

# Communicating particle physics matters

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## Executive Summary

Public and political support for particle physics is essential for sustaining the long-term future of the field - whether this is for attracting young people into STEM careers, gaining support from local communities for building new experiments, or for securing government funding for new and existing experiments. The importance of communicating particle physics has long been recognised by the discipline, with significant effort invested over many years by institutions and individuals to inspire and involve young people and adults. The current European Strategy for Particle Physics emphasises that sharing the excitement of scientific discoveries with the public is part of the duty of researchers, and recommends that communication and outreach in particle physics should receive adequate funding and be recognised as a central component of the scientific activity. This submission stresses the need for the next version of the Strategy to expand on the recommendation<sup>1</sup> from the previous version as follows:

**1) “Outreach and communication in particle physics should receive adequate funding and be recognised as a central component of the scientific activity” across all European countries. Professional communication teams should be in place, to ensure that increasing visibility and enhancing reputation are always included in any communication activity.**

In addition, we make the following recommendations to:

**2) Maintain and support effective networks of professional communications staff to plan and deliver communications activities strategically, effectively and in a coordinated manner, making use of new tools and techniques, and sharing best practice;**

**3) Demonstrate to the widest possible audiences the societal and economic benefits arising from current and historic investment in particle physics using appropriate metrics;**

**4) Play a positive role in promoting equality, diversity and inclusion in particle physics through the coordinated planning and delivery of specific communications campaigns, materials and activities that also target new and underserved audiences across Europe and beyond.**

This document also discusses the current and future challenges that particle physics communicators face; notably the pace of change in social media tools and channels, the speed of dissemination of good news, bad news and rumours, the need to maintain trust and transparency, and the complexities of maintaining media interest until the next big discovery. A significant challenge is the decline in dedicated science journalism within the mainstream media. All of these issues require a network of professional science communicators to work together, sharing best practice to achieve our common goals. **The overall goals of our communication strategy are to ensure the long-term future for particle physics and fundamental research, and to share new discoveries and the process of extending human knowledge with the wider society.**

<sup>1</sup> See <https://cds.cern.ch/record/1567258/files/esc-e-106.pdf>, page 3 n)

# Introduction

Public trust in, and support for, fundamental science are vital for the future of particle physics. Not only is it essential to engage with adults and inspire young people, publicly-funded researchers have an obligation to communicate the value and outcomes of their work to the people who fund them.

This paper focuses on those aspects of communication which are about raising awareness and visibility, and reputation management. Reputation and visibility matter. By delivering consistent, coherent and transparent information about the activities, achievements, goals and people of our field, we help secure funding, attract the best staff and users, grab the attention of media and maintain strong support from the public and other stakeholders. We therefore deliberately apply a very broad definition of “communications” to encompass all aspects of engagement with the discipline’s external stakeholders, the public, and members of the wider research community.

However, science communication is largely about talking to non-experts. The communication of particle physics occurs in many forms including, for example, mass communication through the media and social media, direct engagement through events, or personal contact with decision-makers, funders or industry. Significant effort has been invested over many years, particularly since the last European Strategy for Particle Physics update, by institutions and individuals to raise the profile of particle physics; powerful tools and techniques have been developed for successfully publicising discoveries and milestones to global audiences.

We want to build on our collective successes, including publicising the search for and discovery of the Higgs Boson, and initiating international *Dark Matter Day*. Our efforts to communicate the wonder and excitement of particle physics should not only continue, but be enhanced.

The authors of this paper are the members of **European Particle Physics Communication Network (EPPCN)**. Our network represents a community of highly-experienced experts, dedicated to working in close collaboration with institutes and laboratory management to communicate the concepts and achievements of particle physics, and the value of science, to different audiences.

EPPCN was established as an outcome of the first European Strategy for Particle Physics to strengthen the communication of particle physics in the Member States of CERN. It is a collaboration of communication and press officers in the Member States and at CERN. This paper is endorsed by the **Interactions Collaboration**<sup>2</sup>, a network of professional communicators from particle physics laboratories worldwide, established in 2003 to coordinate international communication of particle physics, and to foster peaceful collaboration across all borders.

In this paper, we make the case for enhanced and sustained investment for communications activities in particle physics.

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<sup>2</sup> <http://www.interactions.org/>

# 1) Recommendations for better communications

The recommendations below reflect the long-term experience of the EPPCN members and the findings of international peer reviews of the communications and outreach functions of large-scale multidisciplinary laboratories around the world<sup>3</sup>. The peer reviews were commissioned by laboratory management and conducted by the Interactions Collaboration from 2009 to 2015.

## 1.1 The continued need for professional particle physics communication

The best performing organisations have a vision and mission that underpin all communications activities, and are subtly embedded in all communications outputs.

Defining and delivering activities for different audiences, and evaluating the outcomes requires professional skills. Science organisations should ensure their communications staff hold recognised communications qualifications or gain professional skills through continuous professional development. Such an approach has proved to be very productive in many organisations, and the Interactions Collaboration reviews found a consistent correlation between the quality and effectiveness of communications outputs and the professionalism of the communications team.

The success of all science communication activities depends on physicists, communicators and educators working in close partnership. In particular, EPPCN works in close collaboration with the *International Particle Physics Outreach Group* (IPPOG)<sup>4</sup>, among other groups.

Evaluation is essential to ensure that resources are being used to best effect; activities delivering the greatest impact should be prioritised, and those delivering little or no impact should be wound down or ceased. Measuring impact should be an explicit requirement of all communications activities.

At present, the quality of science communication is not consistent across all countries - some have a very well-developed process for communicating particle physics whilst others have little or no coordination of activities and communication is undertaken by scientists themselves rather than professional communicators. Just as in any profession, training and experience matter; best practice, tools and techniques should be shared and replicated.

### **Recommendation 1**

**Outreach and communication in particle physics should receive adequate funding and be recognised as a central component of the scientific activity across all European countries. Professional communication teams should be in place, to ensure that increasing visibility and enhancing reputation are always included in any communication activity.**

<sup>3</sup> A comprehensive document, “Best Practice Advice for Directors, CEOs and Communications Managers” was released on February 2016 by the Interactions Collaboration. <https://www.interactions.org/node/13798>

<sup>4</sup> <http://ippog.org/>

## 1.2 Strengthen and support particle physics communication networks

Reflecting the approach of research groups, particle physics communicators across the world have established international networks to plan and coordinate multinational campaigns, share best practice and provide professional advice and support to colleagues in the research community. Nevertheless, not all countries have appointed a representative to participate in the networks, and not all the representatives are professional science communicators.

It is important to try new initiatives locally, nationally and internationally that make use of new communication tools. For example, a number of institutes participated in *Dark Matter Day*<sup>5</sup> offering local events as well as opportunities for global audiences to interact with researchers via Facebook Live.

R&D milestones and experimental results provide opportunities to highlight the specific contributions of individuals and national groups. Acknowledging the work of national and local groups - especially in our “mega” collaborations - demonstrates the return on investment for political stakeholders and taxpayers. Showcasing the work of a dynamic and active research group helps attract students and scientists to the institutes mentioned.

EPPCN and the Interactions Collaboration have agreed protocols for issuing press releases that allow each institute and country involved to translate and adapt press releases by adding a national or local perspective, while sharing the same elements of language and timing. These protocols worked very effectively for announcing the discovery of the Higgs boson and, more recently, for the kick-off of the High-Luminosity LHC project.

The networks also provide communications support at international particle physics conferences, coordinating press announcements and briefings.

### **Recommendation 2**

**Maintain and support effective networks of professional communications staff to plan and deliver communications activities strategically, effectively and in a coordinated manner, making use of new tools and techniques, and sharing best practice.**

## 1.3 Demonstrate impact

Governments can change many times during the lifetime of a particle physics experiment and they tend to focus on the short-term economic benefits of applied science that can be achieved during the government’s term of office. However, the economic impact of fundamental research may not be evident for many years; for example, the applications of JJ Thomson’s discovery of the electron in 1897 were not immediately obvious but they continue to underpin many of today’s technology developments.

Our responsibility is to maximise long-term support for particle physics and make the connection between fundamental and applied science; applied science does not happen without fundamental

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<sup>5</sup> <https://www.darkmatterday.com/>

research. The economic, social and environmental impacts of basic research must be fully considered in the development of any science communication strategy. These include the creation of knowledge, the training of scientists and engineers, as well as technology developments.

We can also promote the benefits of science diplomacy; highlighting how particle physics works across borders and creates peaceful collaborations. Newcomers to the particle physics field learn the values of tolerance, mutual respect and the ways in which different cultures approach scientific and technical challenges, often overturning years of cultural and education prejudice. It is by working together that difficulties are overcome and problems are solved, and is an inspiration for future generations and wider society.

### **Recommendation 3**

**Demonstrate to the widest possible audiences the societal and economic benefits arising from current and historic investment in particle physics using appropriate metrics.**

## 1.4 Reach new audiences and challenge stereotypes

Part of the role of a strong, influential and well-structured particle physics communication network is to ensure the sustainability of the field by attracting the next generation of scientists.

But you can't be what you don't see. Research<sup>6</sup> shows that representation and recognition play a huge role in inspiring young people's life and career choices. Although significant effort has already been made through blogs<sup>7</sup>, social media<sup>8</sup>, videos and publications, there is still a significant lack of diversity in the field, and misperceptions of what a physicist looks like<sup>9</sup> persist.

Our communication should use gender-inclusive language<sup>10</sup> and challenge misperceptions about the gender and diversity of who does physics. We can do this through the choice of diverse and visually different media spokespersons, keynote speakers at conferences, and speakers at public events. Furthermore, we should actively support targets set by conferences to ensure greater gender diversity amongst keynote speakers, discussion panels and session chairs. Some European countries are already making significant efforts to improve the gender balance in science, and especially in particle physics. This effort should be extended to other nations and developed to embrace other aspects of diversity.

Another particular area for detailed consideration is the development of activities targeting new audiences across Europe and beyond, especially in regions where there are still too few particle physicists. These audiences include people with low science capital (low level of knowledge of, and engagement with, science) and/or low socio-economic aspirations. It is important to bear in mind that different countries have specific diversity and inclusion issues to address and overcome. Different

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<sup>6</sup> Concerning gender, read for example "Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)", published in 2017 by UNESCO. <http://unesdoc.unesco.org/images/0025/002534/253479e.pdf>

<sup>7</sup> <https://www.quantumdiaries.org/> or <https://www.interactions.org/particle-people> for example

<sup>8</sup> See for example #IworkatCERN <https://twitter.com/search?q=%23Iworkatcern&src=typd> or or #WomenScienceDay <https://twitter.com/hashtag/WomenScienceDay?src=hash> campaigns.

<sup>9</sup> See also the experiment conducted in classrooms in the neighbourhood of CERN with the "Draw me a scientist" programme <http://dessine-moi-un-physicien.web.cern.ch/dessine-moi-un-physicien/>

<sup>10</sup> E.g. using 'humankind' is preferable to 'mankind'. This is already acknowledged in particle physics with experiments having Spokespeople, not Spokesmen/Spokeswomen. This point is particularly relevant in Latin languages with gendered nouns e.g. in French, 'chercheur/ chercheuse' can be replaced by 'scientifique' <https://www.apaonline.org/page/nonsexist>

audiences require different styles of communication - it is essential to speak the language of the audience, and being able to adapt to different audiences is a skill particular to science communicators.

#### **Recommendation 4**

**Play a positive role in promoting equality, diversity and inclusion in particle physics through the coordinated planning and delivery of specific communications campaigns, materials and activities that also target new and underserved audiences across Europe and beyond.**

## 2) New challenges in particle physics communication

Since the last update of the European Strategy for Particle Physics, the number and use of social media channels has increased dramatically. Social media is now a core activity of every communications department - and requires professional skills to manage the different channels, engage with specific audiences and evaluate outcomes.

Particle physics competes for public attention and funding with other science disciplines but its longer delivery times for societal and economic impact make it more difficult to communicate its day-to-day relevance.

Proposals for major international particle physics experiments are infrequent, and when they are proposed, they seem disproportionately expensive when compared to other science disciplines. Furthermore, limited budgets mean that governments have to balance conflicting priorities; science needs to present a compelling case for funding against other government priorities such as defence, health and education.

We have identified the following communication challenges:

### 2.1 Maintain trust in science

Trust in science is often confused with trust in almost everything resembling science. The explosion in social media channels has coincided with a popular backlash against expert opinion, paving the way for a rise in pseudo-science, conspiracy theories and fake news.

#### **a) Be honest and transparent**

Honesty and transparency are at the heart of peer review in science. They are equally important in the effective communication of science – with scientists and users, with local communities, funders and decision makers, the general public and with the media. Our scientific community is well trusted thanks to our transparency. We need to continue in that direction.

#### **b) Keep it simple**

Particle physics is a complex subject to communicate - the particles that experiments detect are invisible to the naked eye, the theories that underpin the science are conceptual, and technical jargon is

widespread. Communication to non-technical audiences should be kept simple and language should resemble everyday speech (keeping in mind that our audiences do not necessarily speak English as their mother tongue), and we should not attempt to “teach” a physics lesson. Good examples of training opportunities for young researchers include Famelab and similar “xx-minute thesis” competitions<sup>11</sup>.

### **c) Help put science in the headlines**

As news headlines are dominated by politics and the economy, and good science journalism is more and more scarce, we should also invest in initiatives that support good science journalism and develop a critical assessment of information.

### **d) Promote science as part of the culture**

Another way to maintain strong support for our field is to seek opportunities to make particle physics a part of popular culture. This might include collaborating with TV series and movie artists or help producing Q&As based on popular books or movies<sup>12</sup>.

### **e) Dare to innovate**

The communications landscape is changing rapidly and we must embrace new social media channels and exploit their features. We must not be afraid to innovate and try new methods of engagement to keep and extend our audience.

## **2.2 Maintain control of a news story**

The widespread use of social media and the speed with which a story can circulate have changed the way in which communications professionals work. Issues management is now a recognised activity that places professional communicators at the heart of the corporate response.

Issues management addresses the management of controversial/bad news, the unauthorised dissemination of discoveries, or the spreading of rumours (true or false) of new discoveries. In our experience, these happen quite often due to the fact that most particle physics collaborations are large and our field is now followed by a large audience. When management attempts to prevent the circulation of information by, for example, deleting publicly available material or invoking social media guidelines, it invariably has the unintended consequence of giving the issue greater publicity<sup>13</sup>.

Overhyping new results can lead to inflated criticism and potentially a loss of credibility for the field. This is why constant monitoring and evaluation are required by management, with the help of professional communicators to manage the issue and determine if and when special crisis management processes need to be invoked.

### **a) Work with professional communicators**

The best communications teams may be able to intervene quickly to help protect the reputation of a group or organisation by providing facts, refuting untruths and helping employees, partners, collaborators and decision makers to gain a common understanding of events. But professional communicators are only able to do this if they are fully briefed on every aspect of the issue including any that do not reflect the organisation positively. A full understanding of the issue enables a

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<sup>11</sup> Famelab <https://www.britishcouncil.org/education/science/public-engagement/famelab> *Three-minute thesis* <https://threeminutethesis.uq.edu.au/>, *Ma thèse en 180 secondes* <https://www.mt180.ch/finale-internationale-2018/>, etc.

<sup>12</sup> See for example the “Science behind *Angels and Demons*” <https://angelsanddemons.web.cern.ch/>

<sup>13</sup> The Streisand effect [https://en.wikipedia.org/wiki/Streisand\\_effect](https://en.wikipedia.org/wiki/Streisand_effect)

professional communicator to anticipate potential outcomes and advise on the likely reputational risk of any actions.

### **b) Invest in social media**

A 2017 study showed<sup>14</sup> that two third of US adults got their news from social media. Social media has radically changed the way we interact with our audiences. Direct two-way communication and greater visibility will increase the audience but require additional effort and resources to meet the expectations of social media followers in terms of regular content updates and responses to questions and comments. Culturally, it means that we also have to be prepared to make science accessible and questionable by everyone. EPPCN members have successfully delivered a number of live, interactive events on Facebook and YouTube.

### **c) Codes of conduct**

From administrative staff to scientists, everyone in our community should be active advocates for our work and field, just like the employees in a commercial company. With social media, it is now even easier for them to share their passion, trust (and distrust) - with no filter - to a wide audience. Our field is considered transparent and this should continue. However, every organisation should have a code of conduct for using social media, and make sure that its staff are aware of that code and how it applies to their personal use of social media.

There are more than 13 000 advocates for particle physics within the research community and CERN has more than 2.5M Twitter followers! We should continue to build relationships and trust with this online community that will help us manage sensitive issues or controversy.

### **d) Be prepared to expect the unexpected**

Scientists who are well-prepared for a media interview and know what to expect from interacting with a journalist tend to be more satisfied with the outcome. Media training is an important way to increase the probability that a conversation with a journalist is reported fairly and accurately in the media; long or detailed explanations will be cut in favour of short, catchy phrases. This is a skill that comes with training, practice and interview preparation with an experienced professional communicator.

## **2.3 Particle physics is a work in progress**

It is part of the mission of science to explain and share knowledge. Particle physics has proved to be inspiring - even reaching popular culture - and we must capitalise on this. There is also a need to emphasise the special character of fundamental research and explain how science works; we need to explain to non-technical audiences how multinational particle physics collaborations function, how results are produced, and how discoveries are categorised.

Recent successes in particle physics and related fields such as the discovery of the Higgs boson or the detection of gravitational waves have put fundamental physics in the media spotlight. However, we may be entering a period of discoveries and developments that have limited media interest or are of importance to fewer people. Whilst we must be careful not to overstate the importance of a result, in our efforts to maintain media interest in particle physics, we must capitalise on every opportunity to present results and developments.

No-one knows what the next discovery will be or when it will happen, so in the meantime we must convey the excitement of the search and explain the scientific method. Particle physics has made great

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<sup>14</sup> <http://www.journalism.org/2017/09/07/news-use-across-social-media-platforms-2017/>

progress over the last 100 years, but every particle physics discovery opens up new areas of scientific exploration. The more we learn about the mysteries of Nature, the more we realise that we do not yet understand. Science is about questioning the world, and we must never stop asking questions.

## Concluding remarks

To secure public understanding and political support for current and future experiments and research programmes that could discover new physics, and for the long-term future of particle physics in particular, and fundamental research in general, effective science communication has never been more important.

Professional science communicators have the skills and expertise to support the scientific community and enable particle physicists to present their research in the most engaging and effective manner to the audiences that matter. Working with individual physicists, collaborations, institutes and laboratories, professional communicators will play a key role in developing coherent and compelling arguments that will help particle physics gain the support and resources that it needs to continue extending human knowledge.

We consider that a working group focusing on education, communication and outreach is an essential element for embedding science communication within the next European Strategy for Particle Physics and elevating particle physics communication to a new level of professionalism.

Many of the issues that we face in particle physics are common to other related fields, most notably astroparticle physics and nuclear physics, and increasingly, the lines between these fields are blurring. These areas of research are often carried out in the same institutes and funded through the same agencies so it may therefore be appropriate to extend existing particle physics communication networks to encompass a broader spectrum of fundamental physics research.