Particle Physics Masterclasses for the International Day of Women and Girls in Science

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ABSTRACT

On the occasion of the UN International Day of Women and Girls in Science (February 11) Masterclass activities were launched by the International Particle Physics Outreach Group to support and promote the access of women and girls to science education and research activities. Universities and research laboratories organised 10 Masterclasses for girls on February 10 and 11, with participation from Barcelona, Cagliari, Cosenza, Heidelberg, Madrid, Paris, Prague, Rio de Janeiro, and Sao Paulo. About 300 girls participated in the events and analysed LHC data while being tutored by female scientists. Three video conferences with CERN were held where the girls could talk to CERN women scientists and learn about the careers of these role models.

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1 Introduction

Gender equality has come a long way and women enjoy the same legal rights as men in many countries today. Yet, there are still far fewer female than male students and researchers, while men and women make up equal parts of our society. To counteract this fact, the United Nations General Assembly declared 11 February as the International Day of Women and Girls in Science (IDWGS). Awareness-raising events are encouraged on this date and this year the International Particle Physics Outreach Group (IPPOG) followed this call by organising a special edition of their International Masterclasses. IPPOG is an international network of scientists, science educators and communication specialists with the goal of conveying particle physics to the general public and to improve science education. The International Masterclasses are a one-day outreach event and established tool to communicate particle physics to high school students. To do justice to the UN’s call, the IDWGS edition of the International Masterclasses \(^1\) was targeted at female pupils only. They were mainly organised and tutored by female scientists in order to provide role models inspiring the participating girls to enter university and to take up a career in science.

2 The International Masterclasses

The IPPOG Masterclasses were developed to convey particle physics to high-school students aged between 15 and 19 years. They are hosted each spring by about 216 different universities and laboratories located in 52 countries across the globe. The local researchers organise the events together with IPPOG and give yearly about 13,000 participants the possibility to be particle physicists for one day. A typical masterclass is composed of an introduction to particle physics, a hands-on part and a video conference with international participants. Yet, the exact planning of the day is up to the organising researchers. Typically, the introduction to particle physics is performed through organising one or two lectures and sometimes also includes lab visits. After lunch the hands-on part takes place, where the pupils analyse real physics data recorded by one of the LHC detectors. The results of the analyses are discussed with the pupils and finally presented to other participants of the Masterclasses programme during the video conference. The latter is hosted either by CERN or one of the North American laboratories, Fermilab or TRIUMF. This conveys the international spirit of particle physics and is usually very popular with the students.

2.1 Brief History

The idea of this one-day outreach event first came up in the year 1996 in a discussion between Ken Long and Roger Barlow \(^2\). One year later the first Masterclasses were held at 7 institutes in the United Kingdom. They were using data from the OPAL and DELPHI experiments at LEP for the analysis during the hands-on part. The programme expanded steadily from there on and in 2005 it was adopted for all of Europe by IPPOG’s predecessor EPPOG. In 2006 the USA joined with their QuarkNet program and since 2011 the International Masterclasses are completely based on the data of the LHC experiments \(^3\). Now, in the spring of 2017, the International Masterclasses were organised for the first time exclusively for girls following the UN’s call for contributions to IDWGS.

2.2 IDWGS Masterclasses

The International Masterclasses have proven to be a powerful tool in sparking interest for research in young people and in encouraging them to pick up a university education. This is in line with what the UN aims at inspiring in girls through its establishment of IDWGS and thus the organisation of a special edition of the International Masterclasses was decided by IPPOG on the occasion of this day in 2017. In order to involve the female students in the best possible way, IPPOG encouraged the organisation of the IDWGS Masterclasses exclusively for girls and, as far as possible, under the supervision of female scientists. Ten institutes from Europe and South America followed this call and offered about 320 pupils the chance to participate. At CERN, 3 video conferences were organised (two on February 10 and one on February 11) and led by female scientists. This way, the girls met several potential role models during the day. The
10 institutes that participated in this first edition of the IDWGS Masterclasses were: Barcelona, Cagliari, Cosenza, Heidelberg, Madrid, Paris, Prague, Rio de Janeiro, and Sao Paulo. All institutes performed the standard programme foreseen for the International Masterclasses and some extended the programme by additional talks or events. This is highlighted in the following, where more details on the events of some of the institutions are given.

**Institut de Fisica d’Altes Energies, Barcelona**

In Barcelona, a 2-day event [5] was organised with the International Masterclasses on February 10 and astroparticle physics masterclasses on February 11. The former included a visit to the local Tier-1 data centre PIC and the latter was performed with the project *Gamma Ray Hunters* [4]. All tutors were women and around 40 girls participated. A group picture of them is shown in Figure 1 along with a poster promoting the event.

**Dipartimento di Fisica, Università della Calabria, Cosenza**

In Cosenza pupils from various parts of the Calabria region participated in their edition of the IDWGS Masterclasses [6]. Figure 2a shows a group picture of the participants and organisers. The day started off with a presentation about the situation of women in science and was then followed by the standard Masterclasses programme with only female supervisors. While the organisers also wanted to involve university students at the beginning of their academic studies to encourage them, they found this hard to accomplish, as the beginning of February is the period in which the exams are taken. After realising this, the organisers requested the acknowledgement of 11 February as a special day of the physics department dedicated to girls, in agreement with the UN resolution. This request was acknowledged by the Council of Physics such that this day will receive special attention also in the upcoming years.

**Kirchhoff-Institut für Physik, Heidelberg**

The Heidelberg edition of the IDWGS Masterclasses [7] was also well received by the participants. The standard Masterclasses programme was complemented by an informal lunch with two female scientists where the girls could ask about university studies and careers in science. A snapshot from the video conference held that day can be seen in Figure 2b.

**Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, Madrid**

In Madrid [8] the standard Masterclasses programme was extended by a discussion session during which
female scientists from the department talked about their careers and research activities. In total 40 pupils participated and were supervised by female researchers.

**Laboratoire Astroparticule et Cosmologie, Paris**
Apart from the standard Masterclasses programme, in Paris two young female researchers (a PhD student and an engineer) introduced themselves to the pupils, talked about their professional path and joined the 24 participants for lunch for informal discussions [9]. Some impressions of the event are given in Figure 3.

**Czech Technical University, Prague**
In Prague, 19 High School and young University students joined for the International Masterclasses on IDWGS. The event attracted quite some media coverage with 2 articles in Czech newspapers [10, 11] and a reporting team of the Czech public television being present all day. They continuously reported about the event online and compiled a several minutes long TV clip shown on the news [12]. Figure 4a shows a snapshot of the report and Figure 4b shows the beginning of one of the newspaper articles.

**Instituto de Fisica, Rio de Janeiro**
In Rio de Janeiro, two IDWGS Masterclasses were organised: one by the physics institute of Universidade
do Estado do Rio de Janeiro and one by the physics institute of Universidade Federal do Rio de Janeiro. Although they were challenged by the political situation in their country, they offered the pupils the opportunity to get to know women scientists and to get in touch with current day research.

3 Conclusions

This pilot project of organising International Masterclasses on IDWGS especially for girls was a big success. The organisers received positive feedback and enjoyed tutoring the girls. During the regular International Masterclasses being held each year, the typical number of participants is around 60. Due to the gender preselection and the recent establishment of the IDWGS Masterclasses, the groups were smaller on average. This was found to be an advantage, as it allowed for more intense discussions with the individual participants. All in all, the IDWGS were so well received that the programme will be continued in the upcoming years. Anyone interested in participating can contact Uta Bilow, the main organiser of this event, via email (uta.bilow@tu-dresden.de).

4 Summary and Outlook

A special edition of the International Masterclasses was organised by IPPOG on occasion of the UN International Day of Women and Girls in Science. They were targeted at female pupils and mostly carried out by women in order to provide role models for the girls. The events were well received and so the efforts will be continued in the upcoming years to inspire even more girls to take up university studies and a career in research.

References

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