

HistorY and Physics Experience.

The students' contribution in the great debate

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Abstract: The first HYPE–HistorY and Physics Experience–was held in Bologna, Italy, on 25th-27th May 2018, jointly organised by the International Students of History Association (ISHA) and the Italian Association of Physics Students (AISF), National Committee for Italy of the International Association of Physics Students (IAPS). The event gathered 33 international university students from the fields of History and Physics, with the aim of deepen the historical role played by Nuclear Physics, and Physics in general, over the past two hundred years. In this article we review the event, presenting the background in which it has been designed, its structure and implementation, and we give a final remark about the interaction between the students, and the possible future developments.

Keywords: Student Associations: ISHA, AISF, IAPS, Nuclear Physics, History and Teaching of Science.

1. Introduction

The leaders of more than twenty student organizations gather twice a year at the Informal Forum for International Student Organisations (IFISO) to share ideas, best practices and network. On the occasion of the IFISO Fall 2017 edition, the representatives of the International Students of History Association (ISHA) and the International Association of Physics Students (IAPS) expressed their strong will to build a concrete and original collaboration. Although the link between Science and History is deeply-rooted in our society, no real interaction between the two student communities has ever been attempted. This was therefore the goal the first HYPE–HistorY and Physics Experience–was organised with. HYPE took place in Bologna, Italy, on 25th-27th May 2018, jointly organised by ISHA and the Italian Association of Physics Students (AISF), IAPS National Committee for Italy. The event gathered 33 international university students from the fields of History and Physics, with the aim of facilitating the study and analysis of the historical role played by Nuclear Physics, and Physics in general, over the past two hundred years, covering the socio-political, economic and cultural changes that took place in parallel to and as a result of scientific progress in this area.

From the very first studies about atomic structure, Nuclear and Particle Physics have played a particularly prominent role in modern society, conditioning, often in a profound and dramatic way, many aspects of human life. The two nuclear bombs

dropped over Japan at the end of the World War II marked a point of no return in terms of awareness of the potential and responsibility of Science. Today, physicists are assuming key roles in the application of their knowledge to new, peaceful revolutions, for instance by developing the basis for Nuclear Magnetic Resonance and hadron therapy. The time is thus ripe to make History and Physics students debate about the impact of Physics on society, honours and obligations of Science, the two respective methodologies and approaches on this topic. As the research area is shared by historians of Science and physicists working on the History of Physics field, the participants were divided in students of History of Science, students of History and Didactics of Physics, and even pure physicists with a personal interest towards History. What is Science? How to efficiently teach Physics? What are the real responsibilities of Fermi regarding nuclear weapons? When Physics went modern? These are just some of the questions the students argued about, making emerge a plethora of fascinating and intriguing perspectives.

2. Organising Associations

Born in 1990, the International Students of History Association (ISHA) is an international NGO. Its goals are to facilitate communication and provide a platform of exchange for students of History and related sciences on an international level. ISHA believes that international perspectives constitute an important part of every student's education. Membership is open to undergraduate through Ph.D. students from all disciplines and backgrounds with an interest in History and the Historical Sciences. Throughout the academic year, ISHA's various member sections take turns organizing several seminars and an annual conference. These events usually last several days, accommodating up to a hundred student participants from around Europe, and comprise of workshops, discussions and presentations on various topics. In addition, a cultural programme consisting of historic city tours, museum visits and excursions is offered to participants. ISHA's journal, *Carnival*, is published annually and is open to contributions from all students of history and related sciences, not only members of the Association.

Born in 1987, the International Association of Physics Students (IAPS) is an umbrella NGO and not-for-profit that gathers undergraduate through Ph.D. Physics students and societies from all over the world. Today, IAPS counts 16 National Committees and 26 Local Committees for a total of over 60,000 members globally. The aims of IAPS are to introduce its members to an international and peaceful community, encourage them in their academic and professional careers, foster a collaborative attitude, and organise conferences and events run entirely by students for students. IAPS' flagship event is the International Conference of Physics Students that takes place every year in a different country from 1986. The Italian Association of Physics Students (AISF) is the IAPS National Committee for Italy and comprises of more than 1,300 Italian students and 17 Local Committees across the country. AISF was funded in 2014 and today is one of the more active IAPS NCs, and annually organises a wide pro-

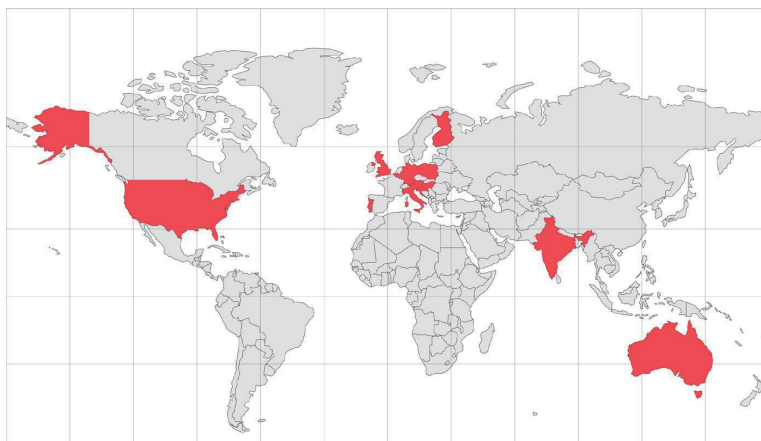


Fig. 1. Map of countries represented at HYPE: Australia 1, Austria 1, Belgium 1, Croatia 1, Finland 1, Germany 7, Hungary 1, India 1, Italy 14, Poland 1, Portugal 1, Slovenia 1, UK 1, USA 1.

gramme of national and international events. It collaborates with the most important and prestigious Italian universities, societies and scientific institutions, such as SIF, SISFA, INFN, INAF, ASI and CNR, among others.

The basic goal of both Associations is to go beyond the standard way History and Physics are presented in a degree course, providing their members with a truly open platform where to share ideas, experiences, and personal and academic growth. It is important to stress again that ISHA, IAPS, and AISF are entirely run by students.

3. HYPE

Before reviewing the event implementation, it is meaningful to have a glimpse of the general framework in which HYPE took place. The event hosted 14 different nationalities as showed in Fig. 1, with a M/F overall ratio of 1.06. The participants were divided in 30.3% Bachelor's degree students, 66.7% Master's degree students, and 3% (1 participant) Ph.D. students. This ensured a rich variety of cultural and academic backgrounds as well as intense and exciting discussions.

HYPE applied a well-rounded cultural approach: beside lectures from celebrated guests, thematic workshops to deepen a specific topic, and a scientific excursion to Villa Griffone, the Italian residence of Guglielmo Marconi, participants had the chance to get to know the strong historical and student identity of Bologna, thanks to a night city-tour focused on the discovery of the local area.

Eminent speakers contributed in the event. Luisa Cifarelli, former President of the European Physical Society, current President of the Italian Physical Society, and Full Professor in Physics at the Bologna University presented the figure of Enrico Fermi and

the scientific heritage of the Panisperna group. Giuliano Pancaldi, Professor in History of Science and Technology at the Bologna University, taking the electricity as a case study presented how pure science can have unintended – and most of the time beneficial – consequences. Luciano Maiani, former CERN Director-General, and former President of the Italian National Institute of Nuclear Physics (INFN) and the National Research Council, known to the scientific community for his contribution to the GIM mechanism and the char quark discovery, gave an overview of Particle Physics from an historical perspective. Antonio Zoccoli, Vice-President of INFN and Full Professor in Physics at the Bologna University, introduced the participants to the emerging but already all-consuming concept of Big Science. Giorgio Dragoni, Professor in History of Physics at the Bologna University, presented the history of nuclear fission with a specific highlight on the role of Ida Tacke Noddack and Lise Meitner. Dragoni's contribution was hosted at Villa Griffone, where the participants had an immersive visit to Marconi's very first laboratory, having the chance to see the exact spot where the wireless communication era began.

The most bracing activity has been with no doubt the workshop session. Participants were split in four different sub-themes: *Old Science*, *Dr. Strangelove*, *Science-History-Education*, *Physics and Modernity*. Each workshop was managed by two leaders, a History and a Physics student respectively. The goal was to provide and integrate the two different points of view and the two different research methodologies in a complementary and informative manner. The workshop leaders introduced the themes with a general presentation. Beside that, two different workshop styles have been implemented. *Old Science* and *Science-History-Education* applied a round-table approach where participants built the discussion without a pre-defined agenda. *Dr. Strangelove* and *Physics and Modernity* included a first section of participants' talks and a following discussion triggered by the different introduced topics.

3.1. Dr. Strangelove

This workshop highlighted the significant role that Nuclear Physics has played in global politics and conflicts since the World War II, from the very first classified studies on nuclear devices, to the 2017 Nobel Peace Prize awarded to the International Campaign to Abolish Nuclear Weapons. After a presentation about the logistics and politics behind the development of nuclear technologies in Europe the 1930s and 40s, a discussion took place about the legacies of Cold War “nuclear culture” across the globe today. Participants have been encouraged to discuss nuclear culture within their own countries of residence, origin, or study, looking to movies, TV shows, public service announcements, comic books, and more to illustrate how the public's relationship with nuclear technologies continues to shape societies across the globe. As participants came face to face with Cold War rationality, we asked: Do we still love the bomb?

3.2. Old Science

Science and the study of physical phenomena have always played a pivotal role in the growth and development of civilisations, leading to discoveries that have significantly altered societies. From observations of natural phenomena, to the development of Astronomy and ancient Mathematics, to the “discoveries” made by pre-modern medical scientists, any method or “science” prevalent before the establishment of contemporary scientific practice have been an object of analysis and discussed in this workshop. A key aspect of the workshop was to look at these topics from a global perspective where possible, critically analysing the various “euro-centric” narratives which continue to surround and complicate our understandings of the History of Science and Physics today.

3.3. Science-History-Education

Scientific outreach and education play a prominent role in shaping popular scientific discourse, having the power to raise citizens’ awareness to the many contemporary social and scientific challenges and topics faced by humanity today. The discussion tackled the two biggest issues facing future teachers today: new technologies and changing political sensibilities. Never before has the world been this interconnected and never before has such a body of information been so accessible. These two factors change how teachers can and must interact with their students and challenge traditional school/teaching settings. At the same time, the rise of #fakenews has made the teacher as an intermediary between students, who are still developing their adult sensibilities, and a progressively polarised global society indispensable. This workshop not only explored future teachers’ responsibility to teach relevant media literacy for their field, but also talked about how to teach students to take charge of their education and make use of what they are taught to shape their future. In doing so, participants discussed how the Sciences as well as the Humanities struggle with the dogma of objectivity, while also needing to defend the pursuit of knowledge to an increasingly belligerent public.

3.4. Physics and Modernity

The workshop aimed to deepen the participants’ understanding of the significant role that scientific inquiry and technological innovation have played in our everyday lives, and provided a platform to analyse the contributions that Physics has made to the development of technologies which have revolutionised how we live and interact with each other today. From the development of the internet, to the breakthroughs which are constantly being made in fields of medical science, participants have been asked to consider how the past can inform the future, and if the teleological narrative of knowledge accumulation within the Sciences should be questioned.

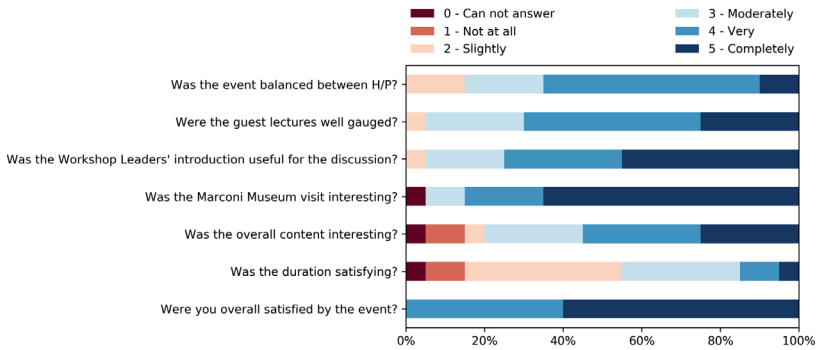


Fig. 2. HYPE satisfaction survey (20 answers).

4. Event analysis

A detailed feedback survey has been distributed to all participants – the most substantial outcome is presented in this section. Fig. 2 shows the satisfaction outcome as a result of 20 answers.

First of all, the event resulted very balanced between History and Physics and the guest lectures resulted well gauged. Being HYPE the first event of its kind – at least within ISHA and IAPS communities – this represents an important achievement. The workshop leaders' introduction resulted highly useful for the start and the progression of the workshops. The 25% found the round-table approach more engaging than the talk-triggered workshop style, that has been preferred by the 75%. It is indeed probable that offering some defined discussion paths could lead to a more effective and in-depth debate.

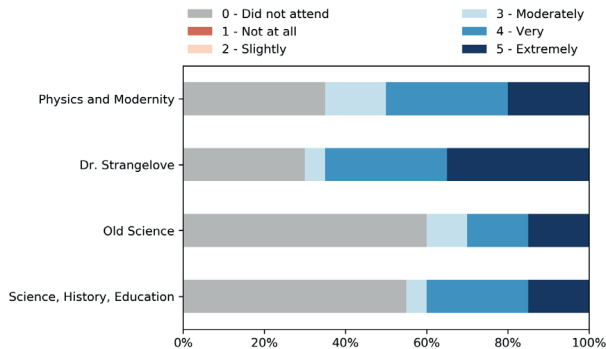


Fig. 3. HYPE workshop survey (20 answers).

The Marconi Museum visit resulted highly interesting. The opinion concerning the academic content was more heterogeneous. The theme of Nuclear Physics and History was chosen especially broad to allow a greater participation, but probably included topics of little interest to some participants. A sharper theme will be considered for the next editions. The duration has been slightly satisfying, in particular more workshop time has been highly recommended. In general, the participants have been highly satisfied by the event. The workshops' appreciation is shown in Fig. 3 – the most attended and liked workshop has been *Dr. Strangelove*. The less attended as well as less appreciated has been *Old Science*, probably because of the difficulty of providing a true scientific contribution by Physics students.

5. Final remarks

HYPE was originally conceived as an academic experiment with the goal of making History and Physics students interact. Nevertheless, it obtained a very positive outcome and stimulated the two communities with interesting and useful sparks. Regarding the approaches to the topic, History students showed a slightly approximate knowledge of Physics, but a much more open attitude to debate. Having a correct and full understanding of the scientific panorama is though an essential requirement to assume the historical point of view. Physics students, on the contrary, showed bit of a dogmatic approach, probably the result of a university teaching still too much information-based and without a real openness to discussion. Regarding the event structure, we understood that the workshop is the most engaging activity, and it is worth to increase the workshop-time. The scientific excursion is also a very appreciated part of HYPE, being a truly multi-cultural and dynamic activity. In general, a more specific theme could guarantee a more detailed development of the debate.

The idea of intentionally organise a conference of History *and* Physics, intended as an organic exchange of knowledge, paid off. The final conclusion of the first edition has been that Physicists and Historians have different but complementary approaches towards the common goal of delving into the historical role of Nuclear Physics, and students can definitely give their contribution. Moreover, we felt an increasing interest from academic institutions towards this kind of initiatives, and we hope that HYPE can pave the way to new events, not only within ISHA and IAPS. The compass is now pointing towards the second edition, scheduled in May 2019 in Rome.