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INTERVIEW

EUROPEAN RESEARCH "OPENS UP" ITS RESULTS

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EUROPEAN RESEARCH "OPENS UP" ITS RESULTS

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Last September 4, 11 European institutions, including INFN, with the support of the European Commission and the European Research Council (ERC), launched cOAlition S, a project for the promotion of Open Access (OA), which envisages that, starting from 1 January 2020, scientific articles must be published on open access journals or platforms, when reporting results of research publicly funded by national and European research councils and agencies. We spoke about the initiative, which has had significant international exposure, with Laura Patrizi, INFN delegate in the OA working group of Science Europe, the association founded in 2011 by European research or research funding bodies to share experiences and practices, to develop and implement collective strategies, and which has been working since 2013 in promoting Open Access.

What does Open Access mean?

Open Access is the unrestricted, digital, free, online access to research results and data, made possible by the advent of the Internet. OA stems from a basic principle: the results of publicly funded research are a common asset, so they must be publicly available. In particular, there are two different forms of Open Access. Gold OA, where the final version of an article is made accessible to everyone free of charge and permanently, immediately after publication. The copyright of the article is kept by the authors and most of the barriers to reproduction are removed. And Green OA: also known as self-archiving, this refers to filing the article in a repository, so as to make it accessible free of charge for everyone. In this case, unlike Gold OA, the copyright of Green OA articles remains with the publisher and there are restrictions on reproduction. There are different terms and conditions on self-archiving depending on the journal or publisher. They affect, for example, the article version

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that can be filed and the time it takes for an article to be available on the archive, after pubblication (embargo period). We can say right away that, even if the goal of cOAlition S is Gold OA, its members recognise open archives and the related infrastructures as strategic research elements.

The history of Open Access is now rather long...

The origin of OA dates back to over 50 years ago with the development, in the community of high energy physicists, of the preprint culture, which responded to the need for a rapid communication of research progress. In 1991, Paul Ginsparg of Cornell University, while working at Los Alamos Laboratories, wrote a simple piece of software to automatically share drafts of works in preparation through a repository. Within a few years, with the World Wide Web, the website became xxx.lanl.gov, subsequently called arXiv.org in 1999. At the outset, ArXiv was exclusively dedicated to high-energy physics, but gradually expanded and is today multidisciplinary. There are now several other dedicated repositories, such as Citeseer for computer sciences, or RePec for economics.

The term Open Access was introduced for the first time in 2002 with *The Budapest Open Access Initiative (BOAI)*, followed the year after by the *Berlin Declaration*, which constitutes a sort of OA manifesto. OA means not only the use of scientific and academic works free of charge, but also the ability to "copy, use, distribute, transmit and publicly display the work, and to create and distribute derivative works, on any digital medium for any responsible purpose, subject to the correct attribution of the author".

In Italy, in 2004, the CRUI (Commission for University Libraries) promoted the adhesion of Italian universities to the Berlin Declaration "with the hope that this gesture constitutes a first and important contribution by Italian universities to a wider and more rapid dissemination of scientific knowledge" (*Messina Declaration*). In 2013, the Presidents of CRUI, CNR, ENEA, INFN, INGV and ISS signed the 'position statement' for the implementation of cooperative initiatives for OA and the development of a specific Italian law.

OA is a complex issue: it involves different players, there are many interests at stake...

Yes, the issue is undoubtedly very complex because it involves diverse categories, with very different, even conflicting interests: universities, research bodies and agencies, publishers, scientific societies, university libraries, as well as, obviously, researchers. Advocates of the OA culture, including the European Commission, believe that the free and immediate dissemination of scientific results stimulates new research, reaching those who, for economic reasons, would not have access to it, and innovation in the public and private sector because companies enter more easily in the

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circuit of dissemination of results and the most advanced methods. Ultimately, its advocates believe that Open Access generates an economic boost as well as contributing to the dissemination of knowledge. And then there are also direct economic benefits: according to several studies, OA leads to savings in costs incurred by universities, research bodies, institutions, etc.
Widespread prejudices concern the poor quality of Open Access publications or the loss of copyright by the author or the lack of peer review of articles published in OA journals. An exemplary case of the opposite kind is the Journal of High Energy Physics (JHEP), owned by SISSA, OA published in Italy by Springer. The journal, founded in 1997, has implemented an online peer review procedure, for which SISSA is responsible.

What is the panorama today, worldwide and in Italy?
The transition to OA is slow all over the world: 15 years after the Berlin Declaration, 85% of publications are still in traditional journals. There are many reasons for this lethargy. Certainly the main one is of economic nature: OA questions a well-established model of the publishing industry. The big publishing houses, which control the most prestigious journals, resist this change that involves a loss on the economic level and of supremacy on the publishing market. As in other economic sectors, the Internet has opened up new opportunities and great challenges.
Also in Italy there is an increasing interest, even if slow, towards OA, with an evident prevalence of the 'green way'. To date there are several dozen institutional or departmental repositories, a complete list can be consulted at *ROAR* (Registry of Open Access Repositories). According to a 2015 study on the status of Open Access journals in Italy (I. Fava AIB studies, volume 55 No. 3, September/ December 2015, DOI 10.2426/aibstudi-11291), there were over 300 Italian journals present on *DOAJ* (Directory of Open Access Journals), with a slow but continuous growth trend.
INFN signed the Berlin Declaration in 2009 and the Messina Declaration 2.0 in 2014. In 2015, with CNR, INAF and INGV, it signed a MoU (Memorandum of Understanding) "for collaboration on the issues of open access and interoperability between R&D information systems".
INFN is partner and coordinator for Italy of the Sponsoring Consortium for Open Access Publishing in Particle Physics (*SCOAP3*) an initiative launched by CERN, and promoted in Italy by INFN, with the collaboration of CRUI, of research institutions and universities. The INFN-OA working group was spontaneously founded a few years ago by Roberto Barbera, Stefano Bianco, Marcello Maggi and Dario Menasce, with the aim of creating a centralised repository of open literature, both Gold and Green. A beta version of *Open Access Repository* has existed for a couple of years and has over 15,000 documents. INFN is among the most active research and funding institutions in OA.

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This month, therefore, there has been a strong signal from 11 European institutions in favour of OA, with the support of the European Commission, the ERC and Science Europe.

Plan S, jointly developed by Science Europe and Robert-Jan Smits, the OA representative of the European Commission, was created with the clear objective of accelerating the transition to OA: as from 1 January 2020, all scientific publications deriving from publicly funded research must be on OA journals or platforms. cOAlition-S, together with the European Commission and the ERC, is committed to a coordinated implementation of Plan S and its ten points which envisage, for example, that the authors keep the copyright of their publication without restrictions, that the costs of publication are incurred by the Institutions and not by individual researchers, and non-compliance of the "hybrid" publication model (hybrid open access) with the established principles. "Hybrid" journals are those that envisage the possibility of having an article published with free access against payment of the publication costs (Article Processing Charge, APC), while the rest of the journal remains accessible only by subscription. Plan S wants to dismantle this model that gives rise to the so-called 'double dipping' phenomenon: journals receive payment of an APC for an OA article and a second payment, for the same article, through the subscription to the entire journal by the libraries. Plan S envisages that a ceiling is established for APCs, that a list of accepted journals is drawn up and, if necessary, that new ones are financed. The objective is a general review of the publication model, in favour of an open and economically sustainable model. It should be noted that the transition will not be abrupt. In order to facilitate the transition from subscription access to open access, publication in "hybrid" journals is tolerated in the short term. It is worth mentioning initiatives such as OA2020, complementary to cOAlition S, which aim to increase the supply of quality OA journals by supporting the conversion of existing ones from the subscription model to the Open Access model. Plan S is certainly ambitious and its implementation will be difficult, because, as mentioned, it affects huge economic interests.

What reactions has cOAlition S received?

The initiative has aroused and continues to arouse numerous reactions. In the first few weeks, more than 500 reactions have been counted in the press and on blogs. On Twitter, Plan S was a trending topic the morning it came out and today there are over 200,000 tweets on the initiative. There have been many positive reactions, most of them highlighting the need to take a bold step, stressing the importance of Open Access to science. Researchers have also raised some questions regarding the implementation of the plan. They certainly want to understand what will actually change for them,

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what will be financed and what not.

There have also been very negative reactions, and not surprisingly, from several traditional publishers who criticised the initiative and expressed concerns about the future of the publishing sectors. In relation to this, think of the economic damage that comes from banning hybrid journals: Springer Nature, for example, has over 1,700 hybrid journals and Elsevier controls over 1,850. It should be added that Plan S raises some concerns among OA supporters, due to the negative impact that, at present, it can have on research quality assurance (RQA), both of researchers and of research institutions alike. To date, RQA is based primarily on bibliometric indicators and we all want to publish in prestigious, high impact factor journals. For a new journal, it takes some time before it can assert itself, gain prestige and have a significant impact factor. This process is also hindered by the spam generated by often dubious quality OA publishers, so it is worth remembering here that there are several databases where it is possible to check the quality of OA journals, for example, *QOAM*, *Scirev.sc.* *DOAJ*. The sponsors of Plan S are aware of this risk and, in fact, the implementation of the project involves the review of rewarding methods, so as to correct some of the perverse effects of the incorrect use of indicators such as the impact factor, as well as the pressure to publish in a reduced number of journals. In this sense, cOAlition S adheres to the San Francisco Declaration (DORA), which aims to put an end to the practice of correlating the impact factor with the scientific merits of a researcher.

In the light of all these reactions, the first thing we need to do now is to analyse and respond to them, addressing the critical issues in order to define the best strategy and to complete the objectives of Plan S by 1 January 2020. ■

OUTREACH

HAVE A GOOD EUROPEAN RESEARCHERS NIGHT!

Once again this year, the last Friday of September has arrived and researchers from all over Europe are getting ready to celebrate their Night. Promoted for the first time in 2005 by the European Commission, the "sleepless night" of research that places scientists and science at the centre has become an event awaited by the public, and represents an important opportunity for meeting and exchanging knowledge between researchers and passionate or simply curious citizens. The success of the European Researchers' Night (ERN) is demonstrated both by the fact that over the years the initiative has been able to attract an ever wider audience, and by the fact that at the last selections for dedicated European projects, a participation peak was recorded, with 128 projects submitted, i.e. almost 14% more than the previous call. In this very competitive context, Italy has distinguished itself: out of 55 approved projects, as many as 9 national projects have been financed, which will light up the night of Italian researchers in 116 Municipalities, along with many other local initiatives organised outside the scope of European projects. INFN, the National Institute for Nuclear Physics, is taking part in four of the winning projects (of which three as beneficiary partner): SHARPER, ERN-APULIA, SOCIETY and BRIGHT. The INFN community is thus among the protagonists of the event and for 28 September has organised initiatives throughout the country: open workshops, meetings, conferences, seminars, shows, experiments and interactive games, happy hours, concerts and much more! ■

RESEARCH

PARTICLE PHYSICS: INFN AT WORK TO CONTRIBUTE TO THE NEW EUROPEAN STRATEGY

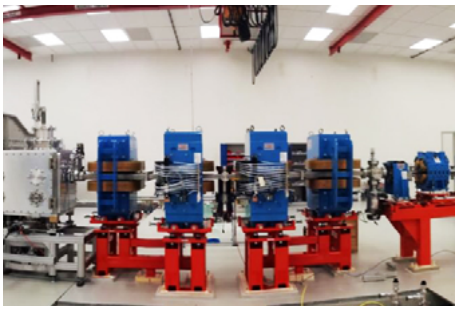
On 6 and 7 September, the event *Particle physics, towards the new European strategy* took place in Rome. It was structured in two days of work that involved the INFN scientific community, called to collaborate in the development of the new European roadmap of fundamental physics research. As well as NuPECC (Nuclear Physics European Collaboration Committee) for nuclear physics and ApPEC (Astroparticle Physics European Consortium) for astroparticle physics, which presented their respective roadmaps for the future of these two research fields in 2017, now the CERN Council has also started the procedure for updating the European particle physics strategy, and has therefore invited the communities involved in this research to propose ideas and contributions by December 2018.

During the two-day event organised by INFN, the possible prospects in the medium and long term were outlined and analysed. In particular, the future of accelerators was discussed, starting from the HiLumi LHC project under construction, considering HighEnergy LHC, up to the possible future types of accelerators based on electrons, hadrons, muons and plasma acceleration. Hadronic physics, electron-hadron physics, physics of flavours and future experiments at the limits of precision and intensity were discussed. Aspects related to the technologies necessary for future frontier research, such as supercomputing, and to future detectors were analysed. Furthermore, there were discussions on neutrino physics, astroparticle physics and cosmology, direct search for dark matter and dark energy and synergies with gravitational wave research, looking in particular at the Einstein Telescope project for the construction of a third-generation interferometer, which Italy is a candidate to host. The next step in this process will be the presentation in December of the documents, including INFN ones, that will open the European discussion, which will lead to the definition of the new strategy by May 2020. ■

SPACE

LISA PATHFINDER: MISSION ACCOMPLISHED

Scientists of the international Lisa Pathfinder collaboration met in Trento to celebrate the success of the Lisa Pathfinder mission and to discuss the scientific results achieved over the past ten years. The event, which took place on 11 and 12 September, was hosted by the MUSE - Museum of Sciences of Trento and it was jointly promoted by the European Space Agency (ESA), the Italian Space Agency (ASI), INFN, the University of Trento and MUSE. The LISA Pathfinder mission of the European Space Agency (ESA), launched in December 2015 and ended in June of last year, has allowed us to open a new path to the exploration of the universe. It tested the concept of gravitational wave detection from space, demonstrating that the movement of two test masses (in gold-platinum alloy) in almost perfect gravitational free fall can be controlled and measured with very high precision. LISA Pathfinder thus paved the way for the construction of the real LISA (Laser Interferometer Space Antenna) space observatory, whose launch in orbit is expected in 2034. This is a new ambitious goal that ESA has foreseen among the three most extensive missions in its development program (Cosmic Vision) for the next twenty years. The final phase of LISA Pathfinder operations will officially terminate at the end of 2018 but the precious scientific data it has produced will be analysed and exploited for a long time. ■



RESEARCH INFRASTRUCTURES

PRAGUE: ELIMED INSTALLATION COMPLETED

The installation of the ELIMED (ELI-Beamlines Medical and multidisciplinary applications) beam line designed and implemented at the INFN Southern National Laboratories as part of the ELIMAIA (ELI Multidisciplinary Applications of Laser-Ion Acceleration) project for the construction of a room for preclinical activities of the new Hadrontherapy centre, which will be implemented in the Czech Republic, has been completed in Prague, in one of the four facilities of the large ELI (Extreme Light Infrastructure) European research infrastructure. Starting from 2019, when it will enter into operation, ELIMED will be the first facility in the world dedicated to the clinical applications of particles produced by a laser source and to multidisciplinary experimentation with laser-accelerated ion and proton beams. In particular, in the medical field, ELIMED will be used for research in the biomedical sector, such as in radiobiology and hadrontherapy to study the possibility of using protons produced by an unconventional laser source, rather than by particle accelerators, as is currently the case, in the treatment of tumours. In the next few years the LNS research group will collaborate with ELI-Beamlines to perform the first irradiations with proton beams produced by laser-matter interaction. The biological damage produced by this type of radiation will be studied and at the same time new dosimetric and beam characterisation systems will be tested. Key sections of the ELIMED beamlines were committed to more than fifteen Italian companies, among which Siatel srl, Fantini sud, VCS, CECOM, Detector srl. ■

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ARIA, FROM THE SEARCH FOR DARK MATTER AT THE GRAN SASSO LABORATORIES TO AN INNOVATIVE HIGH TECHNOLOGY INFRASTRUCTURE IN SARDINIA

It stems from basic research, in particular from fundamental physics, to respond to an experimental need: having large amounts of argon available, currently obtained only from gas wells in Colorado, United States, for the search for dark matter. But in the future it could also be used for the distillation of other isotopes increasingly used in medicine, both in advanced diagnostics and in cancer therapy, and also in environmental and agricultural sciences. The ARIA project was inaugurated today, 21 September, in Sardinia, in the Monte Sinni mine, in Sulcis-Iglesiente, by INFN, the scientific sponsor of the project together with Princeton University, the Autonomous Region of Sardinia and Carbosulcis, an investee company of the Sardinia Region that manages the mining plant. The project consists in the construction of a cryogenic distillation tower for the production of very high purity stable isotopes. The plant will be the first of its kind in Europe, and the first in the world implemented with innovative technology that should allow the achievement of hitherto unprecedented performance. In this phase of the project, INFN has already invested 6 million euros, the Sardinia Region 2.7 million euros and Carbosulcis already contributed for the upgrade of the mining infrastructure with a cost of over 1.5 million euros and has an investment of over 2 million euros in progress for installation of the plant in the Seruci well 1.

The objective of the project is to separate air into its fundamental components, elements which are useful in various areas of research and application. In particular, one of these components, argon-40 (^{40}Ar), will allow the development of an innovative technique for the search for dark matter at the INFN Gran Sasso National Laboratories (LNGS), designed and implemented by the scientific collaboration of the DarkSide experiment. The infrastructure for the production of the argon and other elements will consist of a 350-metre cryogenic distillation tower, which will be installed in well 1 of the Seruci area. The tower will consist of 28 modules tested at CERN, and then transported to the Nuraxi Figus shipyards. Here, the modules will be partially assembled on the surface for the first preparatory tests

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for the installation of the entire column inside Well 1, where the upgrading activities have already been taking place since last year. The height and diameter of the wells, their configuration, with multiple accesses and integrated security systems and, above all, the availability of a truck road from the surface to a depth of 500 metres, are ideal conditions for safe installation of a plant that will have dimensions unequalled anywhere else in the world. Thanks to its advanced infrastructure, built almost entirely inside an existing mining well, ARIA will be able to significantly lower production energy costs, making the precious elements obtained from the distillation of air more accessible and usable.

Cryogenic distillation is the most effective method for producing stable isotopes. The distillation tower, in addition to producing the stable isotope ^{40}Ar of interest for dark matter research programmes, will also serve to carry out pilot studies for the production of isotopes ^{76}Ge, ^{82}Se, and ^{136}Xe, considered of interest for neutrino research programmes, again carried out at the INFN Gran Sasso Laboratories. In addition, ARIA will allow the experimentation and development of the new technology for the subsequent large-scale production of stable isotopes of commercial interest, such as ^{13}C, ^{15}N, and ^{18}O, which are used, for example, in medicine and have a major international market.

The Gran Sasso Laboratories are world leaders in the direct search for dark matter: in fact, various experiments are carried out, based on different technologies, all of which have the objective of detecting the interaction of dark matter particles with the nuclei of the detector's target material. In particular, the DarkSide detector is based on the use of argon as a means of interaction: it consists of a biphasic, liquid and gaseous argon Time Projection Chamber (TPC). The results of a prototype detector in operation at the Laboratories since 2013 have already reached the best sensitivity in the world for the search for low mass dark matter particles. The next detector, DarkSide-20k, has been designed to implement the most ambitious dark matter search and discovery program. It will enter operation in 2022, and will require the use of 50 tons of argon processed by the ARIA plant. Therefore, the ARIA project plays a fundamental role in the strategy of the possible discovery of dark matter through argon detectors. The uniqueness and perspectives of the project have brought together scientists from the four corners of the globe to form a single international collaboration of all the researchers who have so far developed argon detectors for dark matter: we are talking about the Global Argon Dark Matter Collaboration, whose first step is the DarkSide programme at LNGS. DarkSide-20k is an experiment approved and funded by INFN and by the US National Science Foundation. Further important contributions will be provided by ten other countries: Brazil, Canada, China, France, Germany, Great Britain, Mexico, Poland, Spain, Switzerland and Russia. ■

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