ElanPharma, Merck Sharp & Dohme, Pfizer, Merck Serono, Servier, Wyeth). Some of these perform clinical trials in collaboration with universities and hospitals, while others have production facilities and research centers. Lazio boasts eight of the top 10 private sponsors for Clinical Trials in Italy, half of which have production facilities and research centers. Almost 10% of Clinical Trials in Italy is carried out in Rome Cluster centers. The area's research, development and production focus mainly on the Hematology and Oncology sectors. Furthermore, a genuine Biotechnology cluster is being formed thanks to major investments and progressive refocusing of efforts among chemical-pharmaceutical multinationals. Some 20 biotech companies are involved in research projects or testing. Roman Biotech is generally linked to Healthcare owing to the presence of key players in the Pharmaceuticals industry. The Agro-food, Chemicals and Engineering divisions are less well represented but still significant.

- **LAY LINE GENOMICS**

Specializing in functional Genomics and Proteomics, Lay Line Genomics provides advanced proprietary technology services with a view to identifying and assessing targets and developmental drugs. Lay Line Genomics focuses mainly on Neurodegenerative Diseases and Alzheimer's Disease.

- **MENARINI**

The Menarini Biotech Center in Pomezia is the only center of its kind in Italy and one of the few in Europe able to carry out Pharmaceutical Biotechnology right from the initial research phases, through trials, right up to industrial production. Menarini Biotech operates exclusively in the Pharmaceutical sector on high value added ethical projects (Heart Failure and Antitumor Vaccines).

- **MERCK SERONO**

In January 2005 Serono opened a center for producing innovative medicines in Lazio, with an outlay of around 70 million Euro and over 100 researchers. The center carries out small particle research on new treatments for several diseases, including Multiple Sclerosis. The new center is set to be at the cutting edge of Genomics and Proteomics research.

- **MERCK SHARP & DOHME**


Merck Sharp & Dohme owns in Lazio one of the world's finest centers of excellence, IRBM. The Angeletti Molecular Biology Research Institute, created in a joint venture between Sigma-Tau and Merck, currently employs around 200 researchers and is considered one of the most advanced fundamental research centers in Europe. Its work focuses on Virology, Immunology, Microbiology, Genetic Engineering and Biotechnology, Molecular and Cellular Biology and Gene Therapy. Around 80 million Euro was invested in the center between 2000 and 2002 and in 2003 production totaled 52 million Euro. Its research lines utilize the most advanced Genomics and Proteomics technology, with a view to identifying new molecular and synthetic particle breakthroughs, ultimately enabling the development of innovative drugs and treatments for neoplastic diseases. The company is also planning to launch a new antiviral product for HIV and Hepatitis C.

- **SANOFI-AVENTIS**

Sanofi-Aventis is mainly involved in the Cardiovascular, Oncological and Vaccine sectors. At the Anagni facility (Lepetit Group) syrups and drips are produced for markets around the world. In particular the three "drip" lines produce around 6.4 million units per year, while the "syrup" line produces around 1.4 million units per year. It owns one of the largest sites (234 sqm) dedicated to lyophilization in Italy and Europe. The group has recently entered into a partnership with La Sapienza University of Rome, for the setting up of a post-graduate course in lyophilization technology.

- **SERVIER**

Servier is active in 140 countries and in 2003 posted turnover of 2,200 million Euro and 5.6% growth. In 2003, turnover from its Italian plants increased by 132 million Euro – more than in any of the firm's other facilities around the world. Servier is active in only a few sectors but has several market leading products. Its



Diabetology division produced Italy's first anti-diabetes drug; in Flebology Servier produces the most famous Italian vasoprotective medicine; the firm is the third largest in the Cardiovascular sector; and Servier is also active in the treatment of Osteoporosis producing one of the foremost drugs in Italy. At its site in Rome Servier performs major research in collaboration with universities and hospitals, mainly in clinical phases. It employs 140 staff in Rome.

## Research Centers and Expertise

The mainstay of the Rome Cluster is the network of university research centers, science and technology parks, private hospitals, public research bodies and CNR Institutes working in collaboration with private companies in various Life Sciences sectors. Universities operate alongside the business world and the Healthcare and hospital system in the pursuit of cutting edge research and the promotion of clinical trials with a view to meeting significant healthcare demand in a broad and expanding market. The main areas of focus for research and clinical testing are Hematology, Oncology and Neurodegenerative Diseases. The plethora of high-quality private hospitals guarantee a major contribution to innovation and fundamental research. These include: the Gemelli Polyclinic University, the Umberto I Polyclinic Hospital, the S. Camillo-Forlanini-Spallanzani Hospital, the Regina Elena IFO Institute, the Sant'Eugenio and San Filippo Neri Hospital, the Bambino Gesù Pediatric Hospital and Immacolata Dermopathic Institute.

- **Bambino Gesù Hospital**

The Bambino Gesù Hospital focuses exclusively on Neonatal Pathology and Pediatrics and is involved in major research activities. Around the hospital research is carried out by the Italian Association of Pediatric Hematology and Oncology, working alongside, among others, GlaxoSmithKline and the Department of Cellular Biotechnology and Hematology of La Sapienza University.

- **Campus Bio-Medico University**

The University's Faculty of Medicine and Faculty of Engineering offers degree courses in Medicine, Nursing and Dietetics as well as a Master in Biomedical Engineering. At the end of the course, students also have the option to attend the School of Health Management and Innovation, run in partnership with the Polytechnic of Milan. The University also runs doctoral research programs in the Neurosciences, Endocrinology and Transplant Disorders and Infant Molecular Pathology. Further important departments at the university cover Cellular Biotechnology and Hematology, Genetics and Molecular Biology.

- **CNR Cellular Biology Institute**

The institute established the A. Buzzati-Traverso Campus at Monterotondo, which was set-up with a view to developing and putting on an international footing, Italian biological research and biomedicine. Scientific partners include the International Center for Genetic Engineering and Biotechnology (ICGEB), which is a UN-backed research organization with offices in Trieste and New Delhi. The ICGEB is active in advanced Molecular Biology and Biotechnology and its main focus is promoting scientific and technological development in Third World Countries. Also located in Monterotondo is the head office of EMBL, the European Molecular Biology Laboratory. This is a major international center for Fundamental Research, hosting genetics and functional genomics researchers from around the world. EMBL carries out innovative research into Neurobiology and Regenerative Biology.

- **European Brain Research Institute (EBRI)**

EBRI studies the biological and neurophysiological foundations of the Central Nervous System linked to the motor system. The institute is at the cutting edge of research and the development of new approaches for treating neurological diseases, such as Parkinson's, Multiple Sclerosis and the effects of trauma. The EBRI Foundation is run by Nobel Prize-winner Rita Levi Montalcini and works in close scientific cooperation with, among others, the Tor Vergata University of Rome. The EBRI's International Scientific Council includes three Physiology and Medicine Nobel Prize-winners: François Jacob, Torsten Wiesel and Erwin Neher.

- **Hematology Center of La Sapienza University**

Under the stewardship of Director Franco Mandelli, the Hematology Center has earned international recognition for its high-level research. The center is part of the Department of Cellular Biotechnology and Hematology of La Sapienza University and includes the groundbreaking Italian group for the study of chronic myeloid leukemia. The center also carries out its own work in close collaboration with commercial companies, such as Novartis.



- **La Sapienza University**

The largest university in Italy, La Sapienza boasts 21 faculties, 109 departments and major interdepartmental projects. In terms of Life Sciences, the University has over 23,000 students and 2,300 graduates per year. The most important work linked to fundamental research in this sector is carried out by the Department of Cellular Hematology, the Department of Chemistry and Biotechnology and the Department of Genetics and Molecular Biology.

- **National Institute of Health (ISS)**

The ISS carries out public health research, testing, evaluation and consultancy, documentation and promotion and training in Italy. In its 7 departments, ISS performs scientific research, promotes study and research programs in collaboration with National Health Service bodies. ISS is active in the latest clinical trials and technological developments, working alongside Italy's Scientific Institutes for Research, Hospitalization and Health Care (IRCCS) and private hospitals; it also participates in national and international research projects.

- **Regina Elena Institute**

Italy's second institute for numbers of clinical trials, the center focuses on frequently occurring, high social impact Tumor Pathology. Involved in both national and international projects, the institute mainly focuses on research into Epidemiology, studying the causes of tumors, Neoplastic Transformation and Progression and Experimental Therapies. The Regina Elena Institute is also involved in applied research in Biomolecular and Instrumental Diagnostics, Epidemiology and early diagnostics, using both standard and innovative approaches for the treatment and rehabilitation of Oncological patients. The Department of Experimental Oncology, in particular, focuses on the study of Oncogeny, tumor suppressive gene, Gene Therapy, biological or so-called 'intelligent' medicines, Immunology and factors determining resistance to Chemotherapy.

- **San Raffaele Biomedical Science Park of Rome**

Located within the Technological Cluster of Castel Romano, the Park was created in response to the recognised need to have a Biomedical research center in the Lazio region. It is a public – private partnership with 3,000 sqm of laboratories and over 100 researchers. It counts on a broad network of research clinics (132 hospital wards in Italy and 19 pharmaceutical companies). The Park is now home to 3 companies and 9 research groups from Universities and centers working in: Stem Cells, Oncology, Leukaemia and Immunology; Molecular Cardiology; Skeletal Regeneration; Cell Therapy and Tissue Engineering; Muscular Dystrophies; Biomedical Quality Control; Neurological Disorders and Diabetes. The infrastructure allows the development of concept to preclinical development based on the state-of-the-art facilities including an animal facility encompassing conventional and SPF small animals and a large animal surgery unit. The Park has recently created a Lazio based pre-clinical to clinical trial platform with CRISC, the Research Center for Clinical Trials of "La Sapienza", University of Rome.

- **Tor Vergata University**

This University has over 6,300 registered students and almost 2,500 graduates per year in the faculties of Medicine and Surgery. Most Life Sciences research is carried out by the Department of Biology, the Department of Experimental Medicine and Biomedical Sciences, the Department of Clinical Neurosciences and the School of Specialization in Applied Biotechnology.

## Investment Support

The Lazio region promotes cutting edge initiatives and – via the Lazio Development Agency, Filas, BIC Lazio and Unionfidi - manages regional, national and European funds in support of entrepreneurial activities. Life Sciences companies receive significant funding, in particular by means of a dedicated regional law overseen by the Lazio Development Agency. As such, the region makes grants to industries and laboratories which, in collaboration with universities and research centers, are active in the development of new treatments and supporting scientific research. Filas provides concrete support to business innovation and development projects, backing high-tech companies that need to restructure or improve technological processes and/or products. Filas operates – in cooperation with private industrial and financial partners – by means of its own funds, as well as with regional and EU grants. With EU regional funds, however, Filas invests risk capital in Lazio-based small and medium-sized enterprises active in knowledge intensive sectors. Regarding EU funds, Filas promotes and financially supports high-tech companies, via a risk capital fund for innovation processes and by co-funding projects alongside venture capital funds and/or merchant banks.



## Siena/Pisa/Florence. A long established Biotech Tradition

Tuscany has one of the longest and most deeply-rooted traditions in manufacturing and research among all the Italian regions. A significant share of the Tuscan biotech market is represented by the healthcare sector, with particular reference to the segments of Vaccinology, Diagnostics, Oncology, Genomics and Proteomics. The numerous biomedical research centers of excellence (e.g. the Institute for Biomedical Technologies of the CNR, the Institute of Clinical Physiology of Siena) and the growing number of highly innovative biotech companies (Novartis Vaccines, Siena Biotech) set-up over the last three years, not to mention the well-established presence of integrated pharmaceutical companies dedicated to the development of biotechnologies (e.g. Eli Lilly, the Boehringer Ingelheim Group), make Tuscany an ideal location for innovative companies investing in the Life Sciences sector.

### Why Siena/Pisa/Florence

- Numerous centers with a recognised tradition of excellence in biotechnological and pharmaceutical research, notably including: the National Research Council (CNR), the Sant'Anna School of Advanced Studies and the Universities of Florence, Pisa and Siena.
- Highly qualified human capital. Recent investigations into foreign multinational companies operating in Italy point to Tuscany's rich supply of creative and high-quality graduates, high productivity and extremely competitive labour costs (comparable to those of other European countries), as well as high employee retention.
- Well-established scientific and industrial traditions in the sector, which features the presence of top biotech and pharmaceutical firms (including Abiogen, Farmigee, Menarini, Malesi, Molteni, Novartis Vaccines and Siena Biotech), all leaders in their respective market segments. Also significant are the launch and development of initiatives – such as the Toscana Life Sciences Foundation – dedicated to funding innovative ventures in the Life Sciences sector.
- Strong Government support of innovative processes and medical research, with special funding earmarked for crucial sectors including stem cell research, orphan drugs, the development of transplant systems, biotechnologies and diagnostic imaging. Extensive financing is also available for technology transfer mechanisms, made possible by a vast network of science parks and incubators.

### Qualified Skills Base

Tuscany benefits from highly qualified and comparatively low-cost human capital. The Tuscan Life Sciences sector comprises a total of 600 researchers, 1,000 doctoral students and 150 post-doctoral researchers. A labour cost survey recently conducted by Business International in the biotech sector revealed annual labour costs of 31,000 Euro for technicians, 40,000 Euro for recent graduates, 54,000 Euro for experienced graduates and 80,000 Euro for managers. These costs are competitive, especially in terms of both recently qualified and experienced graduates. Furthermore, the BI survey acknowledges the internationally-recognised quality of Italian researchers, as well as the quality of public and private research institutes, widely appreciated in Italy and abroad.

Consequently the Tuscan biotechnology industry, despite being relatively young, offers notable opportunities for enterprises hoping to outsource at least a part of their R&D activity, by creating a network system or expanding already existing networks.





## Industry Focus

The Tuscan Life Sciences infrastructure is highly concentrated within the Siena-Florence-Pisa triangle. Specialisation within the red biotech sector is particularly marked, with a significant skills base in some niches of the agri-food and environmental segments. A well-established presence of pharmaceutical companies with highly-qualified workforces is also worthy of note.

A number of innovative biotech companies have been set-up over the last few years as spin-offs from universities and leading pharmaceutical firms, with prominent specialisation in products and sectors such as Vaccines, blood products, Antibiotics, Optics, Laser medical, Diagnostic Laser applications and Agro-biotech. Particularly significant is the newly established Toscana Life Sciences Foundation, created in 2004, which supports research activities in the field of Life Sciences as a whole and in particular helps the development of projects from basic research to industrial applications.

Alongside the cluster of biotech enterprises (Siena Biotech, Philogen, Protera) there is a host of leading pharmaceutical companies: from Menarini and Malesci to Molteni, Merck and Farmigea.

This collaboration has already proved and continues to prove effective in terms of innovation and technology transfer mechanisms, promoting high-quality and durable start-up and spin-off ventures, as well as contributing towards an especially fertile and dynamic environment for the development of new products and technology in the Pharmaceutical, Biotechnology and Diagnostics sectors.

- **ABIOGEN**

The acquisition of Istituto Gentili SpA by US multi-national Merck Sharp & Dome led to the establishment of Abiogen Pharma SpA, a new pharmaceutical company which appeared on the Italian and international markets in 1997. Abiogen Pharma is pushing back the boundaries of research, especially in the domains of Osteoporosis, Neuropharmacology and Tumour treatment.

- **CAMPIGLIA MARITTIMA BIO INCUBATOR - Sviluppo Italia Toscana**

The incubator is located in the municipality of Campiglia Marittima (Livorno). Established in 2002, it supports the start-up of small enterprises with particular attention to the Biotech sector. It is divided into 24 facilities and currently hosts 8 enterprises, including a consortium comprising seven public and private stakeholders. The site, identified in the Region of Tuscany as a reference point for biotech enterprises, offers the ideal logistics conditions for starting up hi-tech spin-offs. Thanks to the presence of a cutting-edge Molecular Biology laboratory, incubated firms will conduct scientific research in the fields of Biotechnology, Food traceability and safety, Environmental issues, applications in the Healthcare and Aerospace sectors.

- **ELI LILLY**


Established in 1959, Lilly Italia operates in the Pharmaceutical and Zootechnology sectors and today forms a vital component of the Italian pharmaceutical industry. It is based in Sesto Fiorentino (Florence). Today Lilly occupies an area of some 30,000 sqm and its 1,200 employees are involved in clinical research, marketing, finance and information technology. With an investment of 250 million Euro and a new plant covering 43,000 sqm, the US multi-national will exclusively produce human insulin and equivalent drugs using biotechnology. 90% of Tuscan 'made' insulin is exported abroad. In fact, the global demand for insulin is increasing and far outweighs the supply.

- **FARMIGEA**

Farmigea is currently focusing its research and development activities on the specialist field of topical pharmaceuticals, which are predominantly employed in Ophthalmology, Gynaecology and Dermatology. Farmigea's objective over the coming years is to continue developing new technologies for topical drug delivery systems, with the aim of achieving reduced toxicity and greater efficiency in treating particular patient categories; greater efficiency and a significant reduction in the adverse reactions of equivalent drugs already in use, increased biodispersibility with longer-lasting and closer contact of the product with the application site.

- **MENARINI**

The Florence-based Menarini Group is today the leading Italian pharmaceutical group, a multinational operation whose products are available in over 1,000 countries. In 1978, Menarini employed only 11 R&D personnel: today the workforce comprises nearly 800 employees, with an annual investment of some 116.3 million Euro, equal to 10% of the company's ethical turnover. The Group's research activity is



concentrated on a single pole, Menarini Research, which deals with all R&D activities from initial conception of new products to their registration on the market. Its research programmes essentially relate to the fields of Cardiovascular disease, Oncology, Pain, Inflammation and Asthma.

- **NOVARTIS VACCINES**

Novartis Vaccines is the only biotech company in Italy dedicated to the Vaccine sector. Its two Italian production plants, located in Siena and Rosia (SI), research and produce over 35 paediatric and adult vaccines, which are distributed to over 70 countries worldwide.

Together with its plants in Oxford, Liverpool and in Marburg, Germany, Novartis represents a major player in the vaccine sector, a cutting-edge international company committed to Biotechnologies for health protection. Its purpose is to use innovative and creative processes to develop and market biological products for the prevention and treatment of infectious diseases. The Siena plant is predominantly concerned with the research, development and mass production of viral and bacteriological vaccines, in addition to sales and marketing activities.

- **SESTO FIORENTINO INCUBATOR - University of Florence Scientific Pole**

An incubator spanning 8,471 sqm is nearing completion and will be fully operational by the end of 2006. The project is part of a Framework Program Agreement (APQ - *Accordo di Programma Quadro*) for the creation of a business incubator network in Florence, signed in collaboration with the Region of Tuscany, the Municipality of Florence, the Municipality of Sesto Fiorentino, the Province of Florence, the Florence Chamber of Commerce and Sviluppo Italia Toscana. The agreement aims to implement a series of services to support the set-up of research spin-offs.

- **SIENA BIOTECH**

Siena Biotech is an innovative drug discovery company committed to understanding and unravelling human diseases and finding new ways to prevent, diagnose and cure them. Its research projects are focused on both neurodegenerative and proliferative diseases of the central nervous system, including orphan diseases, with the aim of discovering new and effective drugs to cure such devastating ailments. Current major projects include Alzheimer's disease, Huntington's disease and malignant brain tumours. The company applies the most advanced drug discovery technologies, from target identification to clinical phase II. As for the Alzheimer treatment Siena Biotech is leading a European research project with outstanding partners such as Denmark, Germany, the Netherlands and the UK. Siena Biotech has recently signed an agreement with Wyeth Pharmaceutical to research and develop new molecules for the treatment of Degenerative Diseases.

- **TOSCANA LIFE SCIENCES FOUNDATION (TLS)**

Toscana Life Sciences Foundation is a non-profit organization founded in 2004 as a joint initiative by a large consortium of public and private institutions including the Province and Municipality of Siena, the Tuscany Region, the Monte Paschi Bank and Monte Paschi Foundation, the Chamber of Commerce of Siena, the Universities of Florence, Siena and Pisa, the Scuola Normale and Scuola St. Anna of Pisa and the Hospital of Siena. Its mission is to support research activities and in particular to help the development of projects from basic research to industrial applications. A new Science Park was recently created in Siena to host start-up and spin-off companies focused on Pharmaceutical, Biotech, Diagnostic and innovative Biomedical technology. A bio-incubator of 2,000 sqm offers fully equipped laboratories with a wide range of services including access to technological platforms, consultancy for intellectual property, technology transfer, product and business development. A seed capital fund of 2 million Euro has also been created to support the start-ups hosted in the Science Park.

## Research Centers and Expertise

Public research in Tuscany is centered around three universities (Florence, Pisa, Siena), 2 CNR sites (Florence, Pisa), a number of centers of excellence (Sant'Anna School of Advanced Studies, the Scuola Normale Superiore in Pisa) and 27 research facilities.

Tuscany's biotech centers of excellence focus predominantly on Diagnostics using Proteomics, Post-Genomics and all applications which use non-linear spectroscopy (CERM - Magnetic Resonance Center and LENS - European Laboratory for Non-linear Spectroscopy). There is also a marked specialisation in Molecular Biology, thanks to the contribution to research by Tuscan universities and the CNR.



Tuscany's science and technology environment is rich and sophisticated, in addition to the significant integration of biotech applications with other sectors, especially ICT and Nanotechnology. Florence is generously represented in terms of Natural and Environmental sciences (12 centers), Biomedical and Pharmaceutical sciences (7 centers) and Physics (7 centers). Pisa features a high number of centers in ICT-based sectors (8 centers), along with a well established presence in Natural and Environmental sciences (12 centers) as well as Biology and Biochemistry (6 centers). Siena specialises mainly in Biological and Biomedical sciences and is marked by a relative preponderance of centers conducting research in these fields.

Besides, the region offers a rich and sophisticated array of master's degrees and specialist courses (Master in Industrial and Environmental Biotechnologies, Master in Pharmaceutical Biotechnologies, Master in Biomedical Engineering, Bachelor in Biotechnologies, to name but a few), providing a supply of trained researchers that increasingly meets the needs of manufacturers.

- **CNR Pisa**

The new CNR site in San Cataldo comprises a total surface area of 110,000 sqm and hosts 15 research institutes, generating an annual turnover of some 120 million Euro, 680 employees and a similar number of students employed as research associates. The total workforce in this sector is estimated to number at least 1,000-1,100 employees. The site focuses on a number of strategic scientific fields including the Technoscience sector (the ICT institutes represent an international pole of excellence, proved by their cooperation in worldwide projects of basic and applied research); Life Sciences; Medicine and Neurosciences and Soil Chemistry.

- **Sant'Anna School of Advanced Studies**

Research conducted by the Sant'Anna School of Advanced Studies in Pisa is characterised by a marked interdisciplinary approach. The Research Department aims to promote, coordinate and organise the School's scientific research activities. This is achieved thanks to its laboratories and research facilities. The laboratories particularly relate to Experimental Sciences sectors and allow the School to conduct research activities together with external scientists, thereby promoting collaboration with other universities and public and private research centers both in Italy and abroad. Meanwhile, the research centers focus on especially relevant and broad Life Sciences disciplines, branches which are already significantly developed by the activities of the School and relate to mainstream avenues of research. The centers notably have a wide variety of scientific interests and adopt an interdisciplinary approach. The laboratories, despite adopting a similar approach, lay more emphasis on experimentation and application, whereas the centers do not have their own facilities and make use of the School's facilities and services.

- **University of Florence**

The University of Florence, established in 1924 by the transformation of the old Istituto di Studi Superiori Pratici e di Perfezionamento, has experienced rapid expansion during its eighty-year existence. From four faculties in 1924, the university now comprises twelve faculties including seventy Departments and ten centers of excellence. This makes the University of Florence a top research facility for both Science, Technology and Humanity disciplines, as well as one of the leading European universities. With 57,000 enrolled students, 2,300 lecturers and 1,780 staff, in 2003 the university managed research projects totalling over 50 million Euro and promoted the set-up of 4 spin-offs.

- **University of Pisa**

The University employs around 3,500 staff, including lecturers as well as technical and administrative staff, with an overall budget approaching 500 million Euro. Around 50,000 students are enrolled here, of whom 4,000 graduate each year. The university's strong links with the Scuola Normale Superiore, Sant'Anna School of Advanced Studies, CNR and IFM, all of which are centers of excellence, make Pisa a unique location of the Italian Life Sciences industry. Surveys and data prove the University's contribution to every aspect of the national economy, in terms of quality institutes, laboratories and clinics with sophisticated equipment which are requested on an international scale for experimentation and research. This is clearly evidenced by the hundreds of research and experimentation agreements which the university signs with Italian and foreign companies.

- **University of Siena**

The University of Siena has a long tradition in biotech-oriented education, owing to its location within a cluster of numerous Biotechnology and Biopharmaceutical companies. Its training courses include: an interfaculty degree course in Biotechnologies (3 years), with minor in Healthcare and the Agri-food industry; a degree course in Biotechnological Sciences for Human Health (2 years), with minor in Pharmacology or Medicine and Agri-Food and a degree course in Biotechnology. Almost 40% of students enrolled at the University of Siena (over 4,600 in 2004) choose degree courses in Biotechnologies or related sectors (Pharmacology, Chemistry) and in 2003, almost 950 students graduated in biotech-related disciplines.

## Investment Support

Technology transfer and innovation ventures, particularly those in hi-tech and Biotech sectors, are strengthened by the presence of various bodies dedicated to supporting new and innovative business start-ups.

- **Foundation for Research of the University of Florence**

In 2005, the University of Florence set-up a foundation for research with public and private institutions, representatives from the world of business (Assindustria, Api, Cna, Confartigianato) and supervisory bodies (Trade Unions). The foundation is dedicated to promoting the vital role played by research and the University in product development. It serves as a synergic link among the University, the research system and major players in the region's economic development, with the aim of transferring experimental successes from the laboratories to the production line.

- **Siena Monte dei Paschi (MPS) Foundation**

MPS Foundation set-up Siena Biotech SpA and owns 95% of the company, the other 5% being owned by Sansedoni SpA. Siena Biotech SpA aims to promote, finance and conduct advanced projects in the fields of Biology and Biotechnology, including programs to develop highly innovative strategic technologies for use in industrial manufacturing over the medium term, in addition to the participation in national and international research programs and projects. In this way, the Foundation hopes Siena Biotech will help to reach its long-term goals which integrate scientific research and economic development, with special attention to job creation.

- **Tuscany Region and Sviluppo Italia**

An early stage fund of 11.5 million Euro was co-promoted by Sviluppo Italia and the Tuscany Region. It is aimed at SMEs, incorporated or to be incorporated, which are in the start-up or preliminary stage of their lifecycle operating in manufacturing and services preferably in ICT, Telecommunication and Biotech. Through the fund Sviluppo Italia can participate in two ways: risk capital through minority stakes and convertible loans. The fund can provide up to 750,000 Euro and 49% of corporation stocks.





## Trieste. At the Frontiers of Sciences

The international profile and the interdisciplinary approach in carrying on advanced research in the Life Sciences sector give the “Technology District of Friuli Venezia Giulia” its distinctive character.

A special feature of the Biomedicine District, which has its poles of excellence in Trieste, Udine and Aviano is the network management of research activity, the interaction among the largest national and international centers and the presence of transversal technologies, which encourage a fruitful cross-fertilization of research fields (Nanotechnologies being a good example of this). At the top of European tables for innovation capacity, with a ratio of researchers to total active population of 8.8/1,000, the Friuli Venezia Giulia region is home to an avant-garde scientific system based on expertise and know-how in fields that range from Physics to Medicine and from Biotechnologies to Nanotechnologies.

The ability to innovate – borne out by the large number of researchers and technicians – is coupled with the fact that there is a rich network of vibrant and innovative companies both leaders in their sector as well as spin-offs and start-ups. Trieste is an even more attractive investment location thanks to an initiative of the Ministry of University and Research (MUR) and the regional Government of Friuli Venezia Giulia which has led to the creation of a Technology District for Molecular Biomedicine. Funding amounting to 36 million Euro has gone toward the development of new products and technologies in Molecular Oncology and the molecular components of Cardiology, Neurosciences, Hepatology, Rare Diseases, Tissue Engineering and Cell Therapy.

### Why Trieste

- A very highly skilled workforce of 7,500 engaged in R&D at companies and regional research centers. The Life Sciences sector involves more than 1,600 researchers with 4,000 students and an annual average of 650 graduates in Biotechnology, Pharmacy and Medicine.
- The specialization of research in therapeutic areas with high development potential: Oncology, Vascular Cardiology, Neurosciences, Hepatology and Medicine. Particularly active is the research being conducted in applications for Biomedical Nanotechnologies.
- The innovation potential is guaranteed by a heavy concentration of research centers of international note (ICGEB – International Center for Genetic Engineering and Biotechnologies; SISSA – International Higher School for Advanced Studies – Molecular Neurobiology Laboratory).
- A dynamic and innovative environment is guaranteed by the presence of leading companies, e.g., Bracco Imaging, Biofarma, Eurospital, Alphagenics Diaco Biotechnologies, ItalTBS, Bioallergy International, Euroclone, Lay Line Genomics, Actimex; added to which is the quality and frequency of start-ups, e.g., Transactiva, Eufoton, Neurogenics, AdriaCell, Tissue and Organ Replacement and Serichim.
- The significant support given to the development of the Life Sciences by the regional Government with the creation of a Technology District dedicated to Molecular Biomedicine as well as the setting up of an Innovation Fund.

### Qualified Skills Base

Friuli Venezia Giulia and Trieste in particular, have a high concentration of personnel involved in R&D, totaling about 7,500 job units. The specialization of research has a high development potential in the following therapeutic areas: Oncology, Vascular Cardiology, Neurosciences, Hepatology, Rare Diseases, Tissue



Engineering and Cell Therapy. Research in applications for Biomedical Nanotechnologies is particularly active. The Life Sciences sector accounts for over 1,600 researchers, 4,000 students and 650 graduates per year in Biotechnologies, Pharmacy and Medicine. It is a very international environment, due to the large number of foreign scientific institutions and of international researchers that work for them. Over and above those that regularly work in the region, there are 8,500 researchers that every year choose Friuli Venezia Giulia to undertake a period of study or specialist training. Many of these researchers come from developing countries. This is one of the unique characteristics of this environment, which has always valued the sharing of knowledge and progress.

The average cost, on an annual basis of a researcher/technician working for a public regional research body is between 40,000 Euro and 51,000 Euro, salaries that are highly competitive in relation to the sector internationally.

## Industry Focus

The constant push towards innovation, which is the hallmark of the companies working in the “Biomedicine District of Friuli Venezia Giulia”, makes the environment a particularly fertile and dynamic place to develop and produce pharmaceutical, biotechnological and diagnostic technologies.

The presence of leading companies such as Bracco Imaging, Biofarma, Eurospital, Alphagenics Diaco Biotechnologies, ItalTBS, Bioallergy International, Euroclone, Lay Line Genomics, Actimex is complemented by a vital network of spin-offs and start-ups, e.g., Transactiva, Eufoton, Neurogenics, AdriaCell, Tissue and Organ Replacement and Serichim.

- **ACTIMEX**

Actimex develops innovative products in the fields of Pharmaceuticals, Nutraceuticals and Cosmetics. It has patented mechano-chemical stabilization processes of active principles for the improvement of the characteristics of bioavailability. Actimex has a scientific staff with many years of experience and collaboration with various external centers of excellence both within Italy and overseas. Its know-how and technological skills are spread across the following areas: designing multi-composite pharmacy/carrier/agents assisting systems, the characterization of synthesis composites and the determination of the biopharmaceutical properties of the systems developed. Actimex works with the most advanced technology thanks to their collaboration with Sincrotrone - Laboratorio ELETTRA.

- **BIOALLERGY INTERNATIONAL**


Bioallergy International produces reagents for allergy diagnosis. Their parent company, Bioallergy in Rome and Bioallergy International, with its offices in the Trieste Business Incubator, have developed an innovative system for dosing IgE that allows for greater specificity and reproduction of the methodology. The ENEASYSTEM is a practical work tool, with its walk-away automation that is protected by an international patent, being the first one of its kind that is fully commercialized in Italy (70 installations in public and private centers) and in a variety of European countries and beyond. The methodology that was developed for the IgE research can be applied to the analysis of other Immunoglobulines with a specific application to auto-immune and infectious illnesses such as Toxoplasmosis, Cytomegalovirus and Herpes.

- **BRACCO IMAGING**

The Bracco Group, a world leader in the field of Diagnostics, today has 760 patents to its credit throughout the world, with a string of successful products. The Bracco Imaging line contributes to the diagnosis of pathologies with the four tools used today: X-Rays, Magnetic Resonance, Ecography and Nuclear Imaging. Bracco Imaging carries out research in support of Spin, based in Torviscosa (Udine), dedicated to the production of comparison tools for X-Rays, using top of the range analytical instruments, systems for Liquid Chromatography, Gas chromatography, Capillary Electrophoresis and Mass Spectrometry. The company has undertaken research projects in collaboration with the region's universities, focusing on new Biotechnology Applications for Diagnostics and Therapeutics.

- **EUROSPITAL**

Eurospital is an outward looking company, specializing in the Diagnostic In-Vitro, Prescriptions and Over-the-counter Medicine, Surgical Devices and Medical/Hospital Equipment. The company has three divisions: Diagnostics, Pharmaceuticals and Hospital. Its know-how and technological skills are well diversified in each field. The Diagnostics division focuses on analysis systems for Gastroenterology and Enzymatic



Immunology. The Hospital division offers products for the prevention of hospital infections, disinfectants and antiseptics as well as flow dosers for injectable solutions. The Pharmaceuticals division produces generic medicines and self-administered medicines for seasonal maladies, vitamin preparations, throat preparations and injectable solutions.

- **ITALTBS**

ITALTBS is a national leader in clinical engineering services for the Health sector. It provides its customers, both private and public, with support for the efficient management of their technology in terms of equipment safety, maintenance and everyday use of these innovative instruments. The range of services offered includes Clinical Engineering, Security Compliance and Control, technical support for newly acquired equipment and consultancy services for defining new investment plans.

- **LAY LINE GENOMICS**

Specializing in functional Proteomics and Neurogenomics, Lay Line Genomics has developed innovative medicines for Alzheimer Disease and provides advanced proprietary technology services for pharmaceutical companies using its own animal model for Alzheimer Disease and the PKO (protein knock-out technology).

- **TOR - Tissue and Organ Replacement**

Founded in 2004, it aims to develop and market new technologies based on cell culture of adult stem cells. TOR is active in Molecular and Cellular Medicine – Tissue Engineering fields. Its main products are Bone substitutes derived from autologous stem cells derived from a biopsy and cultured offered in vitro in computer controlled sealed culture chambers where cells can proliferate. The ABSIS tissue substitute, grown on a solid scaffold, designed with the final shape and size according to the needs. The ABGIS tissue substitute, grown on biocompatible granules that can be molded in the final shape at the time of the implant. The company carries out R&D into new products and processes, analysis and control.

- **TRANSACTIVA**

Specializing in research and development of Therapeutic Molecules obtained using recombinant technologies in innovative expression systems, Transactiva is highly specialized in the sector of Orphan Drugs and Metabolic Diseases.

## Research Centers and Expertise

The technologies under development in the “Biomedicine District of Friuli Venezia Giulia” require a highly interdisciplinary approach utilizing a cross-cutting range of techniques and skills.

Thanks to the presence in the region of a unique research system which is deeply integrated internationally, Trieste has developed into a center of excellence in high potential therapeutic areas: Oncology, Vascular Cardiology, Neurosciences, Hepatology and Rare Diseases, Tissue Engineering and Cell Therapy.

The significant critical mass of skills in the Life Sciences sectors is enriched and enhanced by complementary technical and scientific skills in transversal and synergetic sectors ranging from Physics, Material Sciences, Nanotechnology, Chemistry and Bioinformatics.

The capacity for technological transfer is of high quality thanks to the existence of an institutional innovation network that works in the field of research enhancement, of the transfer of research results to the market and the attraction of new companies.

It should also be pointed out that institutions such as the Area Science Park, BIC-Sviluppo Italia Friuli Venezia Giulia, the Molecular Biomedicine Consortium and Friuli Innovazione offer a support network for the creation of new companies of high knowledge intensity and of entrepreneurial spin-offs in the research field.

- **Basic Research And Integrative Neuroscience (BRAIN)**

BRAIN is an interdepartmental center, which groups together interdisciplinary skills in the Neurosciences field. The center covers integrated study projects aimed at providing a composite picture of various biomedical issues. The center is made up of researchers selected from each department and works in partnership with the DANA Alliance for the Brain. It is active in a wide variety of projects, all connected with the Neurosciences; many of these projects are coordinated in a synergetic study on Neural Plasticity, approached from the cellular, organ and system levels. The following research programs are currently being undertaken: Stem Cell Analysis, Cerebral Ageing, Neuronal Typing, Cerebral Visualization using fMRI, memory and learning and Pre-natal Cerebral Learning.





- **Burlo Garofolo Research Institute for Hospitalization and Treatment**  
The Burlo Garofolo Children's Institute in Trieste is a Scientific Institute for Research, Hospitalization and Health Care (IRCCS) as well as being a hospital. In the last ten years the Institute has carried out an intense clinical research programme into Rare Diseases. The work of the Rare Diseases Laboratory is aimed at identifying new therapies for Rare Diseases that are estimated to account for 10% of national illnesses. The Laboratory concentrates particularly on discovering cures for: Gaucher Disease, Niemann-Pick Disease Types A, B and C, Glycogenosis Type 2, Fabry Disease, Tay-Sachs and Sandhoff Disease, Mitochondrial Metabolic Acidosis, Imperfect Osteogenesis and CDG. There are research projects for these diseases currently underway being carried out in collaboration with the Ministry of Health.
- **Callerio Foundation - LINFA Laboratory**  
The Callerio Foundation is a leader in research on the Pharmacological Properties of Composites based on active metals for the control of the metastatic progression of solid malignant tumors. Studies were undertaken in close cooperation with researchers from the Departments of Chemical Sciences and Bio-Medical Sciences at the University of Trieste and from the Universities of Bari, Florence, Padua and Sassari at a later stage. A crucial role was played in the project by LINFA, the International Laboratory for the Study of Carcinomas.
- **Center for Liver Study (CSF)**  
The CSF is a research center that was created by the Fund for the Study of Liver Diseases - Onlus and the Cassa di Risparmio di Trieste Foundation. Bracco Imaging also offers an important scientific contribution. CSF is dedicated to research in the field of Physiology and Molecular Liver Pathologies and to the development of Biotech Therapeutic Applications. The center analyzes in particular the Molecular Mechanisms of the transportation of the various Organic Anions (Bilirubin and MRI Tools) and the study of the mechanisms of Bilirubin-damaged Cells in the brain and placenta. CSF is active in various lines of research: the study of the expression of proteins connected to Liver Pathologies involved in the transportation of medicines, Early Molecular Diagnosis and Primitive Liver Carcinoma.
- **Consortium for Molecular Biomedicine (CBM)**  
CBM is a public-private consortium which carries out research and advanced training in the field of Molecular Biomedicine. It provides services promoting the diffusion of innovation, transfer of Technology and support in the launch of new entrepreneurial ventures. Located in Trieste within the AREA Science Park and with laboratories in the main regional scientific centers, CBM acts as a bridge between research and industry by making laboratories and advanced instrumentation available for shared use and open to institutions, enterprises and interdisciplinary research groups, internal or external to CBM. Highly qualified researchers are available for scientific collaboration or service agreements in the following areas: Stem Cells, Bioinformatics, Molecular Imaging, Pharmaco/Proteomics, Genomics and Nanodiagnostics.
- **Inter-departmental Center for Molecular Medicine – University of Trieste (CIMM)**  
The CIMM comprises 32 research groups, hosting 106 University of Trieste researchers and 167 from other Italian universities. In the last three years the center has carried out research projects financed to the sum of more than 10 million Euro. CIMM researchers have filed 23 patents and have at their disposal research instruments worth 4,687 million Euro. There have been numerous collaborative projects with both Italian and foreign groups (146) and with private partners (23). The CIMM has developed numerous applications for the Regional Health Service. Their main areas of study are Oncology; Infectious, Metabolic, Nutritional, Immune System, Genetic, Neurological, Cardiovascular and Reproductive Diseases; and Nanobiotechnology.
- **International Center for Genetic Engineering and Biotechnology (ICGEB)**  
The ICGEB has an international network of centers of excellence for research and high-level training in the fields of Biotechnology and Genetics. Research in laboratories located in Trieste centers on Molecular and Proteomic Biology as applied to the DNA metabolism, Human Parasitology as applied to the transcription of HIV-1, Bacteriology and Gene Expression, Immunology Processes, Molecular Pathologies as applied to the study of aberrations connected to the phenomenon of splicing and the onset of cystic fibrosis, Applied Virology focusing on the Human Papilloma and the study of New Medicines created from Molecular Recombinants. So far, the ICGEB has filed 21 patents with 13 requests for international patents. There are 174 staff working at the Trieste center.

- **International Higher School for Advanced Studies (SISSA)**

The SISSA is one of the largest Italian research centers for post-degree training. The school concentrates on research in Physics, Mathematics, Biology and the Neurosciences. Particular attention is paid to possible practical applications: SISSA has 8 patents, 6 of which have been licensed out for commercial use. SISSA's Molecular Neurobiology Laboratory (LNM) has the aim of integrating the knowledge of the electro-physiological characteristics of Cells and Neural Networks with the analysis of the molecular components through techniques of Functional Genomics. Particular attention is paid to the study of the molecular basis of Neurodegenerative Diseases such as Alzheimer's, Parkinson's and Huntington's Chorea. The aim is to understand their causes and identify therapeutic treatment able to block the degeneration of cells which today is an irreversible process. Proteomic and cDNA Microarray Techniques are used to describe gene profiles and proteic interaction in the various areas of the brain and their alterations in animal and cellular models of human illnesses. The research is undertaken in collaboration with international institutions such as Harvard Medical School in Boston (USA) and RIKEN in Wako (Japan) with financing from Telethon, the European Union and the Giovanni Armenise-Harvard Foundation.

- **National Laboratory of the Inter-University Biotechnology Consortium (LNCIB)**

The LNCIB is a focal point and catalyst for biotechnological research in Italy in collaboration with its university partners. It is active in the production of Full Length cDNA Clones characterized by sequencers with 96 capillaries ABI PRISM 3700. So far, 18,000 human cDNAs have been catalogued used for the production of Microarrays. The cDNA-Microarray platform is used for the study of human colon and ovarian tumors. The use of computer algorithms and databases allows for the prediction of genes co-regulated by the information derived from the use of Microarray Technology. This process allows the Functional Diagnosis of tumors, which was previously only possible through Molecular Diagnosis. The LNCIB as a whole operates in the following fields: Genomics, Bioinformatics, Immunology and Oncology.

- **Oncological Referral Center, National Cancer Institute, Aviano (CRO)**

The clinical activity of CRO focuses on Oncologic Surgery, Conformational, Intra-operative, Stereotaxic Radiotherapy and IMRT (high-energy accelerators – 6 to 18 MV – and orthovoltage accelerator are in operation) and on the Medical Treatment (intra-arterial chemotherapy, high-dosage chemotherapy) of the most frequent solid tumours and rare neoplasias.

Clinical research is based on mono-and multidisciplinary therapeutic protocols (conservative Clinical small-cellung cancer, interdisciplinary treatment of sarcomas of the soft parts and or ovary tumours). Innovative protocols concern: Phase I-II studies of new drugs in metastatic tumours; immunological therapy in human melanoma and other tumours; therapeutic schemes specifically designed for tumours in elderly patients and in patients with AIDS. Experimental research focuses on gene alterations as well as neoplastic transformation and progression; mechanisms of cell adhesion and migration; role of growth factors and growth-factor receptors in haematological neoplasias; mechanisms of sensitivity and drug resistance; diet and cancer.

- **Sincrotrone Trieste**

ELETTRA, the Synchrotronic Light Laboratory in the AREA Science Park, produces and uses very bright rays of electro-magnetic radiation on X-Ray and Ultra-violet Spectra. Its applications attract researchers from Italian and European universities, national and foreign scientific bodies (such as CNR, INFN, ICTP, Austrian and Czech Republic Academy of Sciences) for the development of applied research programmes. There are 16 Light Rays in development, 3 in the trial phase and 6 in the development phase. ELETTRA's avant-garde approach has led to: the examination of the structure of materials and dynamic surface phenomena; research on Super-conductors; Enzymatic Biology Analysis; study of Magnetism; Biomedical Nanotechnologies, Microlithography with electrons and X-Rays.

## Investment Support

The strategic value of Life Sciences and Biomedicine in regional Government policy is confirmed by the creation of a Technology District into which the Friuli Venezia Giulia regional Government and the Ministry of University and Research (MUR) have invested 36 million Euro with the aim of strengthening research (with an expected increase of between 1,500-2,000 researchers over 10 years), hoping to attract knowledge-intensive businesses. The activities of the district are coordinated by CBM, The Consortium for Molecular Biomedicine, Stakeholders of the Consortium are the following research centers, private companies and financial institutions:



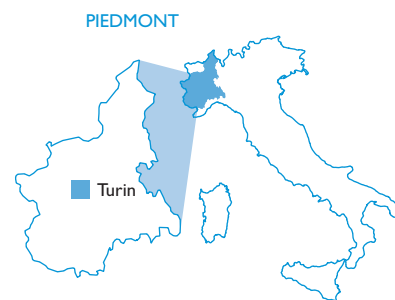
AREA Science Park, the Oncological Referral Center of Aviano (CRO), LNCIB, Burlo Garofolo IRCCS, ISAS; the Universities of Trieste and Udine, Bracco Imaging, Laboratori Diaco Biomedicali, Eurospital, Instrumentation Laboratory, Transactiva, Ruker Biospin Italtbs, Fondazione Cassa di Risparmio di Trieste and Friulia.

A full range of national and regional incentives is available in Friuli Venezia Giulia to facilitate and support the start-up of new businesses, the purchasing or leasing of new manufacturing equipment, the industrial and pre-competitive research, the employment in industrial and pre-competitive research, the training of human resources, the expansion of innovative firms through venture capital and participating loans.

Among the financial instruments for supporting knowledge-intensive enterprises, well worth noting is the Regional Fund for Small and Medium Enterprises, managed by Friulia Holding.

Finally, the creation and development of new knowledge-intensive companies and commercial spin-offs from research are facilitated by the presence and activity of specialised service structures like the AREA Science Park, the BIC – Sviluppo Italia Friuli Venezia Giulia and Friuli Innovazione.

AREA Science Park is the first multi-sector Science and Technology Park in Italy and one of the most important in Europe. Since 2005 it is a 1st level national research body of the Ministry of University and Research (MUR), with technology transfer as its priority objective. The Park is an effective system of territorial innovation which integrates research and business. More than 80 national and international companies and research centers and 1,800 persons are active in research and development, technology transfer, advanced training and qualified services.



## Turin. Peak of Scientific Expertise

With a solid industrial base, Piedmont's economy has experienced a progressive and rapid diversification in recent years. With the founding of new companies in high technology sectors the region is a driver of Innovation Processes in Italy with substantial amounts spent on R&D (16.5% of the national total), 18,000 researchers and a vast network of public and private research centers, including 5 science and technology parks, 3 universities and more than 260 laboratories and research centers.

The private sector accounts for a sizeable share of Innovation Processes and generates 80% of regional R&D spending, one of the highest rates in Europe and comparable with such leading high technology regions as Baden-Württemberg in Germany. The potential for innovation, the strong integration of research within the industrial process, the highly qualified workforce and the entrepreneurial spirit all help to drive on the development of the region's Life Sciences sector.

Piedmont's research and production centers, concentrated mainly in Clusters around Turin, are specialized in the Health (mainly Oncology and Immunology) and Environment (Bioremediation) sectors. The strong skills of locally situated, complementary and highly innovative sectors including ICT, Electronics, Machinery and Nanotechnology, have fed into the excellent results in such segments as Bioinformatics, Diagnostics and Biomedical Equipment.

### Why Turin

- Strong capacity for innovation with over 200 laboratories and public and private research centers, as well as 3 universities and 5 science and technology parks.
- 3,000 job units in the Life Sciences and related sectors, over 700 public research groups (of which 60% in Biomedicine), over 3,000 papers published over the last 10 years and around 20 patents filed annually, 18,000 researchers of which 1,200 in Biotechnology, Pharmacy and Medicine. Strategically located at the heart of Europe between two of the most advanced countries in the Life Sciences sector, just a few hours drive from France and Switzerland with which a collaboration agreement was recently signed thanks to the Transalpine Biocluster, a strategic partnership among Bioindustry Park Canavese, ADEBAG (Grenoble) and BioAlps (Geneva).
- Innovative and well consolidated industry: high spending on R&D (16.5% of the national total); 344 companies in the sector with large internally-respected firms such as Antibioticos, Bracco, Diasorin, L'Oreal, Merck Serono, UCB Pharma and extremely innovated small and medium-sized enterprises like Aethia, Bioman, BSA Ambiente, Creabilis Therapeutics, Safan, Bioinformatica, NobilBio, to name just a few as well as a number of promising start-ups.
- High level of specialization in Pharmaceuticals, Bioinformatics, Diagnostics, Biomedical Equipment, Environment (Bioremediation), and Cosmetics.
- Synergies with related sectors such as Informatics, Nanotechnologies and Chemicals.

### Qualified Skills Base

Piedmont and Turin together make up one of the most attractive sources of highly-qualified human resources thanks to the proximity of three universities that provide outstanding education in such fields as Biotechnology, Bioinformatics, Biomedical and Biomechanical Engineering.

In terms of actual numbers, there are about 1,500 graduates per year and 10,000 students enrolling on



Biotechnology, Pharmacy and Medicine courses, 1,200 researchers at public and private research institutes and a further 3,000 qualified employees working for business.

Some 770 research groups in Biomedicine have recorded particularly high levels of productivity: on average over 3,000 papers have been published over the last 10 years on post Genomics, Proteomics, Oncology, Imaging, Molecular Diagnostics, Bioengineering, Nanotechnologies, Bioinformatics, Virology and Immunology, Metabolic Diseases and Neurosciences. 20 patents are filed in Pharmaceuticals, Molecular Biology, Surgery and the Material Sciences each year.

The exceptional quality of human capital, however, comes at extremely competitive costs, particularly in Biotechnology R&D, that are considerably lower than those in other global high technology centers such as Grenoble, Boston, London and Frankfurt, with savings of between 20% and 60%.

## Industry Focus

The Life Sciences industry in Piedmont embraces over 100 firms, largely situated in and around Turin, that are active in a wide range of sectors: Pharmaceuticals, Diagnostics, Environment, Cosmetics and Bioinformatics. Completing the value chain there are also a number of high value-added specialized service providers.

Some 70% of companies are actively engaged in the development of new products and technologies thanks in no small part to the strength of local centers at the forefront of research and technology transfer. The industrial base of the region has been shaped by its large groups that have an international presence, such as Antibioticos, Bracco, Diasorin, L'Oreal, Merck Serono, UCB Pharma, Nanogen Advanced Diagnostic, Sorin Biomedica, Takeda Farmaceutici.

Large companies, especially in Pharmaceuticals, work in tight synergy with such small and medium-sized enterprises such as Aethia, Bioman, BSA Ambiente, Creabilis Therapeutics and Safan. The presence of incubators and specialized centers inside the University and the Polytechnic allowed the creation of numerous academic spin-offs. APAVADIS is the most recent business, founded to study the Aminopeptidase A to develop Diagnostic and Therapeutic Agents in Oncology.

These Life Sciences companies are also highly valued by companies and research centers active in complementary sectors that offer close synergies such as ICT, Electronics, Machinery and Nanotechnology.

Piedmont, thanks also to its long-standing aptitude for science, can offer a wide choice of specialized consultants in fields such as Intellectual Property Rights, the Evaluation of Copyrights and Patents and for implementing quality systems in the areas of Pharmaceuticals and Cosmetics.

- **AETHIA**

Founded in 2000 as a spin-off of the National Institute of Material Physics (INFM) and located in the Ivrea Bioindustry Park, Aethia employs its know-how and technologies to develop solutions for Bioinformatics based on high performance computing and parallel computing. The possible applications range from the search for homologies in biological sequences, to protein structure prediction and experimental data processing and visualization. One of the most commonly used software tools for homology research is BLAST (Basic Local Alignment Search Tool); Aethia has developed a platform based on PC clusters for the parallel execution of BLAST called Aethia PowerBLAST.

- **ANTIBIOTICOS**

Part of the Fidia Group, Antibioticos is one of the largest producers worldwide of penicillin and cephalosporine based antibiotics. The company is located in Settimo Torinese, where a 570 strong workforce, mainly working on the research and development of new products, runs its 180,000 sqm fermentation plant.

- **CREABILIS THERAPEUTICS**

Creabilis is a drug discovery and development company, established in 2003 with private funds and located inside the Canavese Bioindustry Park and dedicated to R&D using advanced technology for the development of new therapeutic agents for Cloning, the use of Cell Culture, Genomics and Proteomics. Its mission is to identify, develop and bring to commercial fruition novel and highly innovative therapeutic agents. The company seeks out, selects and licenses promising projects, in cooperation with academic institutions. Its original proprietary technology platform, combined with the latest biological research has helped to identify a new family of compounds with exceptional therapeutic potential. The company's current plans involve exploiting the range of opportunities opened by its technology platform, in support of



developing a first family of potential new drugs.

- **DIASORIN**

Originally the diagnostics division of Sorin Biomedica, Diasorin is now one of the most important global developers and producers of reagents used during in vitro testing for determining pathogenic agents or for the recovery of other substances in biological fluids or tissues, mainly used for the diagnosis of Infectious, Hematic and Autoimmune Diseases. Increasingly active in Biotechnology, Diasorin is headquartered in Saluggia also the site of its main production plant and research center. With over 700 employees and 80 researchers, two further sites in Stillwater (Minnesota, USA) and Dietzenbach (Germany), and an extensive distribution network, Diasorin has expanded considerably in recent years also through important international acquisitions.

- **NANOVECTOR**

Nanovector, situated in the Turin Environment Park since 2002, carries out the research, development and distribution of industrial applications for the colloidal system whether liquid or solid and operates in Pharmaceuticals, Diagnostics, the Veterinary sector and Nutraceuticals. With the aim of optimizing the diffusion of drugs, the company produces warming Microemulsions and Solid Lipid Nanoparticles (SLNs), the latest generation of liquid or solid carriers that guarantee particularly prolonged periods of relief in the body.

## Research Centers and Expertise

The network of research centers and science and technology parks in Piedmont plays a vital role in the promotion of scientific activity and in the development of new entrepreneurial initiatives in the most innovative sectors. These offer support services and research laboratories in close collaboration with the three main universities in the region: the Politecnico di Torino, the University of Turin and the University of Eastern Piedmont.

The main areas of specialization at Piedmont's research centers range from Biochemistry and Molecular Biology, to the Neurosciences, Cell Biology, Immunology, Genetics and Heredity Studies. The presence of a number of CNR (National Research Council) groups in Proteomics is also of considerable note. The Proteome laboratory is a permanent site for new graduates and researchers who intend to specialise in scientific methodologies orientated towards basic and applied research in the Pharmaceutical, Diagnostic Biomedical and Food Industry fields. Services available are: Protein and Peptides purification, 2D Electrophoresis, HPLC Narrowbore and Microbore, Electrophoresis native and SDS-PAGE, Isoelectrofocusing, Protein characterization, MALDI-TOF, LS-MS, Ion trap ESI-MS, Immunoblotting, ELISA, Protein sequencing.

- **Biotechnology Foundation**

The Foundation was established in June 1991 with the purpose of promoting the development of biotechnology and public awareness of its role in modern society. Its goal is to promote education and support research related to applied Biotechnology in a plethora of fields such as Medicine, Agriculture, Industry and Environment.

- **Canavese Bioindustry Park**

Founded in 1998 for promoting and developing Biotechnology research, the Park focuses on both Italian and foreign businesses that aim to carry out experimental research and production in the Chemicals, Pharmaceuticals, Diagnostics, Veterinary, Agro-food, Cosmetics, Bioengineering, Bioinformatics and IT sectors. The Park, of which the Merck Serono group is a main shareholder, is currently in a process of ongoing expansion with over 16,000 sqm devoted to research laboratories and pilot sites and 35 public and private organizations present, with some 500 employees in activities related to Life Sciences sector and 40 researchers operating in the Park. Their research activities fall into the categories of Chemicals, Molecular Biology, Proteomics and Functional Proteomics, Bioinformatics and Theoretical and Computational Biophysics. With 140 papers published over the last 5 years, some 20 patents, 18 start-ups over the last 4 years, the Park is a link in the PIP (Patent Information Point) patenting support network and a research partner of the European R&D Partnersearch Network. It also acts as a receptacle for entrepreneurial ideas using high technology content and offering numerous support services to SMEs such as: Feasibility Studies, Technology Transfer; support providing Project Management, Marketing, Personnel and patenting solutions in company R&D work; and Finance via its ties with a network of



informal investors and venture capital companies. The Discovery Project is also a significant achievement of the Park to promote the start-up of new businesses which are funded through the Eporgen fund.

- **Environment Park**

Located in Turin, the Environment Park promotes the creation of new innovative businesses in the sectors related to Eco-efficiency and ICT as well as being active in the diffusion of Biotechnology in the Environment sector.

- **Institute for Cancer Research and Treatment (IRCC) in Candiolo**

The IRCC in Candiolo is a non-profit institute, founded in 1996 thanks to funding from the Piedmont Foundation for Cancer Research. Its main task is combating cancer using knowledge of the Molecular Biological Mechanisms that cause them. Alongside this clinical and experimental research, the IRCC also carries out daily diagnostic and therapeutic activities. About 100 scientists, hailing from different countries, are employed in the various divisions and laboratories at the center (Molecular Angiogenesis, Molecular Oncology, Immunology and Oncogenomics) and have published 265 scientific works in the field (69 publications in 2006).

- **Laboratory of Engineering of the Neuromuscular System and Motor Rehabilitation (LISIN)**

Linked to the Department of Electronics of the Polytechnic of Turin, LISIN is dedicated to the study of the Neuromuscular system via the analysis of cutaneous electrical signals produced by voluntary muscular contractions or induced by electrical stimulus. In close collaboration with various Italian and foreign research institutes, research is carried out at LISIN on the development of hardware and software for the creation of biomedical equipment and mathematical modeling for the simulation, interpretation and extraction of information from EMG signals, as well as developing the relevant clinical and therapeutic applications for them.

- **Polytechnic of Turin**

The Polytechnic of Turin, one of the most prestigious academies in Europe, offers 115 specialized university courses to over 25,000 students. In the Life Sciences field, the Polytechnic is active in Bioengineering for Electronics, IT and industrial applications:

- A degree course in Biomedical Engineering allowing the integration of both methodology and technology in Mechanical Engineering, Materials and Information in the fields of Medicine and Biology
- A Biomechanical Engineering research group active in the study of applying numerical and experimental modeling, typical in machinery, to biological systems.

- **Sub-Alpine Center for Oncology and Hematology (COES)**

Originally an interdisciplinary center funded by the San Paolo Foundation, COES is located within the largest hospital in Piedmont, the Molinette Hospital in Turin and provides daily healthcare assistance as well as education and basic research. COES is the site of the Oncological Prevention Center (CPO) and the Coordination Center of the Oncology Network of the Piedmont region and has 60 day hospital beds and 18 surgeries covering a range of Neoplastic Pathologies. Its Experimental Medical Research Center contains 9 diagnostics laboratories for Molecular Oncology, Molecular Biology, Immunogenetics, the Immunology of Tumors, Angiogenesis, Biochemistry and the CNR Viral Oncogenesis Center, employing 200 researchers in total. The center hosts the International Foundation for Research in Experimental Medicine, the School of Oncology and the School of Hematology both of the University of Turin.

- **University of Turin**

The region's main seat of higher education, the University of Turin's 55 departments include 20 in the Life Sciences among which Neurosciences, Oncology, Biomedical Science and Human Oncology and Genetics, Biology and Biochemicals. The university offers a wide range of degree courses in Biotechnology, Biology, Medicine and Surgery, Veterinary Medicine, Pharmacy, CTF (Pharmaceutical Chemistry and Technology), General and Industrial Chemistry. Moreover, it also offers a Masters program in Bioinformatics and Molecular Modeling, as well as a good number of specialized PhD programs. Its Interdepartmental School of Biotechnology is also noteworthy.



## Investment Support

The Piedmont region offers a coordinated system of incentives for the support of industrial applications in the Life Sciences sector, targeting start-ups and the development of innovative business initiatives. 270 million Euro have been allocated over a 3 year period (2006-2008) by the Regional Government to support investment in research and innovation in cutting-edge sectors including Life Sciences.

Support in the Life Sciences sector is also provided through the presence of venture capitalists (such as Eporgen Ventures) and, above all, by a vast network of banks and credit institutions. Some of Italy's main national banks and credit institutions are from Piedmont, including Intesa San Paolo and Unicredit Banca.

Also in Piedmont, the CRT Foundation and the Compagnia di San Paolo are two leading banking institutions particularly active in supporting scientific research and the Life Sciences. In 2004 the latter distributed 119 million Euro, of which almost 14 million went on scientific research; a good share of this reached 16 separate initiatives in the fields of Biotechnology, Biomedical Research and Bioengineering.

Throughout 2007 the Compagnia di San Paolo will set-up the Human Genetics Foundation (HuGef) in partnership with the University and the Polytechnic of Turin to develop research in the field of Genetics and Genomics.





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# Invest Italy

*InvestItaly is the Italian organization for investment promotion created by Sviluppo Italia, the National Agency for Inward Investment and Enterprise Development, and the Italian Trade Commission, the Government Agency which promotes the internationalization of Italian companies. Its mission is to offer a single and reliable national reference point to current and prospective foreign investors.*

