

Communication and Outreach

(WG5^(*) of ESG, January 2013)

Active and coordinated communication of results and the societal benefits of particle physics, as well as educational activities to increase common knowledge and interest about its fore-front scientific endeavours continue to be of utmost interest and importance for the field. Future outreach and communication activities must be carefully planned and vigorously pursued, taking into account increased public awareness, the growing importance of new social media and advanced globalisation in this field of science. These activities should build on the existing and successful structures and networks of EPPCN (European Particle Physics Communication Network) and IPPOG (International Particle Physics Outreach Group). Both these networks should increase coordinated cooperation and should regularly and commonly report to Council, as well as to ECFA and ICFA. IPPOG is in need of sustainable funding. Personal engagement of scientists in outreach and communication must be recognised with equal importance as scientific research as such.

Communication

Communication of particle physics has come a long way since the original European Strategy process recommended the establishment of a European Particle Physics Communication Network (EPPCN) in 2006. Coordinated by CERN and reporting to the European Strategy Session of Council, this network has proven to be indispensable in communicating particle physics effectively in the CERN Member States. EPPCN members are typically communication officers in Research Councils and Ministries who know and understand their country's key stakeholders and science commentators. Among EPPCN's main achievements has been the coordinated communication of all the major steps in the life of the LHC, from the start-up to the discovery announcement of 4 July 2012. EPPCN is also preparing the communication activities that will accompany the presentation of the updated European Strategy for Particle Physics in Brussels in May 2013. EPPCN works closely with the International Particle Physics Outreach Group (IPPOG), which consists of physicists actively engaged in education and outreach, and the InterActions network of communications officers from major labs and agencies around the world.

Another important development since 2006 is that communication has become better integrated into the fabric of particle physics. A key example is the ICHEP conference in 2012, which included a full media and public

engagement programme as well as a parallel stream on education and outreach. This was a first for an international particle physics conference, and was put in place via EPPCN and IPPOG members working closely with the conference organizers in Melbourne.

In 2006 as now, effective communication begins with the identification of target audiences and the desired effect on those audiences. It continues through the identification and development of key messages, and the choice of a delivery mechanism, and it ends with evaluation. Good science communication is factually accurate but adapted to the knowledge and interest of the target audience. In Europe, culture and language play an important role. Communication should be delivered in the language of the receiver wherever possible. EPPCN has helped in this respect. Key messaging remains the same as in 2006, but market research has shown that the particle physics community needs to do more to convey the societal benefits of particle physics research.

Other important changes since 2006 are that social media channels now play a much more important role, and particle physics has become a much more visible field than in the past. In other words, CERN has become a major global brand, and reputation management with key stakeholders has become a bigger task than it was in 2006.

With these factors in mind, we recommend the following:

- 1) A mechanism to deliver targeted information on a regular basis from CERN to key stakeholders in individual countries should be developed. This already exists for the UK and the USA, both of which base communication personnel permanently at CERN.
- 2) Each of the three international networks communicating particle physics has good reason to exist in its current form, and the three interact constructively together. This situation should be monitored.
- 3) The global nature of particle physics is evolving, and the communication of particle physics should evolve accordingly. Since 2006, EPPOG has become IPPOG, involving countries beyond Europe. EPPCN currently reports to the European Strategy Session of Council. It might make more sense for it to report to the full Council and thereby become more international. Also, reporting to ICFA should be taken into consideration for both groups.
- 4) Further steps should be taken to integrate communication into the fabric of particle physics by, for example, providing training and formal recognition for physicists who devote time to communication, education and outreach, and by systematically embedding these activities into Laboratory programmes across Europe and into major physics conferences.
- 5) The EPPCN network is not complete. Efforts should be made to find network members for all states. Efforts should also be made to formalise the network and ensure recognition for its members. An MoU to be signed between CERN and network members in 2013 goes some way to addressing this question.

- 6) Efforts should be made to reinforce communication of the societal benefits² of particle physics.

Outreach and education

Long-term sustainable efforts of raising cultural awareness, appreciation and understanding of particle physics by the mainly non-scientific broad public audience (outreach) and of educational activities that impart practical science knowledge and skills to students and teachers (formal and informal STEM³ education) complement the communication of topical results in particle physics research, mainly organized by professional science communicators. These fields profit a lot from scientists themselves taking an active role, authentically conveying the fascination of fundamental research and thereby especially reaching out to young people. A large variety of outreach and education effort is already carried out with great success in Europe as well on the national and international level. It ranges from outreach in lectures, site tours, science shows, and exhibitions over informal science education initiatives like classroom visits, national and international masterclasses to formal science education like professional development programmes for teachers and in-service teachers' training by particle physicists.

A key role in the education and outreach effort on international level is played by the International Particle Physics Outreach Group IPPOG, founded already in 1997 under the auspices of ECFA and EPS-HEPP, complemented since 2007 by EPPCN in the field of communication. IPPOG offers a reliable and regular discussion forum and information exchange for science outreach and informal science education world-wide. Among its major accomplishments have been a resource collection of explanatory materials supporting the dissemination of results from particle physics and related fields, and most prominently international masterclasses. IPPOG organises since 2005 with steadily increasing participation the yearly international masterclasses "hands on particle physics", where meanwhile more than 160 institutes from 33 countries take part in offering annually over 8 000 young students measurements with real data from CERN and connecting them, at the end of the day, in an international video conference.

IPPOG has functioned with limited financial support for activities ranging from coordination of the group and its programs, over development of best practice concepts and program evaluation to technical database support. With

² Societal benefits include the wider public applications and benefits, including knowledge exchange, technology transfer, healthcare, inspiration, recruiting for the STEM⁽³⁾ skills pipeline in European countries etc.

³³ Science, Technology, Engineering and Mathematics. We note that particle physics Laboratories and programmes involve advanced technology, engineering, computing, etc and our audiences can engage with these aspects of the work.

a supported and reinforced support structure on national and international levels not only the existing efforts can be secured but efforts for important additional measures in outreach and informal science education would be enabled. For example, adding to and using the IPPOG resources database or initiating topical working groups could strengthen the synergies between EPPCN and IPPOG. More IPPOG support to contact museums and science centres could help extend their coverage of particle physics, for example via the sector organisation *ecsite*.

In the field of formal science education, IPPOG could enhance its impact when organizers of various professional development programs for teachers collaborated more closely. IPPOG could support more widely implementing particle physics in European school curricula and serve as an example for similar international efforts. Such a collaboration could define standardized learning objectives for the findings of particle and astroparticle physics together with its implications on the evolution of the universe and its technology spin-offs, e.g., in medical applications. In defining these objectives also gender issues should play a role.

With these factors in mind, we commend the following:

1. The engagement of individual scientists and outreach groups should be supported, facilitated, widened and secured by the following measures, building on existing national and international structures, like IPPOG:
 - a. **Training** on regular level of communication skills and effective instructional practice for outreach and education activities, similarly supported as scientific training, and officially documented by training certificates.
 - b. **Encouragement** and support especially for Ph.D. students and young scientists to take part in education and outreach activities and corresponding training
 - c. Stronger **Recognition** of outreach activities in the career advancement of scientists and official acknowledgement of such activities, e.g. as teaching duty, also for Ph.D. students.
2. Sustainable funding for IPPOG and its activities should be sought from CERN, for which establishing an official link between IPPOG and CERN is a precondition.
3. The collaboration among the CERN teachers program, other particle physics teachers programs, IPPOG and national teachers organizations should be supported. On a national level European countries should then be encouraged and supported to:
 - a. Intensify the student teacher training in university education in modern physics
 - b. Raise the overall quality of science education and to find and promote innovative initiatives in this field

- c. Widen the professional development programs for teachers in particle and astroparticle physics
- d. Take advantage of materials in the resource databases of IPPOG, the CERN teacher's programs and EU-supported projects like "Pathway", "Learning with ATLAS@CERN" or "Discover the Cosmos."

(*) Members of WG5:

Etienne Jean Andre Auge <eauge@admin.in2p3.fr>,

Siggi Bethke <bethke@mpp.mpg.de> (chair),

Jiri Chyla <chyla@fzu.cz>,

Robin Clegg <robin.clegg@stfc.ac.uk>,

Jens-Jorgen Gaardhoeje <gardhoje@nbi.dk>,

James Gillies <James.Gillies@cern.ch>,

Sijbrand de Jong <sijbrand@hef.ru.nl>,

Michael Kobel <kobel@physik.tu-dresden.de>

Rolf Landua <Rolf.Landua@cern.ch>,

Ivan Melo <melo@fyzika.uniza.sk>,

Bodo Richter <bodo.richter@ec.europa.eu>,

Mike Rogers <Mike.Rogers@ec.europa.eu>,

Mehmet Zeyrek <zeyrek@metu.edu.tr>.