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New development proposals

Business Editor Gaetano Ferretti

The threat of climate change is equal to that of nuclear weapons. This has been said by 72 Nobel prize winners. Hence the need to focus on research

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The intervention by the Nobel Prize for Science **COP21 Paris**

he appeal of the 72 Nobel Prize winners at the great World Conference of the Parties, Cop21 in Paris, compared the menace of climatic change to that of nuclear weapons. Will this letter, presented to François Hollande, President of the French Republic, on December 7, promote urgent intervention on the part of the authorities of all the planet, and greater attention to research themes? The declaration of the Nobel Prize winners is a planetary alert. In effect, according to the Norwegian Refugee Council (Nrc), already in 2010, more than 42 million people were forced to move because of natural calamities. These are environmental refugees, who are still without any statute of international protection. Among the 30 countries, most hit by climatic change, the great part are among the poorest. Let us mention Bangladesh, Guinea Bissau, Sierra Leone, Haiti,

Sudan, Nigeria, the Democratic Republic of the Congo, Cambodia, the Philippines, Ethiopia. All the same, some of the bigger economies in the world, with the most rapid growth, should also be equally affected: India, Pakistan, and Vietnam are at extreme risk, and Indonesia, Thailand and China, are classified as high risk. Over 4.5 billion people (approximately 64 % of the world's population) live in these vulnerable countries, and this figure could rise above 5 billion by 2025. To these we must add the archipelagos of the Pacific which risk being definitively submerged. These changes help increase the risks of civil war and inter-ethnic violence generated by poverty and the increase in refugees. All this should push us to quickly change gears on present energy models and carry out, with urgency and responsibility, the decisions which were recently taken in Paris at Cop21 to reduce carbon



mosphere. Certainly, there is agreement with the Nobel Prize winners when they say that "we need more science and new investments for basic research - we solicited an answer from President Hollande, and thanks to Cop21, from the whole planet, on the urgency to act now. To stop being inactive or postpone important decisions until tomorrow. The president answered the appeal, affirming "The importance and the necessity of science -, to bring to life the Paris climate agreement - and the urgency, for all the states of the world community, to invest massively in science and fundamental research". A word now for the facts. The Paris Agreement is the result of Cop21. This global consensus on the reduction of climatic change represents the agreement of the 196 participating states. The goal of the conference was to obtain – for the first time in 20 years of mediation on the part of the United Nations - a binding and universal treaty on climate, that was accepted by all. The Paris Agreement plans for zero greenhouse gas emissions related to human activity for the second half of our century. In the version that was adopted, the parties also pledge to continue their efforts and to limit the increase in temperature to 1. 5°C. According to some scientists, the 1.5° C. goal requires for emissions to already go to zero between 2030 and 2050. The treaty signed in Paris will become legally active only when it has been ratified by at least the 55 countries, who are responsible for at least 55% of global greenhouse gas emission. The parties must sign the agreement at the headquarters of the United Nations in New York between April 22, 2016 and April 21, 2017, thus making it operational in their own judicial systems. A lesson of humility is in order: the earth does not need us humans. We are the ones who need her biodiversity and the ever more limited resources of our blue planet, the only one, of all those which have been discovered up to now, to welcome life. -P.ANTOLINI-

dioxide (CO2) emissions into the at-



Where are Earth's analogs?

The Etaearth project is hunting for planets that could be inhabited

wenty years after the discovery of the first planet that orbits around a star other than the Sun, research and characterisation of extrasolar planetary systems is now one of the fields undergoing major development and with the highest rate of interdisciplinarity in astrophysics. Almost two thousand exoplanets are known to us today and observations with a variety of detection and characterisation methods of these systems (with instrumentation both on Earth and in space) allow astronomers to study in detail many of their physical (mass, radius, internal composition, atmosphere) and statistical properties (orbital architecture, frequencies, analogies between the characteristics of the planets and those with their parent stars). Because of the inherent limitations in the sensitivity of the techniques adopted, in-depth studies of Earth-like planets have remained in the pioneering stages for a long time. The last frontier in the field, however, is shifting continuously, and que-



stions that mankind has been asking for thousands of years are finally about to receive an answer from the scientific method. The Etaearth project "Characterization of Terrestrial Planetary Systems with Kepler, Harps-N, and Gaia" is a transnational collaboration between eight research institutes and universities in different European countries (Italy, United Kingdom, Switzerland) and the US to obtain the first quantitative answer to the fundamental question of modern astronomy, "How common are Earth's analogs in our Galaxy?" With funding of two million Euros by the European Union for a five year period within the scope of the Fp7-Space projects, it is coordinated by doctor A.Sozzetti of the Italian National Institute of Astrophysics - Astrophysics Observatory of Turin. To answer the ageold questions about the uniqueness of Earth as a habitat for the complex biology which we call life, Etaearth will combine the incredible photometric precision of Nasa's Kepler mission, the unrivalled precision of ground-based radial-velocities from the Harps-N spectrograph on the "Telescopio Nazionale Galileo" (Galileo National Telescope) in the Canary Islands, and Esa's Gaia mission highly accurate astrometric measurements to determine the physical properties and frequencies of terrestrial extrasolar planets with unprecedented accuracy. In the first three years of activity, the Etaearth project has produced over fifty scientific papers exploiting the observatory and theoretical skills of the numerous experts in the field of extrasolar planets who are part of the team. The most significant result achieved so far is the discovery of Kepler-78b, a planet with an Earth-like mass and radius and with an internal composition that is identical to our planet's. Kepler-78b orbits too close to its star to be habitable, but the possibility that Etaearth may be able to determine the physical characteristics of Earthlike planets for the first time within habitable range of stars like our Sun is just around the corner.



Darklight: improving these maps and analysing them with new statistical tools

Te live in an expanding universe: galaxies, clusters of hundreds of billions of stars similar to the Milky Way of which our sun is part, they seem as to be stuck on the surface of a balloon that continues to swell inexorably over time. Recently, in 1998, it was discovered that the speed of this expansion is increasing: the universe is accelerating, instead of slowing down as one might have expected. This discovery has defined the current standard cosmological model, based on the theory of Einstein's general relativity. A feature of the model is the dominant presence of forms of matter and energy not detectable in the form of light or other type of radiation, which we call dark matter and energy, necessary to explain the origin of galaxies and this accelerated expansion. One of the key arguments supporting this model is provided by the large-scale distribution of galaxies. The distance of a galaxy is not known in advance, but must be estimated by spectroscopic measurements: by the end of the 70s, increasingly sophisticated tools made it possible to produce maps of the distribution of galaxies of increasing size. Improving these maps and analysing them with new statistical tools are the goals of the "Darklight" project, based at the Brera Observatory of Inaf (National Institute for Astrophysics), in Merate (Lecco). The project is led by Luigi Guzzo, Professor of Cosmology at the University of Milan-Bicocca, and was supported in 2012 by an "Advanced Research Grant" from the European Research Council (Erc). This corresponds to a five-year loan of 1.72 million Euros, which enabled doctor Guzzo to build an excellent group composed of

ten researchers. Currently, thanks to the large telescopes of Eso in Chile, Darklight has enabled the production of a new map (Vipers) in a previously unobserved era(about 6-9 billion vears ago), measuring the distances of nearly 100,000 faint galaxies. The objective is to develop and test new mathematical tools to analyse these maps, extract fundamental cosmological information and understand how galaxies have aggregated to each other. These measures, combined with those of the expansion rate, are making it possible to check whether the equations developed by Einstein on the relationship between matter and gravity continue to function even at very large scales. These methods developed by Darklight will be crucial for future projects from the earth and from space, which were intended to measure distances of tens of millions of galaxies on an even greater scale. The biggest mission is that of "Euclid" by the European Space Agency (Esa), of which Luigi Guzzo is one of the scientific coordinators. "Launched in 2020, it will map the distribution of about 50 million galaxies together

with the effect of dark matter", says Luigi Guzzo, "covering a third of the sky up to distances reaching twelve billion light years. It will help to clarify the origin of the dark components that seem to dominate the universe in the current model".

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S SEVENTH FRAMEWORK PROGRAMME FOR RESEARCH, TECHNOLOGICAL DEVELOPMENT AND DEMONSTRATION UNDER GRANT AGREEMENT NO 291521





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The battery is the future



New energy storage systems for powering cars

The engine of the mil-**66** lennium will be beautiful and shiny, fast and silent, it will be a delicate engine", Lucio Dalla (a popular Italian singer-songwriter) sang many years ago. In order for this to happen, there are those working hard behind the scenes: experimenting with ever "cleaner "solutions, which in a few years - maybe some decades - will replace the current combustion systems, responsible for a fair share of urban air pollution. At Disat (Department of Applied Science and Technology) of the Polytechnic of Torino, there is a small but very active pool of electrochemical technicians, who for years have participated in European projects in the field of energy storage systems: in other words, of batteries. Although it is true that the market today actually offers a range of electric cars - powered by lithiumion batteries - their performance is rather limited compared to combustion vehicles (electric car does not exceed 150-200 km with one recharge). "We are studying innovative storage systems, using new materials,

to build batteries able to guarantee similar vehicle performance to that of current endothermic engines, but with extraordinary advantages from an environmental point of view". Words of Professor Silvia Bodoardo, creator of these experiments together with Professor Nerino Penazzi, Dr. Carlotta France, and a number of PhD students and research fellows. "In August we wrapped up the European project Stable, which we coordinated and focused on lithium-air batteries: the goals were ambitious but, thanks to the excellent work of the whole team, we managed to even exceed them. In practice, however, it will take years before they come into actual full production". Timings are tighter regarding the second wave of extensive experimentation, on lithium-sulphur batteries. Once again, the Disat pool is involved in a European project, called Alise, which started about a year ago. "A lithiumsulphur battery has more than doubled the storage capacity of a traditional lithium-ion battery - explains Bodoardo -. And among the project partners is an English company that is already producing cells almost ready to be launched on the market. I would like to point out that the new battery is a challenge that Europe can not lose: today 95% of the production of lithium-ion batteries is in Asia, so there is little point trying to compete on that product: therefore we are looking to win the battle of systems which are 'beyond Li-ion' ... ". But these are issues for the manufacturer to deal with. Those who experiment, as the Disat team, do not stop: "we are continuing to work on lithium-ion batteries, but we place great emphasis on the other two studies, focusing the attention on the use of materials that are not negative to Europe or health. Meanwhile, within the projects we are also taking care of the development of nonmaterial: for example, we have created little boxes to hold sulphur Nan particles". In short, this is where research and fine technology come together: complementary and fundamental ingredients for the engine of the millennium.





An innovative approach to the challenges of the European Union's Ict-Psp programme and the objectives of "Geographic Information"

The topic of Open Data has recently become one of the major trends in information technology. The Open Data movement has received a major boost thanks to numerous initiatives in support of open access to data and other resources. Various funding agencies,



such as the EU, promote free access to data as a means not only for the sharing of knowledge and scientific research, but also for the creation of new markets and new business opportunities. Despite the lack of a general agreement and many providers declaring to publish information in accordance with the principles of a kind of "open policy", its effective sharing remains a problem. The Energic Od Project (European NEtwork for Redistributing Geospatial Information to user Communities - Open Data), funded by the EU, addresses these issues through the creation of virtual hubs (VHs), 5 at a national level in France, Germany, Italy, Poland and Spain, which allow access to heterogeneous geospatial information through specific components, Brokers, able to reduce the problems of interoperability between the available data sources. Energic Od is coordinated by the Cnr-Iia (National Research Council of Italy, Institute of Atmospheric Pollution) with Stefano Nativi as project manager.

amiga

Environmental safety of Gmps



Enea has taken part in the drafting of guidelines for Efsa to support genetically modified plants

renetically modified plants (Gmp) are one of the agri-Culture technologies that have rapidly spread throughout areas like America and Asia, but have been greeted with scepticism in Europe. One of the reasons that has limited the dissemination of Gmps is the concern about possible negative impacts on the environment, especially on biodiversity. The Enea Trisaia Research Centre (National Agency for New Technologies, Energy and Sustainable Economic Development) has built up a significant amount of experience in the sector and collaborated in drafting the guidelines of the European Food Safety Authority (Efsa) which outlines the methods to apply in preparing dossiers to request authorisation to trade in Gmps or their products within Europe. The European Amiga project (www.amigaproject.eu), which will draw to a close next May, is the most important European research project, financed exclusively with public funds, and is in charge of the environmental safety of Gmps. It is Enea, in fact, that is responsible for coordinating the twenty-two international scientific institutions. The Amiga consortium carried out experiments both in the laboratory and in the field on maize and potato crops

in thirteen States representing the different agro-climatic conditions of our continent. Professor Salvatore Arpaia, the project coordinator, believes that "the results of the project reinforce the conviction that the risk assessment in Europe can be performed with higher scientific standards".



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Building with **Bio-materials**



BIO4ever supports sustainability in the industry of modern construction

he use of bio-resources as construction material goes back to ancient times, and today one building out of twelve is built of wood. With biological materials new structures are constructed and existing ones are upgraded, while using materials derived from wood big buildings can be built and of several stories. But how do you get past the common

BI@4ever

the performance of bio-materials. With these problems, now take a look at the BIO4ever project run by doctor Anna Sandak, a researcher at the Institute for Showing the Value of Wood and Tree Species at the National Research Council (Cnr-Ivalsa). The action of atmospheric agents cannot be avoided, but it is possible to understand the process and plan for varia-



idea that wood degrades over time? There are innovative processes that transform wood, guaranteeing products of superior quality. Among these, new composites excel, along with protective treatments that are efficient, eco-compatible, well-performing, and which require little maintenance. Unfortunately professionals are not always informed about these innovations, a factor that limits the use of sustainable solutions. At times, even the actual producing companies do not have the scientific evidence of

tions in the esthetic aspect over time. Over the years, even the most beautiful structure in wood can esthetically deteriorate and disappoint the client. In modern society often, the 'end of life' is not related to the loss of performance, but to esthetics. On the other hand, naturally aged surfaces can be very appreciated, and a well-carried out maintenance can significantly prolong the life and the esthetics (affecting however the ecological imprint of the material). The growing sensitivity of clients to environmental questions,

sustainability, recycling, and the reuse of materials makes this project of extreme pertinence. The project, financed by Miur (SIR-RBSI14Y7Y4), is a multi-disciplinary approach dedicated to combating the lack of knowledge in the use of bio-materials in the shells of buildings. The general objective is to guarantee the sustainable development of the construction industry with a low environmental impact, keeping in consideration energy, socio-economic, environmental, and cultural aspects. The project intends to develop original and trust-worthy instruments which demonstrate the advantage of using biomaterial with respect to other construction material. This can transmit to professionals in the sector the necessary confidence to choose, in the most knowledgeable way, bio-materials. More than 20 companies, research institutes, and universities in 15 countries will be partners in BIO4ever to provide avant-garde products and unique knowhow, and more than 100 material have been actually studied in at the headquarters of Cnr-Ivalsa in San Michele all'Adige in the Province of Trento. In addition, at development stage they have a dedicated software which will simulate the performance of bio-materials, the processes of degradation, and the end of the life cycle in various scenarios and which will be an appropriate instrument to demonstrate the advantages of the use of bio-materials versus other traditional resources. This instrument targets architects, engineers, investors, builders, suppliers, and final users. The BIO4ever project team is open to additional collaboration and is seeking exchanges of experiences in the sector.

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The crossroads of experimental design



From stereotomy to anti-seismic criteria in Sicilia and the Mediterranean. The Cosmed project

The Cosmed project (led by professor Marco Rosario Nobile, Department of Architecture, University of Palermo) is investigating construction methods between the Middle Ages and the Modern era in the Mediterranean area, especially in Sicilia. Surveys and material knowledge of the building techniques have been combined with the tools for historical research by studying geometric, constructive and formal models and charting their origins and routes. Over the centuries, Sicilia has experienced an unequalled variety of building phases. The island has served as a centre for the dissemination of innovative solutions, as well as a melting pot for ideas from multiple sources. This exchange is evident in the history of stereotomy and stone construction (domes, cross vaults and complex staircases). Initially, solutions from the Byzantine world and North Africa were influential. A wider experimentation occurred during the Renaissance. In this period new technologies, often related to concerns about earthquakes and involving the use of lighter structures, inspired innovations. The numerous earthquakes that struck the island resulted in a series of experiments in the field of anti-seismic construction. The most challenging aspect of the project is the verification of the flow of ideas and techniques in the Mediterranean which reveals a much less simplistic image of the history and civilisations that were present along its shores.





Catching light and transforming it into energy



If plants can do it, why don't we give it a go! Here is a project that suggests how

MoLecoLab of the Department of Chemistry at the University of Pisa, since 2011, has been working on the "Enlight" project funded by the European Research Council (Erc) for the study of the processes of light-collection in natural photosyn-



thetic organisms. In these organisms, including plants, the 'catching' of the sunlight for subsequent conversion to energy needed to perform vital functions, reaches an almost perfect efficiency. The reasons for this efficiency are not known, however understanding the mechanisms is of fundamental importance to design artificial photosynthetic systems and then, ultimately, allow the production of cheap fuel from solar energy. "Enlight" is specifically aimed at simulating the processes that occur in nature, revealing the molecular mechanisms. The difficulty of these simulations is that these mechanisms are not explainable with the laws of classical physics, which are, those that govern the macroscopic world. The interaction of light is in fact through the molecular pigments that are microscopic systems whose behaviours are driven by different laws, those of quantum mechanics. To explain the mechanisms for collecting light and to suggest ways to control, it is therefore necessary to formulate new models and turn them into efficient calculation codes. That's exactly what researchers of MoLecoLab managed by prof. Benedetta Mennucci have been doing the last few years. Now it is possible to apply the tools developed so far to the simulation of the process exactly as happens in nature with the advantage of being able to show all the steps involved and the mechanisms that regulate them.



Man and metal

A project aimed at reusing zinc waste

ne of the main issues we face today is that of waste, its reclamation or recycling. An environmental emergency which encompasses many fields, even in industrial sectors: for those who work in metallurgy, for example, it is a subject that rears its head on a daily basis. More far-sighted businesses try to deal with it in every possible way, thanks to the support of research stimulated by European projects. Metallurgica Abruzzese

efficiency focused on extremely durable products using recycled materials": the goal of which is the recovery of zinc from scrap and waste processing, for further productive uses. "We use zinc and zinc-aluminium alloy to produce wire rod and other metal rod products" explains Giovanni Cavatorta, president of the company founded by his father and his uncle. Manufacturing produces considerable waste - up to 60% of the scrap is made up of zinc, up to tive coating. "We have identified a path that through a "refining "process could help us find interesting solutions for the reuse of zinc waste within the production process - i.e. the galvanising of wire - but using procedures not currently used, such as extrusion - explains Cavatorta -. Of course we are only in the testing phase, it is not an industrial solution just yet, but the advantage of the projects assisted by the Life Programme is to enable a more far



is one of those: with half a century of experience, 250 employees and a total turnover of around one hundred million (half based on exports), the company from Teramo for some time now has been carefully looking into opportunities offered by the European Union related to the environment. It has been a lead partner for a few months of the project Life14 ENV/IT/000082 entitled "Life M & M Man and Metal a new business model to increase resource now only recoverable with expensive machinery: zinc waste is a real problem, and also as mineral mines are rapidly becoming exhausted across the world, to date the process of recovering the material is very complex. Tackling this issue is the Life project in which the company is part of: the expected end result is the production of products with up to 90% of the zinc recovered from waste, increasing the useful life of the product through better protecreaching research and experimentation. The project has just started, and will last three years: we are optimistic and believe that it will work, without doubt we will reach a partial recovery but the hope is to reach the goal of total reuse. Ultimately, we are looking for increased efficiency and reduced material waste, and if the project were to obtain a positive outcome, there would no doubt be positive effects on the entire industry".



When waste is safe

Broker Angelo Granello's business provides bank guarantees for companies

ore than twenty years have passed since the of 1995, disciplined specifically the sensitive area of waste, with the principal aim being environmental protection. Since then, in order to be in compliance with the new law, any company that transports or intermediates waste has to obtain a special inscription to a register at the Ministry of the Environment, based on the type of waste it deals with. As part of the registration requirements - which is a prerequisite for working in the field - there is also a specific bank guarantee. This need led to the creation of Angelo Granello's business. The broker from Genoa has dedicated the last twenty years to working in the area of securities and sureties for environmental management, becoming one of the experts at a national level: he is now working with thousands of companies throughout Italy, and has customers in every region. "My

job - says Granello - is to verify the possibility to find on the market, at the lowest possible cost, the surety policy that guarantees registration with the Ministry, which allows various companies to be able to carry out their activities". In these twenty years, Granello's business has grown steadily, making it a true benchmark in the sector. "I believe that my ability, which the market recognises in me, is based on being fast, conceptual and always attentive to savings regarding my clients' companies, building loyalty; so much so that from time to time, they can take on different shapes which require me and my business to search for suitable new solutions. That's why my role has become so important". Of course, product knowledge and the experience gradually gained means that Granello's business is going from strength to strength. His day to day work - like that of all insurance brokers - is to find the most appropriate policies and insurance companies to suit each individual customer, in the shortest time possible. "I perform tens of thousands of transactions every year - emphasises the broker from Genoa -. Among my other features, there is also that of creating policies for companies that transport waste abroad, so-called cross-border". But the work of Granello does not stop with guarantee policies. The law provides dozens of permissions - even at a local level - for the management of storage facilities and landfills: another area in which the professional from the Liguria region is very active. Like previous years, even the one that has just begun will be very significant. In fact, all customers with various authorisations due to expire and who have always placed their trust in us, are going to contact us once more. After all, my job is this: every year I start almost from scratch, since each individual policy is born and dies with the authorisation issued to customers".





From tanning to leather: this is the path designed by researchers in Firenze

E codefatting is a project developed by the Faculty of Chemistry of the University of Firenze dedicated to the demonstration of new degreasing formulations for the treatment of animal skins in the preparation for tanning, and then for its transformation into leather. It is only recently that we have been doing so using ethoxylated derivatives of long chain alcohols, vegetable oils and sugars, which have replaced the well-known chlorinated paraffins industry by-product) obtained through a chemical synthesis process compatible with the European legislation Reach (Ec Regulation no. 1907/2006). As a result the processed products guarantee behavioural consistency and effectiveness in the treatment of various types of leathers. It was also possible to demonstrate the microbiological treatment of waste water: both with bacteria and fungus, in a more general application of activated sludge of a sewage treatment plant. The re-

aser formulation was tested on different types of animal skins, demonstrating the generality and versatility of the method. The action on a semi-industrial scale covered the treatment of batches of 5-10 kg sheep and pig skins: the latter particularly suitable for shoemaking, given the softness and malleability of the material. The action on a pre-industrial scale covered the processing of cattle skins (100 kg) and equine skins (75 kg) by following the normal processing procedure and re-



and alkyl phenols as a result of their toxicity. However, the availability of a wide variety of ethoxylated products has determined the presence of a myriad of formulations on the market, increasing the difficulty of their management and the waste treatment. The new formulations created by the researchers include natural extracts, including a derivative of lactose (dairy sults achieved, following cooperation with the Pisa division of Cnr/Iccom, and Newport, a tannery company in Santa Croce sull'Arno, as well as the Spanish company Inescop, allowed the researchers in Firenze to select one of the most effective degreasing agents, in order to extend the demonstration of the project to a semi- and pre-industrial scale. The new degreplacing only the commercial product with the new project formula. The rate of degreasing was evaluated at around 55%, a value that has allowed to set the dose of the new degreasing agent during demonstrations in the tannery. Moreover, the treatment of waste water microorganisms has provided significant outcomes for the biodegradation of these materials.

An institution that shapes innovation

When an interdisciplinary approach makes a difference, ceramics surprise us

he Romagna region is wellknown for being a land steeped in tradition but characterised by a marked ability to "keep up with the times". An example of which is the Institute of Science and Technology for Ceramics at the National Research Council of Italia (Istec-Cnr). Established over 50 years ago in Faenza, the city of ceramics, with a strong vocation to studying and manipulating ceramic as a highly versatile material and the best candidate in many industrial applications. In the last decade the Institute's research activities have focused on innovation of materials and technological processes as a response to gradually increasing industrial, scientific and cultural needs. The advent of nanotechnology has generated substantial progress on many fronts, and has given rise to research projects that only a few years ago would have been considered science fiction, establishing Istec-Cnr as an international leader in the fields of medicine, energy and aerospace. All this has been possible thanks to the integration of multi-disciplinary skills that, starting from a base of "ceramic science", synergistically contributed to design and develop materials of the future with a structural-functional control over multiple length scales from macro to nano level. With this, thanks mainly to European and international funding and close cooperation with businesses, Istec-Cnr is at the forefront in the development of innovative and high technological impact ceramic materials. Among the important innovations include ultra-refractory materials and ones mechanically reinforced

such as fibre-reinforced composites, which exhibit high strength and functionality in extreme industrial environments such as aerospace applications. Furthermore, an innovation with great prospects is the development of new materials through surface treatments. Examples of this are smart surfaces obtained by chemical and structural modifications in the development of notable biological affinity materials for cuttingedge applications in nanomedicine and customised medicine. Worthy of mention in this regard is the recent discovery and development of new smart ceramic nanoparticles, completely absorbable and with magnetic functionality. Nanobots (nano-robots) injected live, represent a new



that enjoy unique properties of selfcleaning, ability to reduce friction, prevent the formation of ice and frost and prevent fouling, thus arousing the interest of companies in the aerospace, shipbuilding, mechanical and construction sectors. Moving on from high-strength materials to materials used in the health sector, Istec is an institution of excellence frontier: they are able to be driven by a external magnetic field and activated when needed, for applications such as drug delivery vehicles, cell taxis or small protein fragments, therefore paving the way for new, more effective therapeutic approaches, with fewer side effects, in order to respond to serious chronic diseases with far reaching social impact.





From Napoli, in the wake of Nobel Prize winner, Rita Levi-Montalcini, the fascinating role of neurotrophins in the development and health of the nervous system

n 1949, Rita Levi-Montalcini and Viktor Hamburger enunciated L their neurotrophin hypothesis, which literally opened a new frontier in modern neurobiology. For the first time it was understood that the survival of neurons during embryonic development depends on special secreted molecules, to be denominated "nerve growth factors". After such a fundamental discovery, two generations of neurobiologists have still not been able to unveil all the secrets. New biological functions of neurotrophins in the brain, in fact, are being constantly discovered, thereby opening up possible therapeutic applications for humans in the near future. Out of Napoli comes a new and "young" research network supported by a Firb 2012 (Miur) project, and under the captaincy of Dr. Salvatore D'Aniello, a researcher at the Anton Dohrn Zoological Station of Naples, which promises to reveal aspects that have not yet been explored in the neurotrophin world. "Since the beginning, we have believed in the potential of our proposal and above all, we have created a multidisciplinary network of research which is able to develop our project from points of view and with skills that are very different from each other" explains D'Aniello. The main goal is to study the interactions between neurotrophins and non-codified Rna, a particular class of regulator genes which represent a higher



of the brain. In this ambition project, flanking the Research Unit of the Dohrn Zoological Station, with decades of experience in the field of the evolution and the development of the nervous systems, are three research groups with their ample and precious baggage of experiences and skills. The team under Dr. Maria Luisa Cigliano, neurophysiologist at the Federico II University of Napoli, is working on the influence of neurotrophins on hypercholesterolemia and the aging of the brain. The team of Prof. Mattia Toni from the La Sapienza University of Roma, who is an expert in behavioral studies, has the task of discovering the role of neurotrophins in modulating physiological and behavioral responses to stress factors. And lastly, the research group under Prof. Luigi Cerulo from the University of Sannio, expert in computational biology, is analyzing and integrating the great quantity of bio-informational products, to create new dedicated databases and supply support for the research of biological information in this study. "The missing piece in the literature in this field is the complete mapping of the molecular cascades in whose diverse factors neurotrophins are involved - continues D'Aniello - and to fill this lack of knowledge, we have focused on the zebra fish as the model organism for the many advantages that it presents, among which is the high conservation of human genes which is a great help to decipher the physiological and pathological mechanisms which control our brain".

level of complexity in the functioning



The Italian forest monitoring



Information for science, politics and society

How much do our forests produce? How do they react to rapid climate changes? And how much does the air pollution affected the services that they offer us in terms of soil protection, air purification, carbon sequestration, biodiversity protection? The monitoring network of forest ecosystems are an essential tool to have this ba-

sic information, not only for technicians and decision makers on the management of the environment, but also for the whole society. Project Life + Smart4action (LIFE13 ENV/IT/000813, www.corpoforestale.it/smart4action), carried out by the Corpo forestale dello Stato and its scientific partners (Unifi, Create, Cnr) and collaborators (Unicam and Terradata Environmetrics), aims to re-

 Passo Lavazè (Daiano - Tn)

the infrastructure and its potential. This year will be held the first meetings of dissemination of the Project targeted to the involvement of the population in some areas close to the monitoring sites: in such occasions we will explain the participatory tools, such as webbased and smartphone applications, useful for reporting environmental emergencies of easier recognition.

structure the system of forest monitoring to make it economically sustainable, without compromising the scientific

validity, and closer to the needs of society. A preliminary

survey has highlighted the high interest from all catego-

ries consulted (administrators, researchers, professionals

and citizens) for data and results, but little knowledge of

The falcon dominates the skies again



A conservation project on the Murgia plateau, Bari

The skies of the falcon. In the lands where stone meets water, the lesser kestrel - once threatened with disappearance - vies for supremacy with the clouds. Gravina in Puglia may soon join the neighbouring Matera and become, with its rocky habitats, a Unesco World Heritage Site. In the meantime, the town is basking in the success of a project that has led this bird of prey to regain its realm, in an area within the Alta Murgia national park, included in the "Nature 2000"network and consisting of sites of Community interest and special protection areas, specifically created for the protection and conservation of habitats and species identified as priorities for



initiative, accompanied by an awareness campaign aimed at citizens, has led not only to the protection of nesting places (often found in an urban setting), but also to spread good practices designed to preserve the species. So much so that now almost every home has a nesting box on its roof. "A major achievement from an environmental and scientific perspective -, says the young mayor of Gravina, Alesio Valente -, which is a unique example in Europe in terms of closeness and coexistence between mankind and nature". The figures leave no doubt: censors show there are currently about 1,000 breeding pairs and more than 3,000 specimens, in the municipality of Gravina alone.

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