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**THE COVER**  
**Roberto Battiston**

**NOVARA**  
Export supports growth  
**LECCO & SONDRIO**  
The courage of a gamble

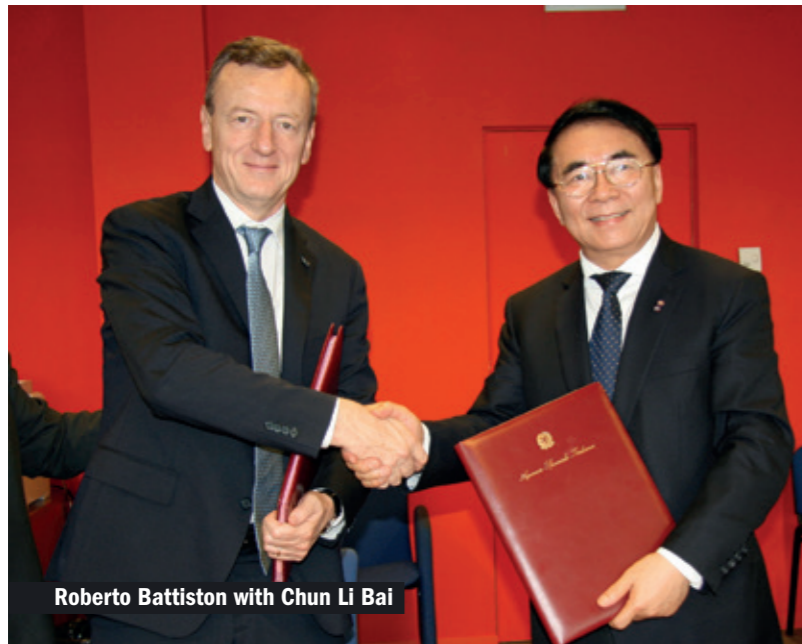
**Special**  
**RESEARCH&INNOVATION**  
The keys for development  
**COUNTRY SYSTEM**  
Food-farming  
as flywheel for growth

# There's space for all

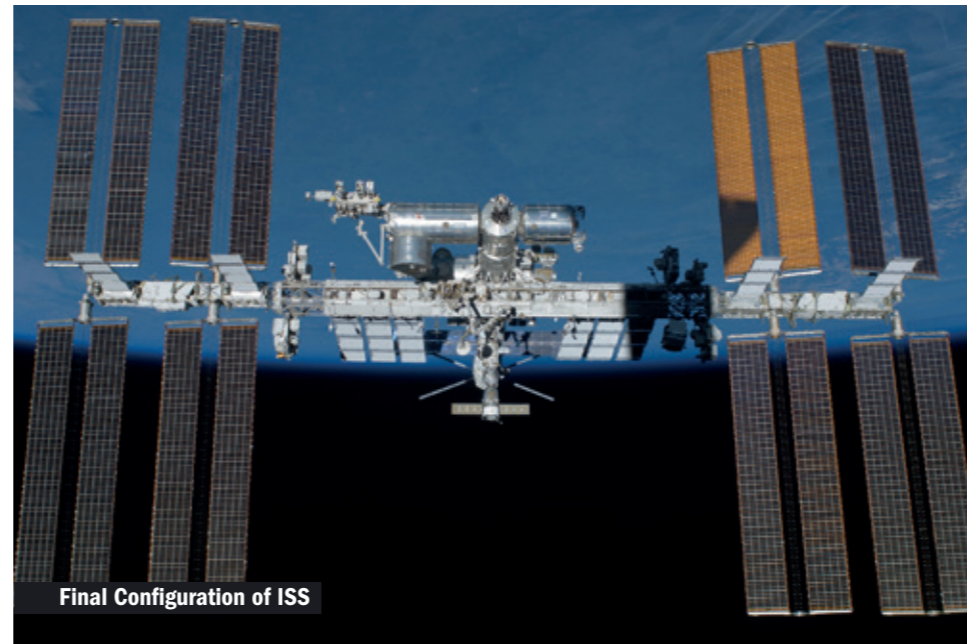
*Roberto Battiston, president of Asi: "Italia is state-of-the-art in the aerospace sector"*

If daily earthly vicissitudes - in Italia but certainly not only - are often marked by political strife and opposing factions, there is a field seemingly made on purpose for everyone to agree: space. What happens above our heads, beyond the clouds and amongst the planets, attracts and compacts: just as public opinion followed the feats of astronaut Samantha Cristoforetti with trepidation, a couple of years ago, in the same way in last May the Senate passed a bill, almost unanimously (two sole abstentions) to reorganize aerospace policies and provide for the creation of a special inter-ministerial committee. Acting as "coordinator" of the various components in the sector, comprising the fundamental world of industry, will continue to be Asi, Agenzia Spaziale Italiana-Italian Aerospace Agency, but with greater operational potential than in the past. "Which will enable us to increase our role as the system's architect: Asi will be an effective instrument to implement the strategies and governance lines in the space sector, with the appropriate competences and emergent technologies, at the same time satisfying the needs of the world of production and research, which will gain

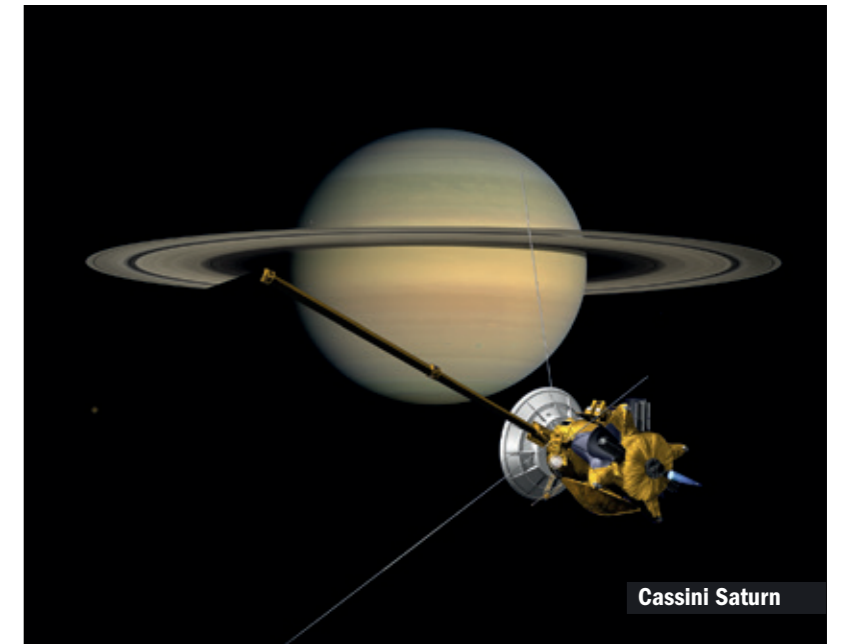
**Roberto Battiston** was appointed president of Agenzia Spaziale Italiana in May 2014 by the Minister for Education, Universities and Research, Stefania Giannini. Born in Trento, graduated with honours in Physics at the Normale Pisa university; already professor of Experimental Physics at Trento University, he was president of the INFN II Commission for Astroparticle Physics and a member of the Trento Institute for Fundamental Physics and Application, the new INFN National Centre. "I was purely a researcher in the Particle Physics sector for 35 years - says the president - then I became engaged with space, in particular on subjects linked with substances and anti-substances. And I have two crucial questions very much at heart: on the one side, the role played by research as an instrument for growth and development; on the other, the relationship between space and the productive world".



Roberto Battiston with Chun Li Bai



Final Configuration of ISS



Cassini Saturn

## Asi will grow this way

Set up in 1988, Agenzia Spaziale Italiana is a national public organization now supervised by Miur, operating in collaboration with other various ministries. But the recent legislative amendments provide a measure to strengthen the structure. “We shall substantially increase our facilities, in terms of technical as well as quantitative competences – explains the president -. Today we are 240 persons; we must grow at a strategic, administrative and monitoring capacity level”. An increase by about a hundred people is foreseen in a three-year period: “But we will not become an organization doing its own research, but will indeed remain an agency, with the necessary scientific competences and relationships with universities and other research organizations. The role played by Asi must remain that of financing, stimulating and supporting those with the will and capacity for research in the aerospace sector”.

in strength”. Words pronounced by Roberto Battiston, number one at Asi: understandably enthusiastic about the ongoing legislative evolution, also because he personally put in a lot of effort to speed up this process, right from his nomination as president 3 years ago. “The law currently in the progress of being passed now affords Asi opportunities similar to the ones of an organization like Cnes in France: it demonstrates that in Italy they realized to have a valid instrument, able to effectively manage a complete chain such as the aerospace one. And it is an important indicator of change”. So space is also a production chain; better still, in Battiston’s opinion, it is a highly important compartment for our country and bound to develop. “Considering that it is now quite normal to talk about space economy – enough to think about the commercial exploitation of satellite data – it should be said straight away that Italy boasts substantial figures in this sector. We are talking about approximately six thousand direct operators and turnover worth 1 billion 700 million, in addition to a considerable number of allied activities. It is by now

### The cover

a consolidated idea that against an investment worth one Euro in the space sector, returns can be 6-8 times as much”. And Italian industry realized this quite a while ago, if it is true that in several sectors it has gained highly profitable results in the last decade. Not only in the said communication sector but also for exploring space: for example, many of the cargos currently sold by Italy to Stati Uniti are “Made in Italy”. Italy is also world leader in building synthetic radars for satellites, able to see the earth through clouds and in the dark: tools enabling for example a radar analysis of the earth’s crust able to distinguish, in terms of agriculture, the zones more or less wet or cultivated. “And we also want to progress in innovative sectors such as hyper spectral imaging (i.e. the optical sphere applied to many different bands) because we know it is a very important world, likely to have a substantial economic return”, points out the president. Then there is the most “epic” and enthralling aspect, space missions: and here again Battiston promotes Italy. “Enough to stress that we have arrived at the ninth successful

launching, or that an enterprise like Avio – producing the Vega satellite launcher – is already quoted on the stock exchange: a tangible demonstration that space projects, if carried out well, can gain important results”. If the Italian industry ranks high in aerospace research, it is also owed to the researchers’ education. In short, we are talking about universities and here again the president praises: we have good-level universities, important departments not only in Rome, but also in various Italian cities, from north to south. Many faculties offer a good education in engineering or astrophysics specialized in aerospace, and there are likewise numerous excellent Master courses, attended by many, giving students the possibility to grow: we ourselves, as Asi, support a few of them. Our young people leave in great number and are well prepared, and our industry has considerable capacity to absorb them in this sector: businesses seek competences and outstanding personalities. In a word, in this sector the young people go abroad to specialize and learn, but can return and find their place in Italy far better than in any other industrial sector”. Reciprocal knowledge and cooperation between nations is anyhow essential in a



Vega W04

sector like aerospace. What Battiston says actually provides an additional element to the leading question according to which space is a less conflictual field than earth ... “It’s true, in space there is a much higher rate of cooperation between nations, remaining intact even in periods of greater crisis on earth. In space stations, or during missions, collaboration of the countries involved knows no boundaries: a bit because space intrinsically

belongs to everybody, a bit because it’s fragile, easy to damage and is difficult to maintain what works well. The power of space, its contemporary fragility, renders it a sphere in which we move with a great capacity to make of it a terrain for diplomacy and common interests, in an environment we must not mistreat. In a word, I am not a gullible person, but I truly believe that space is a natural peacemaker”. ■

research&innovation  
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Communication  
project by  
**Gaetano Ferretti**

# The keys to development

*Networking with institutions and enterprises in other countries, an essential condition to realize European projects as well as to gain access to funds*

## The role of Italia according to the president of the European Parliament, Antonio Tajani

Universities, businesses, research bodies of our country are rich in cutting-edge projects and innovative ideas that allow them to fulfil leadership roles and that the European Union has rewarded with funding related to a wide range of programmes. The following pages - and in general the stories that we tell in every number of Platinum- Research & Innovation - are just some of the many examples that we could make, and they concern sectors which are very different from each other. What is shared by all the experiences is the European dimension: having taken on the importance of networking with institutions and businesses of the other countries, as a preliminary condition both for developing projects and for accessing related funding. If our research looks more and more to the European dimension, the person who represents the latter at the political level and at the highest level can not but be satisfied. And Mr Antonio Tajani - who since January is the President of the European Parliament in office, after having been a Commissioner for Transport and Industry - is happy to talk of the role of the Italian research within the more global European context. "Research represents a sector in which synergies are of

paramount importance", the president begins. The European Union's objective, then, is to create a common space inside of which everyone can work together. This also applies to our country: the more Italia is able to collaborate with other European nations, the more its commitment will be effective". The European Horizon 2020 programme, which has a budget of 80 million euro, favours exactly this space. "Especially in some areas, Italia plays a key role in research, so it has every interest in making the best use of this space represented by European projects". Tajani speaks of "some sectors", thus pointing out the fact that the role of research is not homogeneous within the Italian industrial world... "It is true that Italia is not at the top of the European rankings for the share of the public or private Gdp intended for research: yet in many Italian regions there are realities of excellence in this field. The right path is always



to work together without engaging in self-referential researches. Again, in this case, I repeat that the more cooperation, even between companies, the more the effect is beneficial to everyone. We need very strong values, even transnational ones, through which the industry can be noticed by the university, and at the same time investing directly in training". The Italian industry is largely small-medium in size but is often at the forefront in particular niche sectors. "Food farming, new materials, nanotechnologies, biomedical... There are so many production areas in which our industry can excel, but at the same time we need a country system which has to be integrated to Europa. And since resources are not so many, more efficiency is needed in spending. We need more rationalisation measures in order to avoid unnecessary expenditure, stop the so-called brain drain and organise the research centres at our disposal to the fullest. We can not afford too much waste: today competition between different countries is playing on this field, i.e. on the effectiveness of research and training". And research can certainly be a fundamental flywheel for the economic recovery of our country. "I say more: a proper engagement in the fields of research and innovation is the only key to our economic recovery. There are no alternatives: any other choice would be myopic". Within this process, consideration must be given to the global environmental emergency, which also requires businesses to be sustainable and virtuous. In fact, many European calls include this requirement to award and finance projects. Here too, Tajani is optimistic: "Italian companies have understood that environment and competitiveness are compatible and can help each other. Circular economy choices enhance competitiveness in our industrial sector: we are on the right track, in regard to research. All this also thanks to a series of European standards, which make this journey workable...". ■



# Space for ideas



Marco Falzetti

Small and mid-size enterprises, keystones of the Italian industrial fabric, also have a fundamental role in the aerospace industry. “If we look up all the projects financed by the Horizon 2020 program, space is one of the ones where Italian performance is at the top”, notes Marco Falzetti, director of Apre (Agency for the Promotion of European Research). “In this field, in Italia there are a limited number of big players: rather there is a very differentiated industry, in a very active world of small businesses, who are at the very least, a part of the supply chain of the large industrial system, but work most especially in the services sector”. Space is a generator of information which allows for the development of stimulating entrepreneurial ideas. “There has been an interesting proliferation of businesses which, although they haven’t launched anything in orbit, use the opportunities of observation, remote sensing and satellite communication (data) to develop services/products with a high sales value.

And since we are far from having exhausted the power of use of this data, there is still so much to do: the market is far from being saturated, and can still offer so much”. In addition to this, there is another consideration, equally stimulating from an entrepreneurial point of view: “If we think about the work in the development of imposing space programs (for example the Vega Vector developed by Avio/ASI), the time between the development and consolidation of products is very long. Contrarily, in regards to the sectors we were talking about before, success can be measured in just a few years: if the idea is valid, if the data exists, if the potential application is there and they can find the target market for it, the consolidation of a business can be very fast. The important thing is to create a market as an end market, like services for the public, or intermediate like public administration. With a good idea and a market ready to receive, there have been companies that in a few short years have had significant growth...”. ■



## Emergencies via satellite

360 degree monitoring of crisis situations on the planet

The handling of emergencies is one of the greatest challenges of the XXI Century. Huge losses, be they human, economic, or environmental, due to disasters caused by man or natural events, show the need for a systematic and multi-disciplinary approach for risk management. The international community has invested huge amounts of resources in instruments based on the use of satellites, able to provide information on a vast scale. With regards to the EU, the Copernicus program – which provides data that is accessible to all, free of charge and in a user-friendly manner – permits the complete monitoring of the Earth, with an eye in particular to the improvement of the security of its citizens. e-GEOS, the company partnered by Asi and Telespazio is the world leader for geo-information services and holds an important position in Copernicus. Infact, it operates at the Matera Space Center, one of the three Core Ground Segment stations for Copernicus, which receives, files, and distributes the data acquired by the Sentinel-1 and Sentinel-2 satellites, and coordinates, inside of the Copernicus Emergency Management Service, the Rapid Mapping Service operations, leading a team of partners composed of Gaf Ag, Ithaca, Sirs, Sertit, and

Dlr. 24 hours a day, the service provides maps to evaluate damage and pre-event situations based on satellite imaging (including Sar from the Cosmo-SkyMed constellation (one of Copernicus' "contributing missions"). Access to the service is free for all authorized users who operate in the sectors of Civil Protection and Humanitarian Aid.



Map of Copernicus Ems's delineation

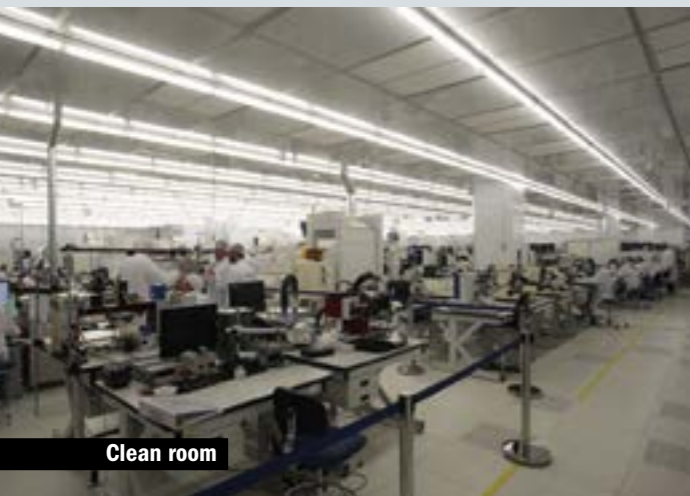


## 40 years at the forefront...of space

Thales Alenia Space is one of the main suppliers in the world of satellite solutions and orbital infrastructures

Thales Alenia Space has an experience of over 40 years in the design, integration, testing and manufacturing of innovative space, telecommunications, navigation and earth observation systems, systems for environmental management, exploration, science and orbital infrastructure.

In addition, it has also acquired unparalleled expertise in dual-use civilian/military missions, satellite constellations, flexible payloads, altimetry, meteorology, and radar and high resolution optical instrumentation. The company has known how to capitalize its skills and made innovation the keystone of its strategy. With the constant flow of new products and the increase of its presence, Thales Alenia Space now has 7,980 employees in 9 countries. One of the key factors for innovation in the space industry is represented by the public policies supporting it, and related actions guaranteeing implementation. Thales Alenia Space successfully participates in numerous projects in the framework program of the European Union for research and innovation, H2020. In particular, as part of the "Sapient" project (Satellite and terrestrial architectures improving performance, security and safety in Atm), the company is leader of a consortium of businesses and has the job of defining and evaluating, through simulations, innovative algorithms to optimize the use of datalinks for communications between satellites and the Earth in order to control air traffic, as per the roadmap of the European Atm Master Plan.



Clean room



## New synergies between earth and sky

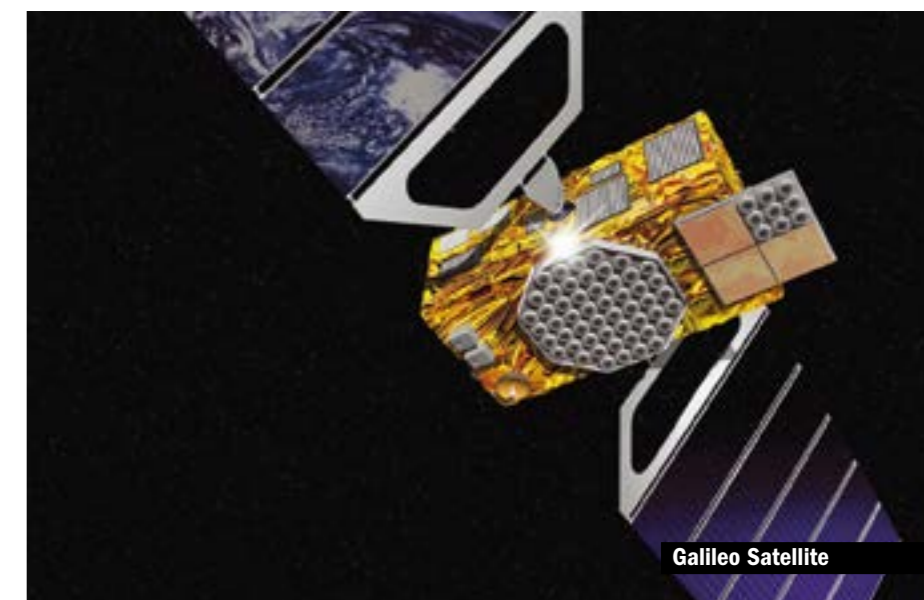


Telespazio develops satellite navigation services for the safety of dangerous goods transport

The logistics and freight transport market has a huge potential for services based on satellite navigation (GNSS - Global Navigation Satellite Systems). GNSS solutions for monitoring, tracking and tracing the transport of goods are widely available on the market, and largely adopted in operations, with resulting benefits in terms of increased efficiency and safety. Various European Commission's initiatives have proven the advantages generated by the use of the European GNSS, EGNOS (European Geostationary Navigation Overlay Service) and Galileo, particularly when combined with other GNSS (i.e. the Russian GLONASS - GLOBal NAVigation Satellite System - and the Chinese BeiDou), thanks to a more precise and reliable position information with respect to the use of the American GPS (Global Positioning System) alone. For the transport of dangerous goods, the use of GNSS is not only a matter of intelligent and efficient logistics, it also implies social interests for the involved authorities. Today, the majority of the companies transporting hazardous materials by road and rail have GNSS-based tracking and tracing solutions/services. Furthermore, over the last few decades, there has been a growing awareness of the authorities in order to validate and support the relevant adoption on a large scale, for regulatory, law enforcement and risk assessment purposes. In CORE (Consistently Optimised Resilient Secure Global Supply-Chains, www.coreproject.eu), a European 7th Framework Programme cofounded research project, Telespazio (a joint ven-

ture between Leonardo and Thales) leads a demonstration on the use of multi-GNSS/EGNOS for the transport of chemicals and gas. Carried out with Hoyer (a key logistic operator in the transport of dangerous goods) and with the Italy's and France's Ministry of Transport, the demonstration develops and proves the functions of a tracking device installed on tank containers transporting Argon from Duisburg (Germany)

anomalous conditions and for prevention/risk management activities, and in parallel forwarded to the platform of the France's Ministry of Transport for cross-border freight flows monitoring and control. The CORE's results verify the advantages of multi-GNSS/EGNOS in terms of reliability and enhancement of transport's safety. They also contribute to the UNECE (United Nations Economic Commission for Europe) working group that



Galileo Satellite

to Terni (Italy) along an intermodal road-rail chain. The tracking device measures the position through a multi-GNSS receiver with EGNOS activated in compliance with the CEN Workshop Agreement CWA 16390, and the status of the transported products through sensors. The data are sent to the platform of the Italy's Ministry of Transport, here elaborated/integrated with information from the Regions for alarm raising in case of

is updating the regulations for the international transport of the dangerous goods, and they support the revision of CWA 16390 undertaken by UNI (Ente Italiano di Normazione). The possible extension to applications and services based on Big Data is presently under evaluation. Therefore, CORE is coherent with the implementation of C-ITS (Cooperative-Intelligent Transport Systems) and Smart Roads in Europe.



# Historical monuments and climatic change

*An innovative approach to increase the resilience of Cultural Heritage*

In the last years the world is necessarily facing to the effects of the climate change, which require interventions in many different fields, from the environment, agriculture, to land protection. The cultural heritage too, in particular that one in Europe and in the Mediterranean basin, where many important and prestigious monuments and sites are located, must face this emergency: in many situations, the presence of meteorological extreme events can severely damage historical buildings and works of art. To find solutions to this problem is the aim of the HERACLES project, funded by the EU within the Horizon 2020 research and innovation programme under grant agreement n 700395, and coordinated by CNR. "Our aim is to increase the resilience of cultural heritage assets against

lity of Gubbio are active parts of the HERACLES Consortium. "Italy and Greece are among the Countries more rich in cultural emergencies; our choice was not to focus on very famous locations, already object of attention, but on minor historical centers/areas since they represent the essence of the European Countries, often not greatly taken into account, even if characterising our Countries, our Culture, our Identity, our Economy, where people lives, and works. The Sea Fortress of "Koules" is located in the port of Heraklion and symbolises all the monuments and sites facing the risk of hazards from climatic change, such as significant impact from the sea. Gubbio instead, wants to represent all the historical monumental towns in Italy and in Europe, which were conceived and built in the past following criteria

when the climate conditions were very different from nowadays and that suffers at present the effects of climate changes, which would endanger their safeguard, particularly the hydrogeological instability and landslides, worsened by the seismic risk. The Minoan Palace of Knossos, is a spectacular Bronze-Age archaeological citadel representing the ceremonial, economical, social and political centre of the first European civilization of the Mediterranean basin, namely the Minoan civilization. The HERACLES Consortium is facing these challenges since almost one year, using a holistic and multidisciplinary approach, through the development of a system exploiting an ICT platform able to integrate multisource information from wide area surveillance (satellite technologies) to in-situ diagnostics. Through the use of context, site and risk analysis, a complete and updated situational awareness will be available to support decision for innovative measurements improving CH resilience and integrating new solutions for maintenance and conservation. In this framework the nanostructured materials are included, that may confer to the structures improved characteristics in terms of resilience."

GA N 700395



Knossos

the effects deriving by climate change", says Giuseppina Padeletti, project coordinator (Istituto per lo Studio dei Materiali Nanostrutturati). A partnership made up of 7 different Countries, integrating research institutions, universities, small, medium and large international enterprises, as well as international organizations, was set up. The end-users, such as the Ephorate of Antiquities of Heraklion (including also Knossos site) and the Municipa-



Gubbio



# A state-of-the-art observatory

*Italian science, technology and leadership for the future European large X-ray space telescope*

European astronomers, in collaboration with high tech enterprises, are building the next generation X-ray observatory, Athena. It will reveal the hottest and most energetic phenomena of our Universe, from the explosions of the first stars in the Universe at its infancy, more than 13 billion years ago, to the monsters black holes that harbor in the center of all galaxies, including our own. Italy has a fundamental role in this Esa programme: Italian researchers are leading scientific and technological strategical areas, and industries are involved in the development of the instruments and will play a key role in the construction of the satellite. Athena relies on cutting edge technologies, employing cryogenic X-ray detectors with high spectral resolution, one hundred time more sensitive than current experiments. Although the launch seems distant in 2028, the activities are already proceeding at full steam. In order to prepare and strengthen the astronomical community and the related infrastructure of the field around this big facility, European Union has funded Ahead (integrating Activities in High Energy Astrophysics Domain), under its multi-year framework program, Horizon 2020. The Ahead Consortium includes representatives from 26 European Institutions, including a space-oriented company, throughout 16 different countries. The consortium is led by prof. Luigi Piro, director of research of Istituto di Astrofisica e Planetologia Spaziali, Inaf, in Rome. The instrumentation we are developing within Ahead is extremely sophisticated, and includes extremely

sensitive cryogenic detectors that, coupled with novel wide angle and telephoto optics, are able to image X-rays and measure with exquisite precision the energy of each single X-ray photon. Although targeted to the exploration of the X-ray Universe, such cutting edge technologies have a huge potential for improving our every-day life. Technological applications for material science, environmental control and biological diagnostics are thus under study within Ahead. Our project offers also a free-of-cost, unified access to the best European facilities for space environmental tests for space scientists and engineers working in research institutes and small-medium enterprises. These facilities, illustrated in this video, include X-ray and gamma-ray beamings, thermal-vacuum chambers, vibration devices and space simulators. They are open for use for a wide range of applications

i.e. instrumentation for exploration of the cosmos, planetology, solar and plasma physics and particle physics or even tests of ground based instrumentation for harsh environment. We are also funding training on data analysis, schools and visitor programs for scientists and engineers at all stages of their career and a strong public outreach program, mainly targeted to the general public and to high school students. Among the excellent educational material, Ahead is very proud of the movie on the "Hot and Energetic Universe" that has been awarded the first prize in the worldwide competition for movies for planetaries. It is being currently broadcasted in more than 200 planetaries around the world and translated in a dozen of languages. Our web-pages (ahead.iaps.inaf.it) provide detailed information on access programs and opportunities for scientific institutes and private companies.



Luigi Piro



The project is funded by the European Union





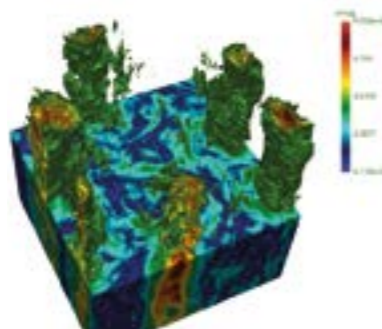


# Focus on turbulence

*Complex flows and complex fluids: when theoretical physics meets the applications*

Turbulence is everywhere on the earth as it is in the sky. It is a complex phenomenon described by the Navier-Stokes equations in presence of strong non-linear components. It is an empirical experience that under these conditions, a fluid evolves chaotically and unpredictability in space and time. The flow fluctuations are strong and far from equilibrium. As a result, the diffusion of contaminants in the atmosphere, the rate of consumptions of reactants in combustion engines, the hemodynamic inside the aorta are out of control and unpredictable, just to cite a few problems where turbulence play a key role. It is not by chance that turbulence is considered the most important problem of classical physics unsolved yet. The group led by Professors Luca Biferale and Mauro Sbragaglia at the Department of Physics of the University of Rome 'Tor Vergata' is interested to both theoretical and numerical studies of complex fluid dynamics, using high performance supercomputers. The group has been recently awarded

of two grants from the European Research Council for a total of more than 3 Million of euro in order to develop innovative models for turbulence simulations (NewTURB: New eddy simulations concepts and methodologies for frontier problems in TURBulence) and microscopic rheological properties of micro- and nano-structured fluids (DROEMU: DROplets and EMUlsions: dynamics and rheology). Among the most important results of Biferale's group we cite a series of state-of-the-art numerical simulations of turbu-



**Result of a high resolution numerical simulation on turbulent rotating fluids**



**From right Luca Biferale and Mauro Sbragaglia**

lent flows under rotation and seeded with micro particles (see Figure) with applications to atmospheric physics, solar corona and turbomachines; the study of the role played by helical structured in the energy transport of turbulent flows and the effects of diluted polymers solutions. The contributions of the Sbragaglia's group are focused on micro- and nano-fluidics. Here, non-linear turbulent fluctuations are inhibited by the spatial confinement and the problems appear because of the presence of multi-phase physics and complex boundary conditions. This is the realm of applications in the fields of medicine, food industry, bio-engineering and cosmetics. We cite the paradigmatic problem of the dynamics of a small droplet in presence of micro-corrugations on the walls, as for the case of red blood cells in small capillaries, or the collective motion of millions of nano-droplets forming an emulsion. In the latter case the collective motion is characterised by the simultaneous presence of both solid and fluid behaviours. If stirred from outside, the emulsion reacts as in an elastic solid, till a maximal deformation beyond which it critically breaks down and flows. The transition is due to the formation of many micro-earthquakes produced by the rearrangements of clusters of droplets. Both NewTURB and DROEMU are based on a series of innovative numerical methodologies, developed 'in-house' and optimised to exploit the most powerful supercomputers available on the international landscape. Both projects are meant to study aspects otherwise impossible to address in the laboratory. Numerical tools are used as a 'third mode of discovery' next to experiments and theory.



# A top european school



*This is SISSA of Trieste. The research fields, supported by Erc, are part of its study areas: neurosciences, mathematics and physics*

Excellence in research to meet the scientific challenges of the future. Testifying to the success of SISSA is the recent VQR (Evaluation of Research Quality), drawn up by the National Agency for the Evaluation of the University and Research Systems, which places it among our country's top universities. Further proof: the substantial international funding obtained, particularly from the ERC (European Research Council). The ERC is among the most prestigious and selective research organizations in Europe, investing only in projects of the highest profile. A good 17 have been won by SISSA in the last ten years, a result which, in relation to the number of faculty investigators, places the School at the highest levels in Europe. All three of SISSA's research fields -- neuroscience, mathematics and physics - are supported by the ERC. In the neuroscience sector, "STATLEARN", coordinated by Davide Crepaldi, deals with the understanding of how our reading skills depend on the fact that the brain unconsciously identifies recurring patterns in the way that letters are organised to form words. The "BiT" project, led by Doménica Bueti, studies the neuronal processes underlying the perception of time, exploring whether there is a cerebral topography in the brain's clocks, and asking "when" and "how" the clocks interact. Mathew Diamond's "CONCEPT" project investigates the neuronal basis of tactile perception to understand the mechanisms by which the brain converts a series of elementary physi-

cal events into the representation of a more complex and meaningful object. Davide Zoccolan, with "LEARN2SEE", studies the neuronal processes giving rise to visual object recognition, positing that processing is determined by the spatiotemporal statistics of the visual environment experienced during early postnatal development. One worth mentio-

is developing reduction techniques for numerical simulation in real time, in order to export and develop scientific computing in fields where at the moment there is still little exploitation, for example in complex system design for industry and hospitals. The focus is on mathematical models and numerical methods for fluid dynamics. Finally, Jacopo



**Il team**

ning in the area of physics is Giovanni Bussi's "S-RNA-S" project, which studies the movements and interactions of RNA molecules by using computer models. RNA is the "less famous cousin" of DNA but its dynamics in the cell play a fundamental role in controlling the expression of the genes. In the area of mathematics the "AROMA-CFD" project, headed by Gianluigi Rozza,

Stoppa and other members of the project "StabAGDG" work on some basic open questions in mathematics and mathematical physics. They study Einstein's equations of gravitation and the Yang-Mills equations of particle physics using advanced tools drawn from complex differential, algebraic and enumerative geometry, unveiling new hidden structures in the process.



## Towards new frontiers in chemistry sciences

*Innovative materials and devices based on Metallacrowns*

Studies on compounds contained in lanthanides are a frontier in chemistry sciences. Their use ranges from the field of telecommunication to information storage and biomolecule identification. “Metallacrowns containing lanthanides are compounds with extraordinary chemico-physical properties, from luminescence to magnetism and what is more, are efficient molecular identification agents”, explains Dr. Matteo Tegoni Department of Chemical Science, Life and Environmental Sustainability at the Università di Parma. His laboratory in the Department of Chemical Science, Life and Environmental Sustainability has been developing Metallacrowns for over 15 years. Dr. Tegoni is currently co-

ordinator of the European project Marie Curie “Metallacrowns-based innovative materials and supramolecular devices” (GA 611488). This



Matteo Tegoni

project unites laboratories in the Usa, France, Ukraine and Poland. “In the last 4 years, this consortium has provided an important contribution towards studying Metallacrowns. Their chemistry is in expansion and researchers throughout the world observe Metallacrowns with interest as precursors of functional materials”. Dr. Tegoni is also coordinator of an Italian-Usa bilateral project funded by the General Direction for Promotion of the Country System at the Ministry of Foreign Affairs and International Cooperation. “Together with our partners we continue to discover new Metallacrown properties every week – says Dr. Tegoni -. The limit for envisaging future applications lies solely in our imagination”.



## In search of the sterile neutrino

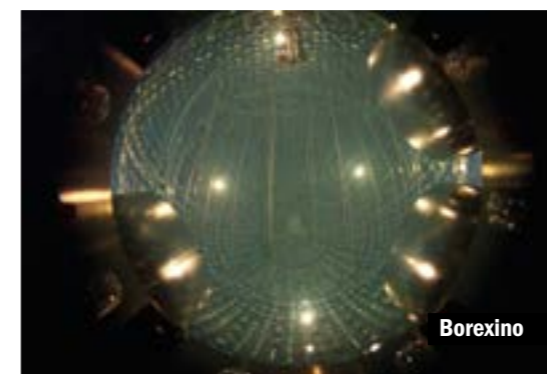


*A conclusive experiment at the Laboratori Nazionali del Gran Sasso*

Neutrinos are the most abundant elementary particles in the universe: about ten billion pass through every square centimetre each second, and their production - which derives from the Big Bang - is mainly tied to the activity of the sun and stars. Scientists discovered the existence of neutrinos in the middle of the last century, and as of today three types have been identified: electron, muon and tau. But there are indications, albeit vague, that there might be other varieties of neutrinos, such as the “sterile” (meaning “isolated”: it is a particle with even weaker interactions than those currently known, of which there are still very few). The

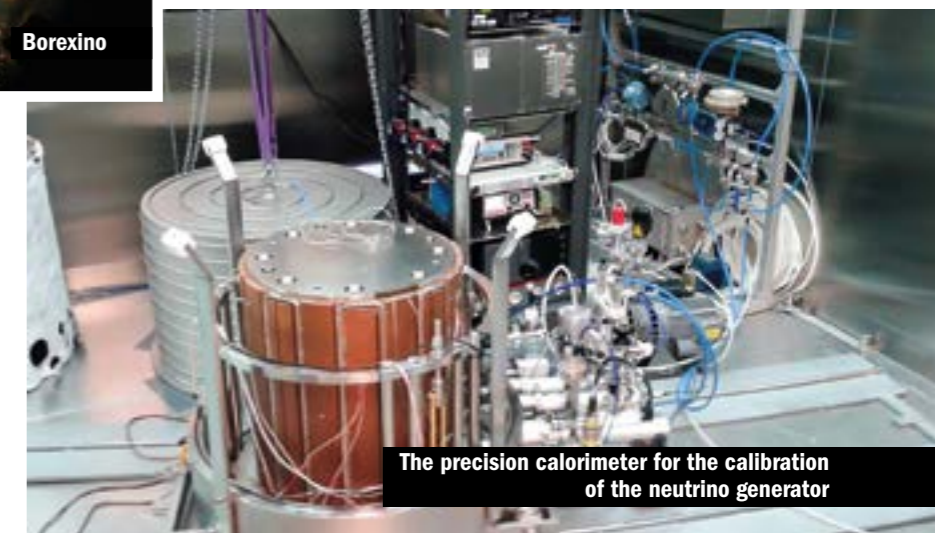
Italian, French, German, Russian, Us, Hungarian and Polish organisations. The majority of the work is carried out within the Gran Sasso National Laboratories of the National Institute of Nuclear Physics (Infn): home to the creation of Borexino, the most sensitive neutrino detector ever built. “The heart of Borexino is the least radioactive site in the world, so the detector provides a measurement that is clean and with no effects of disturbance”, explains professor Marco Pallavicini - member of the National Institute of Nuclear Physics as well as President of the Science Festival of Genova - which is the coordinator of the project. “Over the last

few years we have undertaken a long preparatory phase, building, among other things, an extremely sensitive precision calorimeter that will be used to calibrate the neutrino generator and allow us to understand how much it can emit to the second. Today, we are refining the analytical software tools and simulations, so soon we will begin the measurements”. The next few months are crucial. “What we are doing is the conclusive experiment - emphasises Pallavicini -: either we discover this new neutrino, or we rule out its existence once and for all. This does not deny the existence of other types, but the one with the characteristics indicated by the experiments made to date, thanks to this technology, either we find it or it isn't there... “. As for the expected result, however, the professor does want to commit himself too much: “it is difficult to imagine whether the sterile neutrino exists or not before having the results of the experiment. Neutrinos have always been amazing: in order to remain clearheaded, I prefer to think that there is nothing, but if the opposite is true, it would be an extraordinary discovery”.



Borexino

potential discovery of this fourth type of neutrino would have a great impact both on cosmology and on particle physics, requiring a rethink of today's two accepted theories. It is therefore very important for research to know if the sterile neutrino exists or not. And that is the goal of the European Sox project coordinated by prof. Marco Pallavicini of the Department of Physics at the University of Genova, with an international partnership that includes



The precision calorimeter for the calibration of the neutrino generator

## The new face of digital maintainance

*A toolkit that reduces maintenance costs in process automation*

ALMeS (Add-on, Low cost, Multisensing-enabled Smart Maintenance) is an initiative supported by the European Institute of Technology (EIT) Digital - Digital Industry Action Line in January 2017 and it's the new face of digital maintenance. The manufacturing companies have to face the automation and robotics innovation challenges without

measuring their return on productivity efficiency and they are seldom supported from machinery manufacturers in collecting and making sense of real-time data from their own production cycles. ALMeS is a toolkit of innovative IoT sensors with fiber optics and MEMS, connected to an intelligent microcontroller which can transmit the data from vibrations, energy consumptions and more to a machine-learning software in the cloud, enabling real-time analytics, alerting and medium-term forecasts on residual lifetime. The field implementation of this toolkit can significantly reduce the maintenance costs of various industrial sectors and enables a higher level of process automation. Reply cooperates together with Politecnico di Milano, Fondazione Bruno Kessler di Trento, ST Microelectronics, Coherentia, Crowdee and Konux to provide the toolkit “as a service” thus eliminating the purchase costs of both sensors and industrial gateway. The Add-on, Multipurpose, Low Cost (ALM) modules can measure the following real-time parameters: mechanical vibrations (RMS, PSD and detailed frequency spectrum), energy consumptions, temperature, 3D positioning and many others.



Hi RES



# Nanotechnology for industrial devolvement at the forefront



*NanoInnovation 2017: the key Italian event for a meeting between research and industry, when nanoscale becomes a qualifying factor for innovative technology, processes and products*

Treasuring the success attained in 2016, the NanoInnovation 2017 convention, Conference and Exhibition, has become the key national event for industries, entrepreneurs and investors, research organisations, universities and institutes working in promoting research applied to nanotechnology and its integration with other enabling technologies (Key Enabling Technologies-Ket). The event will take place from 26 to 29 September 2017 in the Renaissance Chiostro del Sangallo in the faculty of Civil and Industrial Engineering of the Università La Sapienza in Roma. It is organised by the Associazione italiana per la ricerca industriale (Airi) and Associazione NanoItaly, in partnership with the main research organisations, universities, industrial associations, businesses and national institutions. The 2016 edition saw more than 1,000 participants who were able to participate in 48 sessions, 9 workshops, 4 tutorials, 2 open sessions, 12 keynote speakers, with the involvement of 257 high profile speakers and the presence of 24 exhibitors. Of particular import, also in this edition, is the collaboration with Ice – the Agency for promo-



tion abroad and the internationalisation of Italian businesses, thanks to whom the participation is planned, in the quality of speakers, of a wide range of representatives for applied industrial research coming from Poland, Switzerland, South Korea and Taiwan. In addition, thanks to the

contribution of Apre - Agenzia per la promozione della ricerca europea [Agency for the promotion of European research] – there will also be a session for business networking, one-to-one meetings, bringing together research and enterprise. The aim of NanoInnovation 2017 is to propose a forum for discussion and encounter in the community working in nanotechnology, with a particularly varied scientific program, centred on the most innovative developments and industrial applications in key industries like materials, medicine and health, electronics, transport, aerospace, the environment, biotech, agriculture and consumer products. The emerging topic of Industry 4.0 will have a dedicated specific in-depth discussion, with the participation of key players from industries and institutions. Particular attention will be paid to young people, to the topic of their training and their entrance into the world of work and high-tech business, through tutorials and meetings with businesses. A rich exhibition, where the most recent innovations will be displayed, completes the event. There is still the possibility of contributing to NanoInnovation 2017, by responding to a call for papers and a call for young talents, adhering to one of the modes of envisaged partnership or applying for a stand during the event. Participation in the event, including business networking meetings, is free upon registration online. Also online, updated information and documentation can be found.

**Nano** Rome, 26-29 September  
**2017 Innovation**  
**Conference & Exhibition**



# Paving the way to curvatronics



*Nanostructures with unconventional geometries for quantum computing and spin interference*

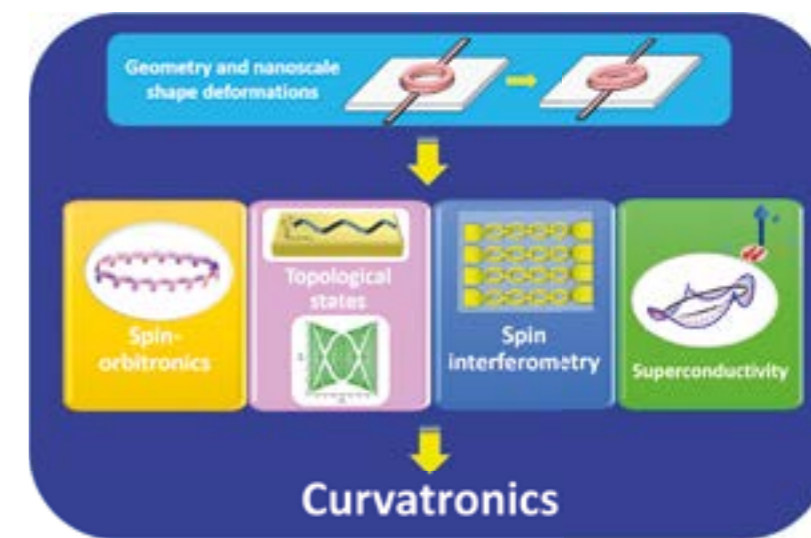
Quantum computers are nowadays the most promising means for achieving an exponential speedup in computation over classical computers. However, contrary to their classical counterparts, they are affected by errors due to quantum decoherence. A successful path to fault-tolerant quantum computation is based on concepts of topological quantum protection, which requires anyonic quantum particles, like so-called Majorana bound states. Recently, Majorana modes have been predicted in a variety of materials platforms. Although such solid-state-devices consist of conventional building blocks, generation and control of Majorana states are still the biggest challenge in the field because of a very delicate fine-tuning of intrinsic materials properties and external applied fields. In order to open new directions in this field, the FET-Open project “Curved Nanomembranes for Topological Quantum Computation” (CNTQC), funded by the European Commission from June 2014 to May 2017, has addressed innovative materials where geometric effects can be exploited to tailor new quantum electronic states. CNTQC Consortium is made up of four teams led by Dr. Carmine Ortix (CNTQC coordinator) from IFW Dresden, Dr. Denys Makarov from Helmholtz-Centrum Dresden-Rossendorf and Dr. Ivan Vera-Marun from University of Manchester. The CNTQC Italian team includes Dr. Paola Gentile, leader of one of the CNTQC workpages, and Dr. Mario Cuoco, both operating in the unit of Salerno of CNR-SPIN in synergy with the Department of Physics of the University of Salerno. Overall, the SPIN Institute has high



Paola Gentile

expertise in superconductors, oxides and other innovative materials and devices. Gentile and Cuoco explain that nanoscale geometry has a dramatic impact on electronic, topological and superconducting properties of low-dimensional materials. ‘For instance, in a periodically corrugated semiconducting nanowire, geometric effects lead to a metal-insulator transition, also promoting the generation

of topological states. This system can thus act as a nanoflextransistor switch, being on or off if the nanowire is flat or curved’, Gentile says. ‘Moreover, geometric curvature effectively acts like a spin-torque, twisting the electron spin’, Cuoco adds. ‘Consequently, spin transport and interference properties in shape deformed nanostructures result to be directly tuneable via geometry, opening the possibility to novel spin-orbitronics device concepts’. ‘In superconducting nanostructure, geometric deformations allow to control the strength of spin-singlet superconductivity, tuning at the same time non-trivial spatial textures of spin-triplet pairs’, Gentile explains. The advances achieved within CNTQC in the experimental fabrication and characterisation, and in the theoretical analysis of novel nanostructures with unconventional geometries pave the way to innovative platforms for Majorana states and also for new spintronic and spin-orbitronic devices.





# Creating jobs while regenerating the environment



**B**ioeconomy - which includes traditional sectors such as agriculture, livestock rearing and fisheries, but also biomass production, coastal tourism, maritime industry - is an important sector for Europa: it accounts for 9% for both turnover (2.2 trillion euros) and employment (19 million jobs). It is also significant for Italia, which is the third country in the Eu in terms of performance - after Germania and Francia - with € 254 billion euros and more than one and a half million jobs. And our country, especially in recent years, has been able to attract a lot of funding in this area from the major European programmes: it ranks second in Eu for the ratio between projects submitted and won. To what do we owe these excellent results? "Mainly to two factors", explains Fabio Fava, Professor of Industrial and Environmental Biotechnology at the Dicam of Bologna and Government representative for the Horizon 2020 and Bbi Ju European programmes, specifically focused on bioeconomy. "On the one hand, there is no speci-

fic funding in Italia, so our business has learned to look for it in Europa, where there is. On the other hand, Italian industry is finally beginning to head, also culturally, in the European direction". In the meantime, just a few months ago the Italian Government also adopted a specific strategy for bioeconomy by creating a discussion table with representatives of five ministries and all regions. This is because it is a sector that can grow, also and especially in rural areas, where agriculture is getting a foothold: "bioeconomy has an important feature: it regenerates the environment by creating jobs - concludes Fava - I'll give you an example: biorefineries need to work with biomass, like the thistle in Porto Torres. Therefore the crops need to be planted, and it is done in non-cultivated areas; in Italia there are three million hectares which are no longer cultivated because it is not worthwhile. In this way, land can be re-cultivated, thanks to the crops used as biomass and this creates new opportunities for employment and jobs in abandoned areas". ■



# Energy photographed from on high



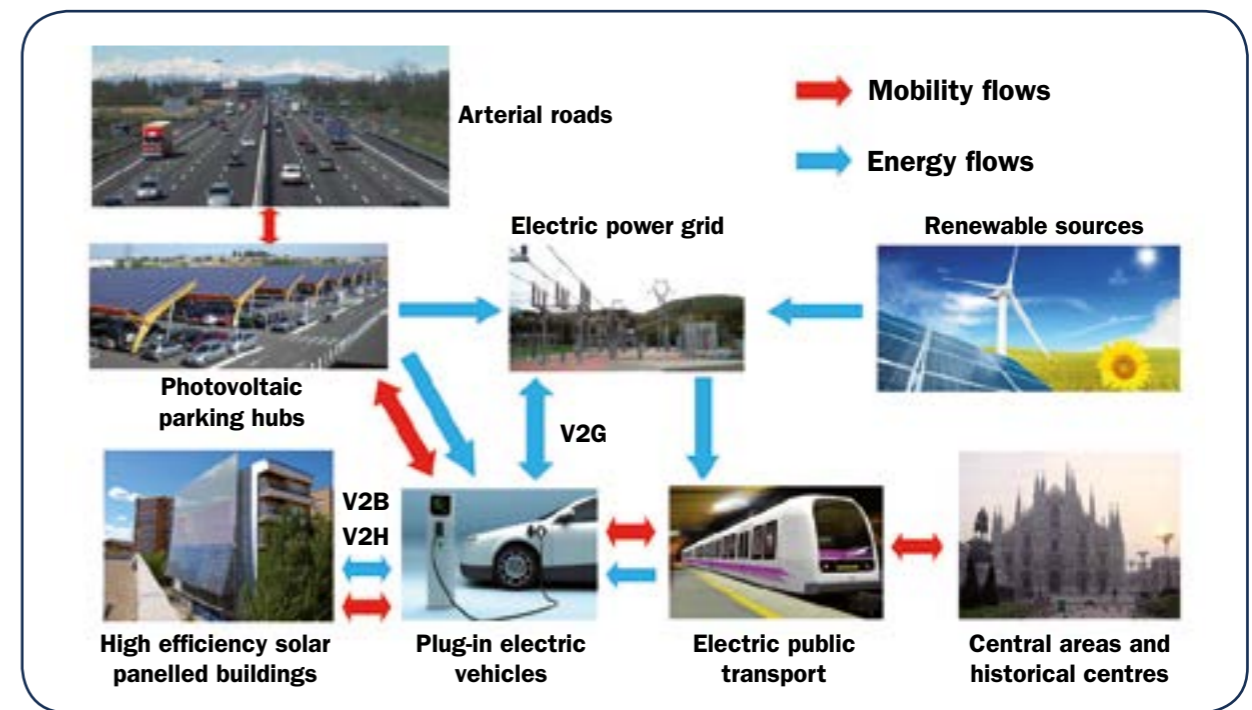
*How to use aerial thermography to analyze a city's energy efficiency*

Aerial thermography is a technique which is based on the acquisition of infrared thermal images, by using a camera installed on an airplane. Among the most promising fields of application is the analysis of energy efficiency of buildings, based on the option of measuring the temperature of their surfaces from the images. All the same, the differing materials and the atmosphere (with variable temperatures and humidity) visibly change these measurements. The "ChoT", developed at the University of Bologna's Dicam reduces these errors to a minimum, with the purpose of obtaining sufficiently accurate temperature maps to carry out evaluations of the surfaces of the buildings photographed. "This instrument – explains Dr. Emanuele Mandanici, the head of

the project – should allow us to make extended maps, for example of an entire city. Even though this method does not substitute for the procedure of energy certification of buildings, these maps can allow for an overall vision of the city, identifying the zones or blocks where the building typology has greater dispersion problems and therefore greater need for upgrading actions". After two years of work and another one at disposal, "ChoT" is already well ahead. "We have made notable progress. The last test that have been done – flights and control measurements made on land – show that we have gone from the initial errors of many degrees to a range of a degree and a half to two. Therefore, we are now close to our goal – data processing of the data to be the best".



Emanuele Mandanici



## New scenarios for electric vehicles

*Environmental and social sustainability, socioeconomic development, social and energy policies*

In the context of energy policies intended to promote environmental sustainability, the Research Group on Electrical Systems for Transport at the Department of Energy of the Politecnico of Milano is conducting researches into sustainable mobility in synergy with renewable energy sources. Local public transport based on electric vehicles has become fundamental in urban mobility, both because it is better suited to the space available and it does not produce local pollution in areas which are already affected by other intensive large-scale human activities. Indeed, electric vehicles, such as trains, trams and subways, have always been the most efficient ones in terms of energy and the most sustainable ones from an environmental point of view. Modern mobility stra-

tegies have sought to integrate public transport with private means by utilizing specific hubs positioned in strategic or peripheral areas of the city, with cars from suburban areas and metropolitan transport lines decongesting traffic in more central areas. However, if, on one hand, there is an effective integration in terms of mobility, the different technologies used by road vehicles and public transport, on the other, have not yet fully exploited the synergy between the two systems also from the point of view of energy or infrastructure. Nowadays, this opportunity is being allowed by the diffusion, now evident in all technical and economic fields, of electric traction and hybrid plug-in vehicles. The use of electric vehicles actually allows to reduce polluting emissions locally and to use different renewable sources di-

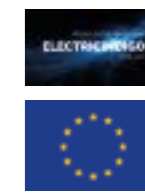
rectly for battery recharging. The widespread diffusion of electric cars in the short and medium term, however, may result in various problems related to the need to create infrastructure to recharge them, not just in terms of recharging points, but also the need for a power grid being capable of providing the energy which is required. In this context, the Research Group on Electricity Systems for Transport is conducting studies into the infrastructure of systems for recharging electric vehicles and their impact on the supply network by exploiting synergies with renewable sources and other technological systems through the opportunities offered by the Vehicle-to-Grid (V2G), in conjunction with services provided for buildings (Vehicle-to-Building V2B) and single households (Vehicle-to-Home V2H) as well. The opportunity to use electric vehicles, regarding them not only as a non-polluting private means of transport, but, thanks to their batteries, also as an energy reserve for housing, buildings or integrating with energy consumed by other loads through the grid, opens up interesting scenarios for new social and energy policies where mobility and consumption optimisation come together in the context of environmental sustainability.



# Cybersecurity, a crucial issue



# An open software for science



*A Horizon 2020 programme project to train top level experts*

*The project is called Indigo-DataCloud funded by the Ec Horizon 2020 programme*

The issue of cybersecurity, together with that of Co2 emissions is, for the European Union, one of the most strategic sectors for intervention. For this reason, a few years ago a special generic, open call was issued under the

Horizon 2020 programme. And the projects submitted and funded also comprise NeCs, led by the Istituto di Informatica e Telematica of Cnr (National research council) and a working group numbering 7 beneficiaries (comprising several renowned

European universities) and various public and private partners. Begun in 2015, the project lasts for 4 years and counts on a funding worth 4 million. “The basic purpose is to create a network of 15 students with a doctorate, coming from all over Europe, and assure them appropriate training to render them competent researchers in the field of cybersecurity”, explains Fabio Martinelli from Cnr, who coordinates the project. Apart from this, NeCs is also engaged in creating a training infrastructure (with schools, courses and relevant materials) and in research on 3 principal topics: cybersecurity management, information sharing and the work of risk management for critical infrastructures. “It is a crucial issue: some 6 million jobs in cybersecurity are estimated to be necessary in 2018 and only 4.5 will be covered and this is the reason why there is a need for educational training at the highest possible level”. It is practically the point of an iceberg: “and for Cnr it is extremely important to address this point, to confirm the great experience we have gained over the years”.



Fabio Martinelli

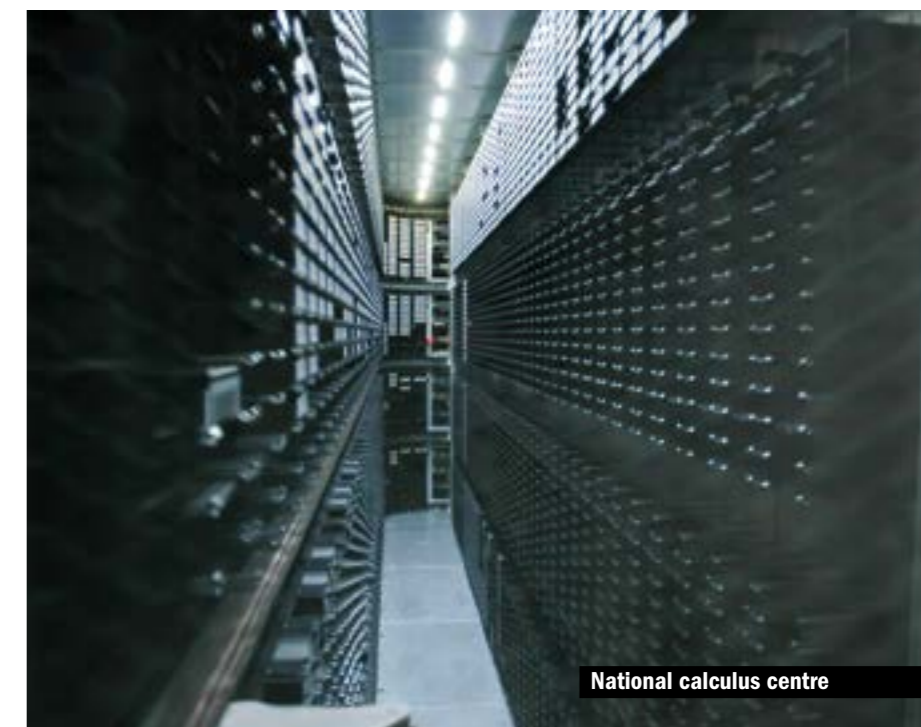


Meeting room

“Cloud” is a combination of technologies used for some time now both by public and private users to trace ‘on demand’ information sources. The providers of said sources, employed to manage data, applications, database and others, can themselves be both public and private bodies. The convenience of the cloud as a unifying and efficient source provider mechanism is what actually makes it such a great success. Various scientific activities, such as for example the experiments in physics at Cern in Genève, molecule sequencing activities, or even conservation and analysis of our immense literary and artistic heritage in digital form, require enormous calculus and data management capacities, so that adopting cloud in these fields would appear to be an obvious solution. But there are however some major problems that often forestall all this: from the necessity to be independent from the source provider, achieved by using de jure or de facto standards and reliable open-source tools, to the difficulty in using public or private clouds for common business. Here are some examples: repetition of data on multiple websites, safe, flexible mechanisms for user authentication and authorization support, transparent access to distributed data, support of traditional applications on cloud, a simple and portable definition of requests for sources, relevant monitoring and accounting, creation of extendable and web portals interfaceable with mobile applications. These problems, also often applied to cases of use not related to scienti-

fic purposes, are the motivating reasons that led to the creation of Indigo-DataCloud, or Indigo for short, a project funded under the European Commission’s Horizon 2020 programme and coordinated by the Italian Istituto nazionale di Fisica nucleare (Infn). Indigo has 26 public and private partners, distributed in

private clouds. ElectricIndigo has already been adopted in areas such as astronomy, physics, bio-information, climatic change analysis, medical imaging, digital library management and many more. The use of tools developed by Indigo is also being followed with great interest by private enterprises. Indigo is an



National calculus centre

11 European countries. Its purpose is precisely the resolution of the aforementioned problems, producing software enabling exploitation of the cloud-related services in a simple, open and extendable manner. To this end the project recently released the ElectricIndigo software, comprising 40 open-source modular components, supporting the technologies used by the major public and

important research and innovation testimony born from the competence of European excellences, and Italian in particular, also in fields like the cloud and for handling great quantities of data, often commonly believed to be dominated by overseas countries.

The INDIGO-DataCloud project received funds from the European Union Horizon 2020 research and innovation programme through Grant Agreement n. 653549



# When law meets history



Interdisciplinary research on the Convention for the Protection of Civilian Persons in Times of War



Even though it was signed in the distant year of 1949, the Fourth Geneva Convention for the Protection of Civilian Persons in Times of War is still very current. Although the current conflicts – first and foremost in Syria – often make people fear this no longer applies, very few people know how and what led to the underwriting of this Convention: this is also due to the secrecy of the archives, which have now been opened for the first time in 50 years. Annalisa Ciampi, professor of international law at the Università di Verona and Un Special Rapporteur on the freedom of peaceful assembly and association, and doctor Gilad Ben-Nun, historian on international relations, are trying to fill this void thanks to a grant from the Marie Curie program: an interdisciplinary study combining international law and history. The title of the research, “International Law and History”, is a complete novelty: an unprecedented approach from the very beginning, which the European Union valued positively, so much so it granted financing on this specific proposal. It is easy to understand how this new partnership could open doors to a strategic research sector, capable of thoroughly investigating dozens of key historical moments in contemporary history, in any part of the world, even in light of specific legal topics, as the same authors hope to achieve. “This method is decisively new, and can be applied to many other topics, because the juridical mea-



Annalisa Ciampi and Gilad Ben-Nun

“THIS PROJECT HAS RECEIVED FUNDS FROM THE EU FRAMEWORK PROGRAM FOR RESEARCH AND INNOVATION, HORIZON 2020, BASED ON THE MARIE SKŁODOWSKA-CURIE GRANT AGREEMENT N. 701275”

ning of the acts we are studying is different from the historical, and the comparison could lead to great contributions”. In detail, the work that the pair is doing in the historical archives around the world – and which will conclude mid-2018 – intends to understand how this Convention came to be, the first signed at a global level after

the end of the Second World War. “We still don’t know who came up with the idea, or who wrote it. For example, we have found that the first group of documents is from Francia, that its greatest supporter was the Ussr, and the two countries who were most against it in the beginning were the Usa and Gran Bretagna...”.

How do young people move within the European Union? Which desires, migratory flows and employment needs do they follow? Attempting to answer these questions - which are definitely appropriate in a very delicate historical moment for the EU - is a project funded by the Horizon 2020 programme called “Ymobility” coordinated by Armando Montanari, professor of Geography of Tourism and Human Mobility at the Sapienza University of Roma. A project that will close in February 2018 with a conference organised at the Istat headquarters. Initially 9 European union countries were selected, divided into three types: countries where the outflow of young people prevails (Latvia, Romania and Slovakia), others characterised by greater immigration (Uk, Germany and Sweden) and countries with mixed flows (Italia, Spain and Ireland). “In these countries, we have created specific working groups, and for more than two years we have been interviewing - 30,000 phone calls and 850 more in depth - young people between the ages of 15 and 35 to understand their migratory dynamics, also with a future perspective”, explains Montanari. Also emphasising the specific choice of starting the research from high school, that is to say from minors. “From the data emerges a liquid society, for which ICT tools are a daily bread”. European youngsters move around a great deal. “After 30 years of Erasmus, we should be happy that so many young people want to go abroad: this is the only way to have a European Union. For our research, it is important to understand the identity of these young people, and the impact on society on a global and regional level”. Brexit arrived halfway through the study. “On a research level, this was a blessing. Of course, it has complicated our life, but it has made it more appealing and interesting. A recent seminar in Ireland on this topic provided significant results regarding the possible impacts that Brexit may



Armando Montanari



## Europe, a crossroads for youngsters

Research among the under 35s reveals European young people’s migration flows and wishes

have on young people. Both regarding those who live in Great Britain - many of the 500,000 Italians, for example, are clamoring to get British citizenship - and in the fact that in other countries the appeal of London is already waning, for example in Germany”. Interesting data are emerging even with regard to Italia. “The first significant data is that there is no brain drain. There are young people who go abroad to learn and acquire knowledge, but afterwards they choose to return home, provided the economic con-

ditions allow so. This is something our businesses should think about, to build situations appropriate for the return of our young generation”. On the other hand, the appeal of Italia is still noteworthy: both for some specific sectors (in the faculties of tourism science, 30% of students come from abroad) and for the overall quality of life: “In London earnings are better, no question: but in terms of the environment, food, and quality of life in general, Italia holds great fascination for young Europeans “.



# User's experience in multimedia applications



The QoE project manages an interdisciplinary training network

The recent ICT technological advances enabled a wide range of new services, such as: social TV, immersive environments, mobile gaming, HDTV over mobile, and 3D virtual worlds. One key aspect determining the success of these services is the provided level of Quality of Experience (QoE), which represents the degree of delight or annoyance of the user of an application or service. This is the central concept of the QoE-Net project (qoe-net-itn.eu), which has built and is ma-

naging an inter-disciplinary training network in the core disciplines involved in the research and development of QoE modelling, optimization, control and management schemes for new and emerging multimedia services. This requires knowledge from different fields: psychology, visual and performing arts, communications and networking, signal processing and media technology, as well as customer behaviour research and business studies. From the technical point of view the QoE-Net project studies and

develops models, methodologies and tools for an effective management of the QoE along the whole chain of design, production, delivery and control of multimedia services. The major results achieved so far are the contributions to standards for the evaluation of quality in adaptive video streaming services and mobile gaming, the definition of interfaces between different service providers for a QoE-oriented collaboration and the modelling of quality in next generation TV and immersive services.



Luigi Atzori



## A question of... skin

How to make the tanning production line greener



Italy is a leading country in the tanning sector with over 60% of production at European level and 17% of world production. The EU has financed different "Life" projects in this sector to make the tanning industry greener by substituting the toxic substances used for the working of leather with natural substances based on waste from the agro-industry and from renewable sources. Enea with its Research Laboratory in Faenza is at the head of the Lifetan Project (Life 14 Env/It/443 Eco friendly tanning cycle) which – starting from the results obtained by five previous Eu projects dedicated to the working of leather – has as its goal, the making of the leather production line more ecological, guaranteeing the companies economically sustainable and high quality production even for the "chromium free" lines. "To obtain the soaking agent for leather - explains Alice Dall'Ara from Enea, the head of the European Lifetan project – we are testing production which uses chicken manure, which is waste from



chicken-raising, while for degreasing and coloring, we are experimenting with substances with a lactose base coming from the making of cheeses". "For the moment, we are in a testing phase, with the involvement of some Italian companies (Amek, Glycolor, Serichim), but our goal - concludes Dall'Ara – is to soon begin innovative industrial production with low envi-

ronmental impact in accordance with the circular economic model. This should give a push to the sector, creating a Made in Italy production line and new jobs". The Lifetan Project coordinated by Enea has, as partners, two research centers, Cnr-Iccom in Italia and Inescop in Spain, while the tanning factories involved are Italian Newport and Spanish Tradelda".





# With a puff of gas



*New technology allows us to reduce waste to a minimum in gas networks*

It is well known that water networks, even the ones best taken care of and maintained, all have a loss of resource to some level. Few know, however, that the same thing happens with gas: these are losses due to the micro-leaks with no consequence to the areas involved, and are, however, proportional to the pressure present in the gas pipeline. This is a topic which might seem paltry, and for which, up to a short time ago, there were not real ways to intervene, in an industry which has always been fairly traditional from a technological point of view. But today, the innovations tied to digitalisation allow for the development of new projects, even in gas distribution: including the possibility of reducing to a minimum any losses. And this is the goal of Life “Green Gas Network”, led by Pietro Fiorentini spa – a company from Vicenza leader in the gas distribution industry – and as partners RetiPiù and Teranova. Having now reached the end of three years of work, after two years of laboratory testing, the

project has been upgraded after live experimentation in a test area. For about a year, in the two towns of Cesate and Albiate, near Brianza (about twenty thousand overall inhabitants), gas distribution cabins have a device which allows for the variation of pressure dependant on the load, use and need: in practice, something which has already been happening for some time in the electric distribution network. “The idea started with technology we already had in the company, a smart device applied to mechanical pressure regulators to reduce the emissions of greenhouse gases”, explains Pietro Cerami, marketing manager for Pietro Fiorentini Spa. “On average, the demand for gas is not linear throughout the day: use occurs in the morning, when the heaters are tur-

ned on, people shower and prepare breakfast; then it goes down, it goes up again at lunch, back down in the afternoon, peaks again in the evenings; and at night everything is off. Now, if It technology can help us to see these variations and modify the pressure in the network depending on the load, there are many periods over the 24 hours, especially at night, in which we can noticeably reduce the pressure on the network. And as a consequence the number of leaks will also be reduced”. Even though it is a minimal quantity of gas per



Datalogger

person, it is clear that when multiplied over a vaster area, or over an entire country, then the savings would be remarkable. “With two evident advantages - continues Cerami -: one environmental, because it would reduce greenhouse gas emission in the atmosphere; another economic, because even client bills would go down”. It is no surprise then, that the project has gained the interest of other Italian and European networks: since it is working well, it could soon become working technology.



The first system

# A more competitive Calabria

*The programming period 2014-2020: the local area focuses on innovation starting from methods*

Enhancing its territorial vocations and promoting the excellences of its productive and research system: with this approach Calabria Region intends to face the challenges affecting the global economic balances. The Regional Administration intends to show strong characterization in the management of structural funds with a deeply renewed approach, starting with a new strategy for innovation. Approved in September 2016 by the European Commission, the Smart Specialization Strategy - S3 is the reference framework for innovation policies in Calabria. S3 is the regional strategic document that aims to improve the effectiveness of public policies for research and innovation, enhancing market areas and niches where the territory expresses competitive advantages or potential for business development. In the S3, innovation begins with the method: the document has been conceived as a dynamic and evolving tool, open to comparison and socio-economic changes in the territory. The planning phase of the strategy saw a steady dialogue with the economic and regional innovation operators through



Comparison tables for the S3 strategy

thematic and sectorial meetings: this consultation process led the regional administration to meet and listen to almost a thousand operators between September 2015 and May 2016, and to collect from them more than three hundred contributions. This dialogue has been renewed in the implementation stage of the strategy thanks to the launching of the Thematic Platforms, which allow the community of operators to be fully involved in the S3's governance. The Strategy uses an innovative monitoring system that identifies useful indicators for assessing the results and impact of the S3 and the Regional

Operational Programme, whose results are updated daily and displayed on the website “Calabria Europa” ([www.regione.calabria.it/calabriaeuropa](http://www.regione.calabria.it/calabriaeuropa)). Up to now, 42% of the entire budget of the OP 14-20 have been implemented. With respect to the OP's Axis 1 on Research and Innovation, Calabria Region has already published calls aimed at funding Research & Development projects, supporting local operators' participation in Horizon 2020, and financing the take-up of innovative services within the local enterprises. Regarding Axis 3 on Competitiveness of production systems, three calls for the financing of new equipment and plants, for the adoption of ICT technologies and for supporting the internationalization of SMEs are in the evaluation stage. Over the next few days, innovation will be further promoted with the publication of a call for the reorganization of Innovation Clusters in S3 areas and the launching of an initiative supporting the creation of innovative startups and spin-off from research. A brand new approach, with a challenging goal: to place Calabria Region among the most virtuous regions in terms of quantity and quality of the expenditure.





# At the forefront of biomedical research



Andrea Ballabio

For 10 years now the European Research Council (Erc), which was established within the Seventh Framework Programme to foster research in Europa, has offered researchers the opportunity to propose innovative ideas in any field. During this decade, Italia has won Erc funding for 97 projects in the field of biomedicine: 10 of these have been proposed by the research team of Tigem, the Telethon Institute of Genetics and Medicine in Pozzuoli which was created in 1994 based on the Telethon Foundation mandate. Professor Andrea Ballabio, a well-known genetic disease expert and former co-director of the Human Genome Center of the Baylor College of Medicine of Houston, was one of the founders and is still the director. He coordinates the activity of the institute and the work of the research groups: “our results are based mainly on two important aspects - explains the professor -: on the one hand, the high quality of the researchers working at Tigem, on the other hand, the organisation, which allows for efficient and transparent

management of support structures”. Tigem’s mission is to understand the mechanisms that cause genetic diseases and develop the best possible treatments. Over the years it has identified the genes which are responsible for several pathologies, as well as participating in the Human Genome Project. In recent years, attention has focused on lysosomes, “organelles” that look after the disposal of cellular waste within the cells. Researchers of Professor Ballabio’s team have shown how different types of cancer cells (melanoma, kidney and pancreatic cancer) are able to replicate indiscriminately precisely because this “anti-waste” regulation system is always active. “Several of our preliminary studies show that inhibition of this mechanism blocks tumour growth - concludes Ballabio, suggesting a new strategy for treating tumours - Our findings show that Telethon’s choice of working on rare genetic diseases provides the opportunity to make important breakthroughs for common diseases such as cancer and neurodegenerative diseases”. ■



## The right dose in chemotherapy



Is the goal of an innovative instrument created thanks to a European project



Silke Krol

One of the basic problems for those treating with chemotherapy is linked with the dosage of the medicine: a doctor mainly goes by the height and weight of the patients, but is unable to quantify their metabolism, so that once therapy has begun they can no longer control the medicine in the blood. As a remedy to this problem there is a European project, “DiaChemo”, being developed under the guidance of the Istituto Tumori Giovanni Paolo II cancer institute at the Bari hospital, together with a European partnership comprising two hospitals, two industrial partners, a professional Eu project management Agency and three research institutes. “The basic idea from where we started is to prepare a prototype of an instrument directly measuring the effectiveness of treatment whilst the patient is being given the medicine: a

bit similar to what happens with the instrument to measure glucose for those suffering from diabetes - explains Silke Krol, the “Dia-Chemo” coordinator -. In this way the doctor can control the actual concentration in order to stay between the effective concentration and the toxic concentration and also change the dosage of the medicines during treatment”. Begun two years ago and now at the halfway mark, the teamwork has, for the time being, produced two different prototypes, currently at the last stages for forwarding to the partner hospitals (one in Aviano, Italia and one in Munster, Germany). “We now await their feedback, from where to understand how the instrument can be optimized – ends Krol -. The idea is to optimize the prototypes ready to be put on the market in a follow-up project.



## Protecting the diseased muscle by making it slower

RegeneratioNfix: a study on an entirely alternative approach to treating muscular dystrophy

The skeletal muscle is the tissue responsible for posture, locomotion and diaphragmatic breathing. Muscular dystrophies are heterogeneous pathologies both from a clinical as well as molecular point of view, marked by primary

atrophy of the skeletal muscle, compromising the patient’s mobility and, in more serious cases, the respiratory and cardiac systems, leading to total dependence on a wheelchair, respiratory insufficiency and premature death. The group led by Professor Graziella Messina in the Bioscience Department at Università degli Studi, in Milano, has just concluded a project, funded by the European Research Council (Erc Starting Grant) and lasting for 5 years, which has demolished the current concept in the field of muscular dystrophy. “The scientific community has worked for years to increase dystrophic muscular regeneration, without understanding its fragility: if forced to regenerate, this can

paradoxically originate an exacerbation of the phenotype”, explains Graziella Messina. On the contrary, various studies, forgotten for years, had evidenced how muscular fibres that contract slowly (“slow fibres”) degenerate later on in the patients. From here the idea: we must make the dystrophic muscle slow both in regeneration as well as in contraction. Prof. Messina’s group has been working for years on a protein - Nfix, Nuclear Factor One – which, when absent in the skeletal muscle, slows down its regeneration and induces the muscular fibre to contract slowly. Results: improvement in morphological parameters, reduced fibrosis and inflammation, recovery of muscular functionality.



The team



## Bacteria hunters



An interdisciplinary research project focused on young researchers

It is many years now since Europa has seen new anti-bacterial medicines, whilst there are always new bacteria, which must be appropriately dealt with. In this respect, the European Union is funding specific research projects on this issue, in the belief that it is a strategic challenge for the future. The latter comprise the “Integrate” project, funded under the Marie Curie programme, with the Department of food and pharmacy sciences at Parma University as the lead partner: Begun in early 2015, it has now reached the half way mark and the first results have raised hopes .... “I would say straight away that research in this field is not easy: tangible results, if we see them at all, will only be visible at the end – begins professor Gabriele Costantino, department director and project coordinator -. We study new targets with the purpose of reducing bacterial resistance as far as possible. Today there are many medicines in

chemist shops that were excellent 20 years ago but are now increasingly useless, because the bacterium adapts itself. To fight it we must try to mislead it and identify new targets to aim at, unsuspected by the bacterium”. But the first two years of work have anyhow achieved the pre-established goals: in the first place, a painstaking job of selection from amongst over 500 applications to choose the winners and put them in the condition to begin their work. There are now 11 young researchers coming from all over the world (“also someone from the Stati Uniti, unusual for European projects” points out Costantino), who are acquiring specific interdisciplinary skills – chemical, biological, microbiological and computational – working at the various project partners: apart from Parma, the Universities of Lubiana, Helsinki, East Finland, Anversa and Cambridge; the Lithuanian institute of organic synthesis; the Fraunhofer Institute in Amburgo and two pri-

vate businesses, Aptuit and Taros. “A network was immediately created and is working well, with an extremely active but informal collaboration, and the first publications are already out, being quite important both for the project and for the young people’s experience in itself”. The work done by the young researchers is in fact the true heart of this “training through research” project, as the co-ordinator himself states -. We stake a lot on arousing an enterprising spirit in the young people and in giving them the possibility to make their experience bear fruit also thanks to contacts with the small and medium sized enterprises, shedding that romantic idea of a researcher. I am convinced that research is a true asset, which has to generate returns also when it comes to jobs: it must create start-ups, spin-offs. In short, I hope that at least a few of our young people will be able to become their own entrepreneur, thanks to this project”.



Gabriele Costantino with the team



# Eliminating brucellosis



An Italia-led partnership faces an illness endemic to the Mediterranean area



Maybe, to many readers, the name will mean nothing, but brucellosis is an illness which is still very widespread in the Mediterranean area. It infects some domestic animals – mostly cattle, sheep, and goats – giving them problems in reproduction (even miscarriage) and in milk production: but it can also be transmitted to humans through the consumption of uncontrolled dairy products. And in this case it presents itself as a fever, prolonged and intermittent which is also called “Maltese fever”, “Gibraltar fever” or in other ways, even though the official name comes from the doc-

tor, Captain David Bruce, who was the first to isolate the germ in the 1800s. In the Mediterranean basin there are still thousands of registered cases among humans, especially in North Africa and some European countries like Greece. Although in our country it is a disease that has nearly disappeared (except in some areas of the South), the coordination of the BrucMedNet project, financed by the Seventh EU Framework Program, is still Italian: headed by the Istituto Zooprofilattico Sperimentale in Abruzzo and by the “G. Caporale” Institute in Teramo, Molise at the head of a pool of another 6 partners coming from Italia, Gree-

ce, Portugal, Egypt and Tunisia. “Our project aims firstly at implementing and developing laboratory methods to support epidemiological studies, which will allow health authorities to manage outbreaks more efficiently - explains Mauro Mattioli, general manager of the institute -. In addition, we are studying the interaction that the pathogen has with the animals, and therefore the ability the laboratory has in diagnosing it through the research of specific antibodies”. A task which is carried out both through explicit research action (the study of the characteristics of the genome), and through the implementation of a web system which will contain the results of the specific research and make them public. As a consequence, the system created will connect individual outbreaks in the area, to understand how widespread the illness is, and help veterinary services in the field. A year on from the beginning of the project, and with another two ahead, the project is progressing well: “we are satisfied, the deliverables and milestones have been reached as expected - notes Mattioli -. There have been no modifications and we have registered a fruitful interaction between the partners, which is not always easy in these situations. Also, in terms of distribution, we have tried to make the information accessible with leaflets written in many languages, in integration with what will be the final output, meaning a website with an interface for the results of the project and control activities for the local health authorities of the areas involved”.

BrucMedNet is a project financed through ArimNet2 (Era-Net). Financing has been granted to Mipaff by the European Union as part of the 7th framework program



Mauro Mattioli



# The cornea in the foreground



A new tomograph, created with European funds, dedicated to the front segment of the eye

Last May was a difficult month to forget for Gilda and Veronica Mura, owners of Cso, a company in Firenze, leader in the field of diagnostics and therapy equipment in the ophthalmology sector. On the one hand - and this is a positive aspect - the European project, which has allowed the company to design and patent a new concept device, was officially closed: an optical coherent tomograph specifically dedicated to the cornea, or to the front segment of the eye. On the other hand - and this is the sad note - just two days before the end of the works, their father, Sergio Mura, who founded the company (together with Giuseppe Matteuzzi) just 50 years ago, passed away; he has always been at the forefront of all new ideas which allowed Cso to grow year after year to reach the present, remarkable dimensions (170 employees, 40 million yearly average turnover). And it is just as a tribute

So, it seems to us a fair tribute to his memory”. Funded under a call of the Horizon 2020 programme, the project that led to the new device - of which Cso was the only beneficiary, although the European contribution allowed the company to engage in important academic collaborations that led to the creation of about fifteen prototypes before the final product - developed on the basis of some features that did not exist on the market: “first of all the combination with the placid disc, a tomograph that allows to obtain very accurate data for the front part of the cornea and to integrate it with the spectrography of the other corneal surfaces. Secondly, the fact that it is a compact device, one only piece, while tomographs currently existing have a detached re-

mote unit for the light source”. If, to these innovative technical features we add the fact that Ms-39 is also particularly attractive from the point of view of the design (merit of the business experience also in this area), it is easy to understand the great appeal that the device has had in the sector since its first presentations, within special conventions staged in recent months. “Today, having the planning accounts ended, Ms-39 is already on the market - concludes Gilda Mura -: we must say with satisfaction that the interest is remarkable, and that the first requests arrived right away. It also appears that some important names in the sector are willing to take it into consideration: in short, the prospects for the new device are rosy, and we trust we will sell at least a few dozen from here to the end of the year...”.



From left Gilda, Veronica and Sergio Mura

to their father that the Mura sisters called the new instrument with his initials, Ms-39. “Our father believed enormously in this project, which is a bit of a celebration of the work that he has led for half a century - explains Gilda Mura -. And we are very happy of the result obtained.



Ophthalmic instrument