OCTOBER 2018

NEWSLETTER 52

Istituto Nazionale di Fisica Nucleare

INTERVIEW

NEWS

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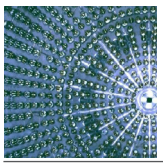

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WHAT NEXT TTA. THE INSTITUTION I'M WISHING FOR.

Interview with Roberto Gomezel, national representative of Technological, Technical and Administrative staff

On 11 and 12 October, "What Next TTA" L'Ente che vorrei" (The Institution I'm wishing for) took place in Bologna. This was the final event of an effort which lasted for several months, involving over a hundred people in INFN, to identify and select operational proposals to improve scientific research support services. We talked about this experience, which was in many ways innovative and interesting also for its radically bottom-up approach, with Roberto Gomezel, national representative of INFN Technological, Technical and Administrative staff.

What is What Next TTA?

It is a project that stems from the Staff General Meeting, consisting of representatives of the Technological, Technical and Administrative staff of INFN facilities, which led to the establishment of a working group to study the possibility of improving technical and administrative work through the sharing of good practices, the optimisation of those already existing, the recovery and sharing of unused skills and the standardisation of procedures. In short, the project aims to investigate the possibilities of "networking" to improve the efficiency and quality of work, and the well-being of those who carry it out, and to allow ever greater excellence in scientific research and the activities in which INFN is engaged.

How is the project organised?

Working groups were created within the Staff General Meeting to allow the national representative, who sits on the Management Board of the Institution, to contribute to draft the regulations and provisions, as well as to bring out new proposals to improve the work of the staff and their development. Following the What Next initiative, which involved INFN researchers and management in exploring new lines of research in physics for the coming years, we came up with the idea organising an internal workshop to reflect together on new projects that could improve organisational processes, so as to be able to

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accompany and support the new technological and research challenges even more effectively. The project was presented during the directors' meeting that preceded the Management Board meeting of 26 October 2017. The initiative was very much appreciated by the directors of INFN facilities and the President considered that the proposal contained important food for thought and ought to be certainly accepted and implemented.

Who is involved in What Next TTA?

The project was first presented to all colleagues of INFN facilities through their representatives. Following the authorisation of the Management Board, the work plan was presented, which should have involved all the staff concerned, organising a videoconference kick-off meeting, to which all INFN facilities were connected. In this first meeting a phase named "call for ideas" was launched, during which all those who thought they could contribute to the project, not only bringing an innovative idea or a good practice to share, but also reporting system inefficiencies and solutions to solve them, were invited to submit proposals using a web platform made available for the project. A total of 130 people took part and brought their contribution to the project.

On which topics did you work?

Many topics were addressed covering all areas of services and activities supporting scientific research. This highlighted the need to divide them into general areas of interest which were administrative, management and scientific secretariats, external funds, relations between Central Administration and facilities and new ideas for Central Administration. In addition, the areas of organisation, well-being and human resources, worker safety and radiation protection, electronics, IT, mechanics, cryogenics, accelerators, technology transfer, outreach, training, quality, evaluation and transparency and "everything I would like to add"! A total of 64 abstracts were presented, subsequently summarised in the 21 projects presented at the final workshop that was just held in Bologna during the two days before the INFN 2019-2021 Three-year Plan meeting.

How did you work in these months?

In order to achieve this result, we immediately identified the coordinators of the various areas, who had the task of developing a work schedule and planning video-conference meetings, necessary for discussion on the various topics. Indeed, the people involved came from all INFN facilities, and the use of video-conferencing and INFN systems for document management meant that all the activities took place without people having to travel and move around. A total of 100 video-conferences were

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organised, managed by 15 coordinators. Moreover, at the beginning of each month, video-conferences were planned to guarantee verification of the timing, compliance with the plan and support for the coordinators. In addition to this, the coordinating group also had to take care of the final organisation of the workshop in all its aspects.
A very positive aspect, which I am pleased to highlight because I think it is equally important, is that all the work is the result of a collective effort, made possible by the enthusiasm of the people who took part. Each person, as in an orchestra, played his score to contribute to the final result that was presented at the What Next TTA event. I believe that each of us felt very motivated and expressed the sense of belonging and sharing of the INFN mission, which is scientific research of excellence. What emerged the most was the desire to share experiences and proposals, overcoming the distrust that can sometimes develop often without even realising it. We worked as a cohesive team, despite the difference in points of view and opinions, we created a significant amount of energy that triggered a process of change not only for the project, but also for the individual participants.

What are the results that were presented during the two-day workshop?
The president and the executive committee supported the idea for the two days to be organised in the same venue of the 2019-2021 Three-Year Plan. This was done to encourage the participation not only of those who contributed to the project and of the staff, but above all of the managers of the Central Administration, of the directors and the INFN management. It was decided to dedicate the entire day before the Three-Year Plan and the morning of 12 October to the event. The first day was divided into three sections, in which the 21 projects were presented according to the TED talk formula. This involved more work for the speakers who were not used to this mode of communication, and who therefore had to learn its style. At the end of each section, public interventions were scheduled, which were then used to define the work carried out in the parallel sessions on the various areas, which were held at the end of the plenary session (the recording of the entire event is available at: *http://server11.infn.it/video/multimedia/Whatnext-2018/Main_Page.html*, ed.). During the morning of the second day, the President and the national researchers' representative spoke on the project and its possible developments, followed by a round table discussion to evaluate how to proceed with the project.

So what are the next steps of What Next TTA?
During the round table it emerged that the project has illuminated certain thematic areas, proposing some improvement actions, both in terms of work organisation as well as overcoming certain critical issues. Moreover, it also emerged that, without an immediate operative proposal to give substance

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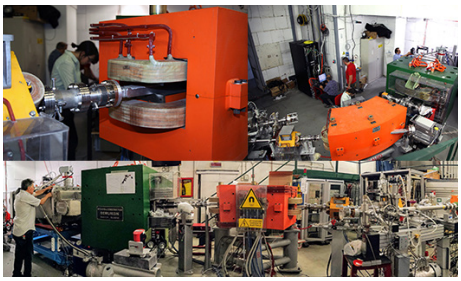
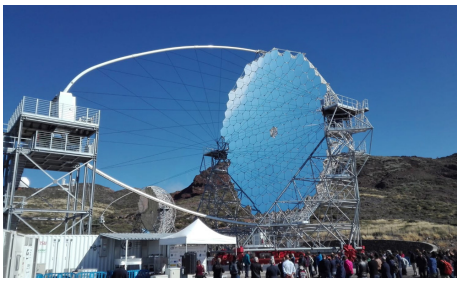
to some of the suggested actions, there would be the serious risk of not reacting to the significant commitment of many people and not following up on a process already started. For this reason, the responsibility of the work group and coordinators becomes even more demanding: the project must enter a new phase that outlines the actions to complete some of the proposals in the various areas. Of course, the path is complex and not without risks, but I think that the brainstorming of these months was able to start a virtuous process that will allow us to consolidate a new vision of services and good practices, and to see people's work appreciated. ■



EXPERIMENTS

DARK MATTER: THE PADME EXPERIMENT STARTED THE DATA TAKING PHASE

On October 4th, the experiment PADME (Positron Annihilation into Dark Matter Experiment) for the search of dark matter entered the data acquisition phase thus concluding the commissioning period. PADME will study the interactions produced by positrons accelerated to the energy of 550 MeV from the linear accelerator (LINAC), of the INFN National Laboratories of Frascati. Its goal is to find an hypothetical particle called the “dark photon”. The experiment is based on a hypothesis advanced by some theoretical models that foresee the existence of a fifth force able to connect the dark matter with our world and that would be added to the four known fundamental forces: gravitational, electromagnetic, strong nuclear and weak nuclear. To this new fifth force, as it happens for the other four, a messenger particle would be associated, in this case a "heavy" photon, having a small mass (as opposed to the ordinary photon which does not possess it). Physicists named it "dark photon". PADME is an international collaboration involving researchers from the MTA Atomki institute in Debrecen, of Hungary, the University of Sofia, of Bulgaria, the Cornell University, the Iowa University and the William and Mary College of the United States. ■



RESEARCH INFRASTRUCTURES

LST-1, THE FIRST CTA TELESCOPE, INAUGURATED

LST-1, the Large-Sized Telescope, prototype of the four LSTs planned on the north site of the CTA, Cherenkov Telescope Array, was inaugurated on 10 October at the Roque de los Muchachos Observatory on the island of La Palma in the Canary Islands. LST-1 is, in fact, the first telescope on a CTA site.

CTA is a global initiative, in which Italy is participating with INFN and INAF (National Institute for Astrophysics), which involves more than 1,400 scientists and engineers from 31 countries in the scientific and technical development of the biggest and most sensitive high-energy gamma-ray observatory in the world, with approximately 120 telescopes divided between two sites: one in the northern hemisphere at the Roque de los Muchachos Observatory, and the other in the southern hemisphere near the existing site of the Southern Observatory of Paranal, in Chile. The newly inaugurated LST-1 telescope has a parabolic reflecting surface of 23 metres in diameter, supported by a tubular structure in carbon fibre reinforced with steel tubes. The 415 sqm reflecting surface collects and focuses the Cherenkov light in the chamber, where photomultiplier tubes convert and amplify it into electrical signals that are processed by dedicated electronics. Although LST-1 is 45 metres high and weighs approximately 100 tonnes, it is able to swivel to any point in the sky in less than 20 seconds, in order to acquire signals as quickly as possible. The LSTs will extend the observational potential to weaker sources and at cosmological distances. Both the repositioning speed and the low energy threshold are fundamental for the study of gamma ray transient sources in our galaxy, and for the study of active galactic nuclei and high redshift gamma rays. Together with other telescopes, they will contribute to new results and possible new discoveries in the field of high energy astrophysics, cosmic ray physics and multi-messenger astronomy, in synergy with the neutrino and gravitational wave observatories. ■

INTERNATIONAL COLLABORATIONS

INFN ACQUIRES AN INTEREST IN THE COMPANY XFEL

On Friday, 5 October, the deed of acquisition of the European XFEL shareholdings (corresponding to 723 shares, each of the value of one euro, equal to 2.89% of the share capital) was signed. With this acquisition Italy, together with INFN and CNR - the Italian National Research Council - formally acquires an interest in the European XFEL company, the future European supermicroscope based on a superconductive linear accelerator: a fourth generation synchrotron radiation source that uses a free electron laser. Italy has participated since the outset in the project and in the foundation of the company, and is the fourth founding country in terms of overall contribution after Germany, Russia and France, thanks to its participation in the construction of the accelerator. An accelerator that will power the X-ray laser and will, therefore, be the key component of the supermicroscope, thanks to which it will be possible to photograph and film, with atomic resolution, biological, chemical and material processes, both condensed and in the form of excited-state plasma. The ceremony of INFN and CNR becoming shareholders of XFEL was also an opportunity for a meeting with the national community active at X-FEL which, with its 30 researchers involved in the project, is the second largest community after the German one. ■

INSTITUTIONS

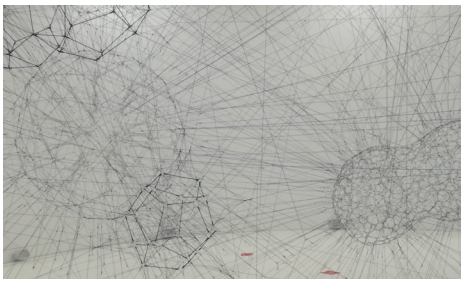
THE INSTITUTE FOR FUNDAMENTAL PHYSICS OF THE UNIVERSE OPENS IN TRIESTE

Recent discoveries, like the accelerated expansion of the Universe, Higgs boson and gravitational waves, associated to high precision observations of the cosmic micro-wave background conducted by the Planck satellite and to the increasingly detailed large-scale mapping of the structure of the Universe, highlighted the need to put together different communities in a renewed dialogue between theory and observations. With this approach, the Institute for Fundamental Physics of the Universe (IFPU) was established on October 2nd in Trieste and it was founded thanks to the agreement of four scientific institutions – INFN , SISSA (Scuola Internazionale Superiore di Studi Avanzati), ICTP (*International Centre for Theoretical Physics*) and INAF (Istituto Nazionale di Astrofisica). Its scientific mission is to explore the fundamental laws of nature from a cosmological and astrophysical perspective with a multidisciplinary study approach, research teams set up ad hoc and innovative research models. The institute will start with the intellectual contribution of the researchers, both theoreticals and experimentals, of the four founding members and positions for post-doctorates and the participation of PhD students and visiting foreign scientists are already envisaged. ■

AWARDS

THE APS DANNIE HEINEMAN PRIZE TO FRANCESCO CALOGERO

The American Physical Society (APS) has awarded the Dannie Heineman Award for Mathematical Physics 2019 to the Italian scientist Francesco Calogero, Professor Emeritus of Theoretical Physics at the Physics Department of Sapienza University of Rome, where he spent his entire scientific career, and researcher associated to INFN. Together with Calogero, the French Michel Gaudin and the American Bill Sutherland were awarded the prize.. The motivation of the award mentions their “profound contributions to the field of exactly solvable models in statistical mechanics and many body physics, in particular the construction of the widely studied Gaudin magnet and the Calogero-Sutherland, Shastry-Sutherland, and Calogero-Moser models”. The Dannie Heineman Prize, which is awarded annually to one or more scientists since 1959, has acquired great prestige over time. Francesco Calogero is the tenth Italian scientist to whom the Heineman Prize is awarded: before him, Tullio Regge (1964), Giancarlo Wick (1967), Sergio Fubini (1968), Bruno Zumino (1988), Gabriele Veneziano (2004), Giorgio Parisi (2005), Sergio Ferrara (2006), Carlo Becchi (2009), Gianni Jona Lasinio (2012). This demonstrates the great prestige of the Italian tradition in the field of theoretical and mathematical physics. ■



OUTREACH

A MULTIMESSENGER ROOM AT PALAIS DE TOKYO IN PARIS

On Air is the personal exhibition of Tomás Saraceno, the Argentinian artist among the protagonists of the Gravity exhibition, curated by MAXXI, INFN and ASI - Italian Space Agency - and proposed until 6 May last in the MAXXI exhibition area in Rome, with great public acclaim; the exhibition was inaugurated on 15 October and will be open to the public until 6 January 2019, at the Palais de Tokyo of Paris.
With On Air, Saraceno transforms the 13,000 sqm of the prestigious exhibition venue into a unique sensory experience, proposing a selection of his main works, together with ambitious new productions, such as the Multimessenger Room installation, created in collaboration with INFN and CNRS (Centre National de la Recherche Scientifique). Multimessenger Room is an installation that narrates the new frontier of multi-media astronomy, whose birth was announced a year ago with the first joint observation of gravitational waves and electromagnetic radiation emitted in the process of fusion of two neutron stars. The installation connects the Palais de Tokyo with some of the main gravitational wave and astroparticle observatories on the planet: Virgo, KM3NeT and Antares, IceCube, Auger and AMS. During the three months of the exhibition, the data collected from all these experiments will arrive in real time also at the Palais de Tokyo, creating an extraordinary and unique listening spot of the universe, where the experimental data, transformed into sounds and vibrations, will link visitors to the messengers coming from remote cosmic events. ■

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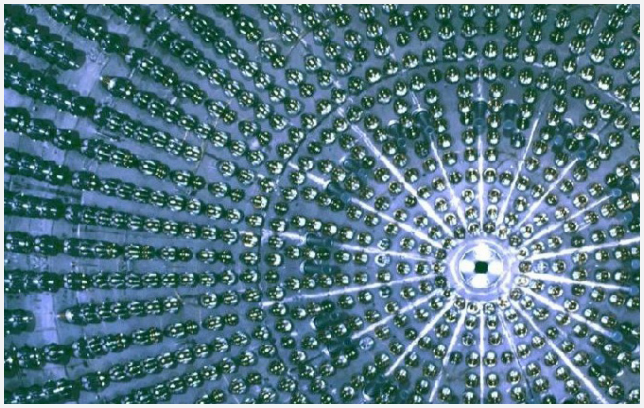

BOREXINO: OVER 10 YEARS OF SCIENTIFIC SUCCESSES

After more than ten years from the beginning of its scientific activity focused on the internal structure of the Sun, which gave an understanding of the power mechanism of our star with unprecedented detail, the Borexino experiment at the INFN Gran Sasso National Laboratories, on October 25th, published on Nature the compendium of its results on solar neutrinos. With this publication, Borexino crowns a long history of measurements and experimental investigations, which led the experiment, on the one hand, to investigate in detail the mechanism of energy production in the Sun and, on the other, to study in the region of low energy (from a few MeV down to less than 1 MeV) the so-called neutrinos oscillation phenomenon, i.e. the transformation of neutrinos from one type (flavor) into another.

Borexino is a large liquid scintillator detector, featuring about 1,300 tons of scintillator, 2,400 tons of water and 2,200 photomultipliers. The success of Borexino comes as a result of a 15 year long R&D study carried out by the collaboration to develop the best techniques of scintillator purification, allowing to reach and exceed the required levels of radiopurity. Immersed in the cosmic silence of the underground Gran Sasso Laboratories, from the moment of the data taking start-up, in May 2007, Borexino has been so radiopure that it conquered straightaway a unique and unmatched position within the many existing low background experiments. This peculiarity is the basis of the multiple results accumulated in more than a decade of operation, which go far beyond the initially set objectives, when the experiment was devised. In fact, designed to measure only the flow of neutrinos from ^{7}Be (beryllium 7) among those produced along the proton-proton chain (pp chain, i.e. the sequence of nuclear reactions in the solar nucleus initiated by the fusion of two protons), Borexino has gradually widened its experimental sensitivity, to cover the entire range of neutrinos from the whole sequence.

The unique characteristics of the measures carried out by Borexino, namely the real-time and low-threshold

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spectroscopic detection of the neutrino flux from the Sun, are all reported in the publication of Nature, with in addition a novelty: in this last result, the different neutrino components were measured simultaneously, and not separately as it happened for the previous analyses, and with considerably greater precisions. The precise and concurrent measurement in a single experiment of the neutrinos fluxes pp (^{7}Be, pep and ^{8}B - boron 8), as well as the limit on the minuscule flow of higher energy neutrinos (hep), altogether coming from the pp chain, allows Borexino to depict with absolute clarity on the experimental side the framework of the operation of our star, putting a definitive end to the secular question about the mechanism that makes it shine for the billions of years of its life.

At the same time, through the comparison of these experimental data of very high quality and accuracy with the forecasts of the Standard Solar Model, Borexino demonstrates incontrovertibly the existence in the low energy region of the oscillation between neutrinos of different flavor by the MSW (Mikheyev-Smirnov-Wolfenstein) effect. In particular, Borexino emphasizes in a completely autonomous way, using only its own data and without having to resort to results of other experiments, the peculiar transition between the two regimes of "vacuum" and "matter", that represents the signature of the MSW effect.

Borexino, stemmed from the intense cooperation among Italy, Germany, France, Poland, the United States and Russia, has been built exploiting cutting-edge techniques internationally recognized of absolute and unmatched excellence, especially in the field of materials radiopurity and low background. ■

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Cover

LST-1, the first Large-Sized Telescope in the north site of the Cherenkov Telescope Array (CTA)