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Cascade projects

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Cascade projects

*Efficient and enjoyable way to
inform and engage many
students with Particle Physics*

IPPOG - International Particle Physics Outreach Group

Network of scientists, informal science educators and communication specialists active in outreach in particle physics



1997: started under joint auspices of ECFA and European Physical Society

2011: European → International

Membership includes CERN member states (21)

+ Ireland, Romania, South Africa and the United States

+ five major experiments at CERN's Large Hadron Collider

+ CERN, DESY, Fermilab



1st international meeting in Kosice, Slovakia, 2011

- *Who do we serve?*

*Anyone, especially **educators and students** (from school to university).*

- *What is our aim?*

To raise standards of global outreach and informal science education efforts.

- *Our vision for the future?*

Understanding and enthusiastic support of particle physics from all audiences.

*Two examples: **International Particle Physics Masterclasses**
Cascade projects competition*



Watching 3D ATLAS movie



2012 Innsbruck meeting

Particle Physics Masterclasses:

Started in Great Britain 18 years ago

Expanded by IPPOG to International Masterclasses in 2005



Universities around the world open their gates to welcome high school students who become particle physicists for one day

- *Lectures*
- *Data analysis/computer exercises*
- *International videoconference*



2014: 41 countries, 183 institutes, 10 500 students

Cascade projects - motivation

Particle Physics Masterclasses is an extremely successful event. However, it is only a one day thing. We motivate the students and let them go

I always felt that we should offer something to them that would take them deeper into the realm of particle physics

We tried a few things but nothing seemed to work very well

Then we tried Cascade projects

UK Cascade projects

I was inspired by the U of Birmingham Cascade projects (reported at IPPOG meeting in Prague in April 2008 by Pete Watkins)

UNIVERSITY OF
BIRMINGHAM

New National competition for 2007-8
a Cascade of Particle Physics in schools & colleges

STFC

An exciting Opportunity to....

Enhance your A Level studies

Develop Key Communication Skills

▪ *Make personal links with Research staff at a leading University*

▪ *Win money to help finance a trip to CERN*



CERN accelerator control room

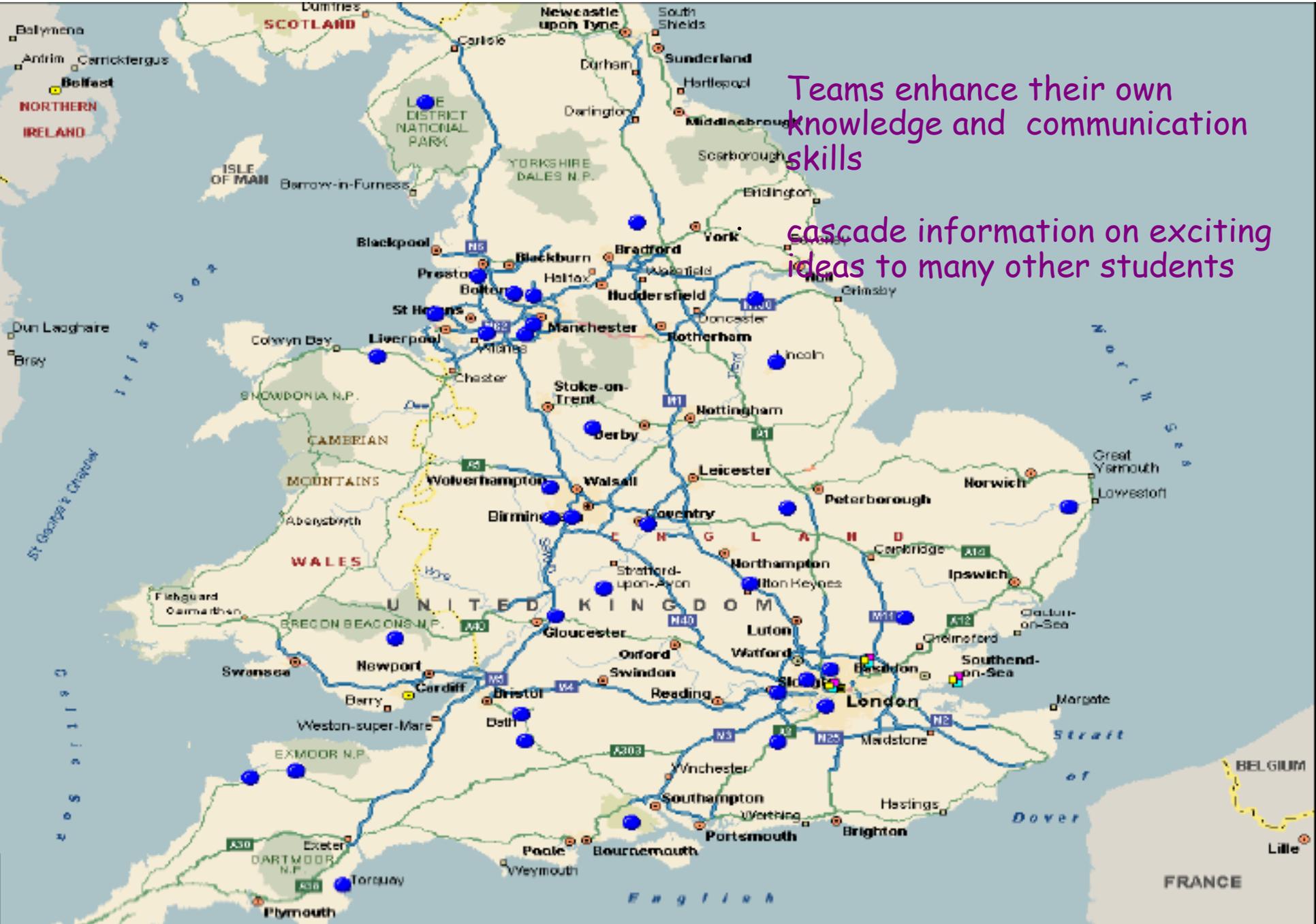
Teams of 2-5 high school students make 20 min presentations in their own schools

Presentations are on topics from particle physics and cosmology

Teams then send videos of their presentations plus .ppt files to organizers

Jury selects best teams and invites them to Grand Final

Best teams in the Final win trip to CERN



Teams enhance their own knowledge and communication skills

cascade information on exciting ideas to many other students

150 students giving group talks to 1500 students in 2008



Cascade Slovakia

Cascade projekty 2011

Do celoslovenského finále postupujú nasledovné štyri tímy (zoraďené podľa abecedy):

- Gymnázium Martin, Termojadrová fúzia
- Gymnázium Tisovec, Štandardný model
- Gymnázium Žilina sv. Františka, Extra dimenzie
- Gymnázium Žilina Varšavská, Tmavá hmota

Na 5.-8. mieste bez udania poradia podľa abecedy skončili (a suveníry dostanú):

- Gymnázium Brezno, Vývoj vesmíru



Ukážka z vystúpenia víťazného tímu Cascade 2010 z Gymnázia Brezno

Ukážka z vystúpenia ďalšieho finálového tímu (Gymnázium Prešov)

EPPOG
Cascade projekty
Pravidlá súťaže
Témy
Prihláška
Cascade 2010
Cascade in UK
Masterclasses



Slovakia: Almost the same as in Birmingham except that we have teams of 2-3 students
Ages: 16-18

We invited students to Cascade during International Masterclasses with this result:

4 teams participated in 2009

15 teams in 2010

15-18 teams in 2011, 2012, 2013

Time to prepare projects: ~ 6 weeks

Teams received help from mentors - volunteers from all HEP community in Slovakia

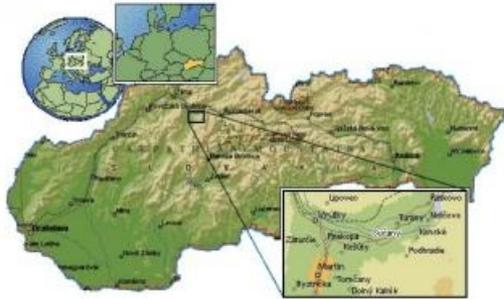
Audience: minimum 25 people was required (typically their class with Physics teacher)

Topics

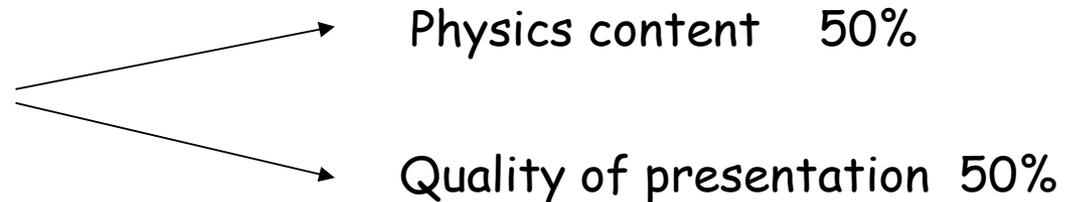
- What are we all made of ? Atoms - Quarks - ?
- Particle Accelerators - How do they work?
- Medical Applications of Particle Accelerators - What are they?
- Recreating the Early Universe at the LHC
- Antimatter
- Dark matter
- Quantum nature of elementary particles
- Neutrinos
- Are there more than 3 spatial dimensions?
- Search for new particles. Higgs boson
- History of the Universe

Students can come up with their own topic which we have to approve

Grand finals 2011 at Sučany high school



Judging criteria



Prizes 2011

1. trip to CERN
2. week at CVUT university in Prague (summer school for HS students)
- 3.- 4. week in Kysak near Kosice, Slovakia (summer school for HS students)

Some facts and experience we gained

We advertize Cascade to ~ 200 students during International Particle Physics Masterclasses (6 Slovak universities participate)

2011: 21 teams registered

16 teams completed their projects and submitted them

Teams were usually mixed (boys & girls)

They had 6 weeks for the projects. Most teams exchanged a few emails with mentors, some did not contact the mentor at all

The quality of presentations was good and some of them very good and funny.

Nevertheless, many teams tried to cover too many things

The lesson we try to teach them is that "less is often more"

We publish best presentations on Cascade pages

and plan to give more time for the projects (3-4 months rather than 6 weeks)

Cascade worked even without Grand Finals (jury chose winners based on videos)!

Cascade projects summary

The format is very successful. Students love to work in teams and present things.

The particle physics community in Slovakia responded very well and volunteered to become mentors

Masterclasses (MC) seem to be a good spring board for Cascade. MC are a 1 day thing, in Cascade we invite curious minds for a deeper adventure

Cascade is relatively easy to organize.

Best Cascade presentations have the qualities we had hoped for. Team members are interested in pursuing scientific career



Rules (short version)

1. Teams consist of 2 or 3 students. Each member has to contribute in a significant way
2. The team registers by filling in the registration form. Chosen topic must be indicated
3. Recommended topics can be found at <http://fyzika.uniza.sk/cascade/>
4. You can choose your own topic but we have to approve it
5. After receiving your registration, we will assign a mentor to your team. Mentor is not your supervisor but rather a good friend on e-mail. Do not be afraid to ask him/her questions
6. Your presentation should be 20+-2 min long
7. Talk only about things which you understand (of course, many things you will understand only to a certain level - in that case do not go beyond that level in your presentation)
8. Presentation must include a .ppt (or .pdf or .odp) element
9. We expect your audience to be at least 25 students 14-19 years old
10. After the presentation at your school send us DVD with
 - video of your presentation in mp4 format
 - .ppt (or .pdf or .odp) file
 - original registration form
 - file with details about audience
11. Send the DVD by date
12. Your presentations will be judged by the jury according to these criteria:
 - scientific content 50%
 - quality of presentation (correct explanation, audible/entertaining, capturing audience interest, good .ppt , ...) 50%
13. Best 4 teams will be invited to Grand Finals where they will repeat presentations in front of jury and invited high school audience
14. Videos of your presentations can be published on Cascade web pages