1997 – 2005 2006 – 2010 2011 - 2022

IPPOG 25: Adolescence

Michael Kobel, TU Dresden

CERN, 29.10.2022

INTERNATIONAL MASTERCLASSES
hands on particle physics

My term of office: 1999-2021

- November 1999
  - Teachers already in the focus

FRIDAY, 5 NOVEMBER

09:00 → 12:15 **Links with Education**

09:00 **Introduction**
Speaker: Close, F.

09:10 **Report from Teachers Summer Programme**
a. Outreach delegates nominated teachers
b. Report of what was achieved
c. Web Pages (teachers.cern.ch)
d. Future
Speaker: Mangano, M.

09:30 **Education and Teachers**
a. Austrian teachers weekend;
b. Physics on Stage - major pan European initiative involving CERN ESA and ESO.
Speaker: Close, F.

11:00 coffee

11:20 **Germany and Teachers**
Speaker: Kobel, M.

11:40 **NuPECC PANS**
Speaker: Pascolini A.

Outreach Meeting of 02-03 June 2000 / Palais de la Découver

List of Participants:

J Boucrot	Switzerland
G Edelheit	France
Y Sacquin	France
C Gottfried	Austria
E Johansson	Sweden
D Vite	Switzerland
M Kobel	Germany
P Von Handel	Germany
R Moller	Denmark
A Pascolini	Italy
G Poscik	Hungary
J Rames	Czech Republic
R Riita Rinta Filppula	Finland
C Sutton	United Kingdom
N Tracas	Greece
T Velhinho	Portugal
F Close	CERN
M Draper	CERN
D Barney	CERN & CMS
A Wright	CERN & LHCb

ıitees:

N Calder	CERN
R Lewis	CERN
J A Rubio	CERN
Antonella	CERN
Anne Gaud McKee	Mimescope, Geneva University

Adolescence Step 1: INTERACT

EU Project

- EU Network proposal by Christine Sutton et al. for EPOG
  - Masterclasses in UK mentioned as one of best practices

C.Sutton 20June 2001

INTERACT *(new working title!)*

A project to explore and develop ways for European physicists to interact directly with the public, especially young people

A2 Proposal Summary

Objectives *(max 1000 characters; this is 810 characters including spaces)*

The objectives of the INTERACT project are:

- To identify a variety of mechanisms and channels (materials, activities, events) through which active scientists make direct contact with young people and the general public, in particular in a frontier area of science, namely high-energy particle physics.
- To select specific mechanisms and channels for appraisal through a programme of evaluated trials in several countries across Europe. Particular attention will be paid to assessing the value of an activity that has been developed in one country in a wider European context.
- To produce a manual of best practice to assist particle physicists and other scientists in Europe in making direct contact with the public and young people in their own countries. This "Guide to Good Practice" will be supplemented by a database of mechanisms and channels associated with different target audiences, such as visitors to science centres or young people in schools.

INTERNATIONAL MASTERCLASSES
hands on particle physics

A joint 25th anniversary

- Roger Barlow‘s masterclass idea 1997

2022 Lise Meitner Medal and Prize

Professor Roger Barlow for distinguished contributions to physics outreach/education, most notably for initiating the Particle Physics Masterclasses, in which hundreds of thousands of school students have participated worldwide over 25 years.

About

News

Blogs

Diversity and inclusion

International

IOP Awards

Supporting diversity and excellence in IOP Awards

Awards committees and panels

Isaac Newton Medal and Prize

In celebrating the 25th anniversary of Professor Roger Barlow initiating the National Masterclasses in Particle Physics, it is important to appreciate how groundbreaking they were at the time. Then, the standard practice was for an individual physicist to visit an individual school to give a one-hour talk. In contrast, the masterclasses give school students and their teachers a whole day with a local particle physics group. Participants actively analyse real data from large particle physics experiments, see small-scale experiments being conducted, as well as hearing talks. They interact with the research group (PhD students, postdocs and academics) informally over lunch and drinks breaks and in the sessions. They are directly exposed to the enthusiasm and excitement of actually doing particle physics.

INTERNATIONAL MASTERCLASSES

hands on particle physics

Adolescence Step 2: Never give up

- 2001 EU- proposal not approved

Block 1: Scientific and technological quality and innovation

The objective to identify best practices for communicating physics to the public. The physics component of the project is undoubtedly well established.

However, the identification of best practices is not a physical question but a social scientific research problem. Once the public has been confronted with information or experiences in physics, effects can be identified at different levels: on knowledge, attitude and on the level of behaviour. Every level takes an entirely different communication effort. Realising this, the identification of Best Practices proves to be a social scientific research problem. To solve the questions social scientific knowledge, if not mass-communication scientific knowledge, are indispensable. But it is lacking in this enterprise. It is indispensable though to define the research objectives, the set-up, to execute the research and to analyse the results. In this way physicists will get scientifically founded and solid best practices for communicating with the public.

  - But: 2005 world year of physics ahead !

INTERNATIONAL MASTERCLASSES
hands on particle physics

First funds for EPOG

- 04/2003 letter to EPS-HEPP
  - Asked for 30.000 € to prepare WYP 2005 masterclasses

To:
EPS-HEPP Board
c/o Michel Spiro

From:
European Particle Physics
Outreach Group EPOG

Prof. Dr. Michael Kobel
European Particle Physics
Outreach Group
Tel. x49-228 73 35 32
- 73 32 25 (Secretariat)
Fax x49-228 73 32 20
email: kobel@physik.uni-bonn.de

Physikalisches Institut
Nussallee 12
D-53115 Bonn

25.04.2003

Expression of Interest of EPOG for a Masterclass Activity in the WYP 2005

Dear Michel Spiro,

Referring to Your offer at the EPS-HEPP board lunch at CERN in December 2002 the European Particle-Physics Outreach Group (EPOG) would like to express its interest in organizing a European-wide Particle Physics Masterclass activity in the World Year of Physics 2005, if there is hope to receive funding for that by the EPS, as detailed below.

Masterclasses are events, pioneered and regularly performed in UK, where local high school students, (typically 30-50 students with an age of 16-18 years), come to a university or research centre for one day. (http://www.innotts.co.uk/morrison/masterclass.htm) There they learn about particle physics in lectures from active scientists, and do measurements like real scientists in PC exercises. During the PC exercises, the students are instructed by local tutors, ideally Ph.D. students or other graduate particle physics students, each one of them instructing typically 10 high-school students. The concept of masterclasses has been taken over by other countries. A recent systematic evaluation at 3 locations in UK and 1 university in Germany proofed (see article by M.Kobel, Europhysics News 3/2003) that a masterclass program with combination of good lectures and own activity leads, via the fascination of modern physics, to a significant increase of general physics interest of the students.

In the EPOG meeting of 5.4.2003 a proposal was worked out to contribute to the celebration of the World year of Physics 2005 with a 2 weeks-long European Masterclass Event. On each workday within these two weeks a few masterclasses would take place in parallel in several countries. At the end of each day, the classes join in a video conference in order to share and discuss the results like an international collaboration. This video conference would underline the international aspect of the event, and in addition teach the students that the accuracy of results can be improved by combining independent measurements.

In our EPOG meeting, the representatives of at least 12 countries plus those of the research centres CERN and DESY expressed great interest to join such a project. If on average three locations in each country take part, up to about 40 masterclasses could happen in these two weeks, corresponding to about 4 locations taking part in a common video conference each evening.

Since the material for the PC exercises is already available, and the events will take advantage of the cost-free ifrastructure of the universities and research centres, this activity will not be very cost-intensive. The material, planned to be used, can be viewed on: http://www.hep.man.ac.uk/~events (Manchester:OPAL events, event ID, Z branching rations) http://opal.physik.uni.de/~mkobel/schnupper/home.html (German translation of the above) http://www.physik-astro.uni-bonn.de/outreach/Collisn1.exe (Lancaster, ALEPH events, kinematics, momentum measurements, event classes)
It might be complemented by events of other LEP detectors, and by other programs (e.g."Hands on CERN", Stockholm) which perform the same measurements.

For about 40 such masterclasses we made up a very rough cost estimate.The cost estimate will be refined, and the locations of participation fixed in a letter of intent, if the EPS-HEPP board encourages us to continue with our planning.

As cost per masterclass we estimate roughly
- Own cost of students: short-distance travel to University (<~ 25 km)
- Own cost of University / research centre
  - infrastructure (video conf , PCs, lecture halls)
  - Scientists giving lectures
  - Copies for work sheets
- salary for student tutors (40€ x 5 tutors = 200 €)
- lunch / refreshments for participants (50 x 5€ = 250 €)
- Printed material / CD to take home (50 x 4 € = 200 €)

In addition, we estimate about 4000€ for central organisation tasks, like collecting material for the master of a masterclass CD, and for the design, print, and distribution of an information flyer,etc.

For 40 Masterclasses this would correspond to a total sum of 40x650€ + 4000€ = 30,000 €
Of course, there might be some variation depending on the place of the events, how the 650€ will be used in detail, and if further matching funding is seeked for in addition.

We hope that the EPS HEPP board will support this expression of interest and encourage us to continue and submit a proposal, listing the participating universities and research centres, and the required funding from EPS in more detail.

Best regards

(coordinator of the EPOG masterclass proposal 2005)

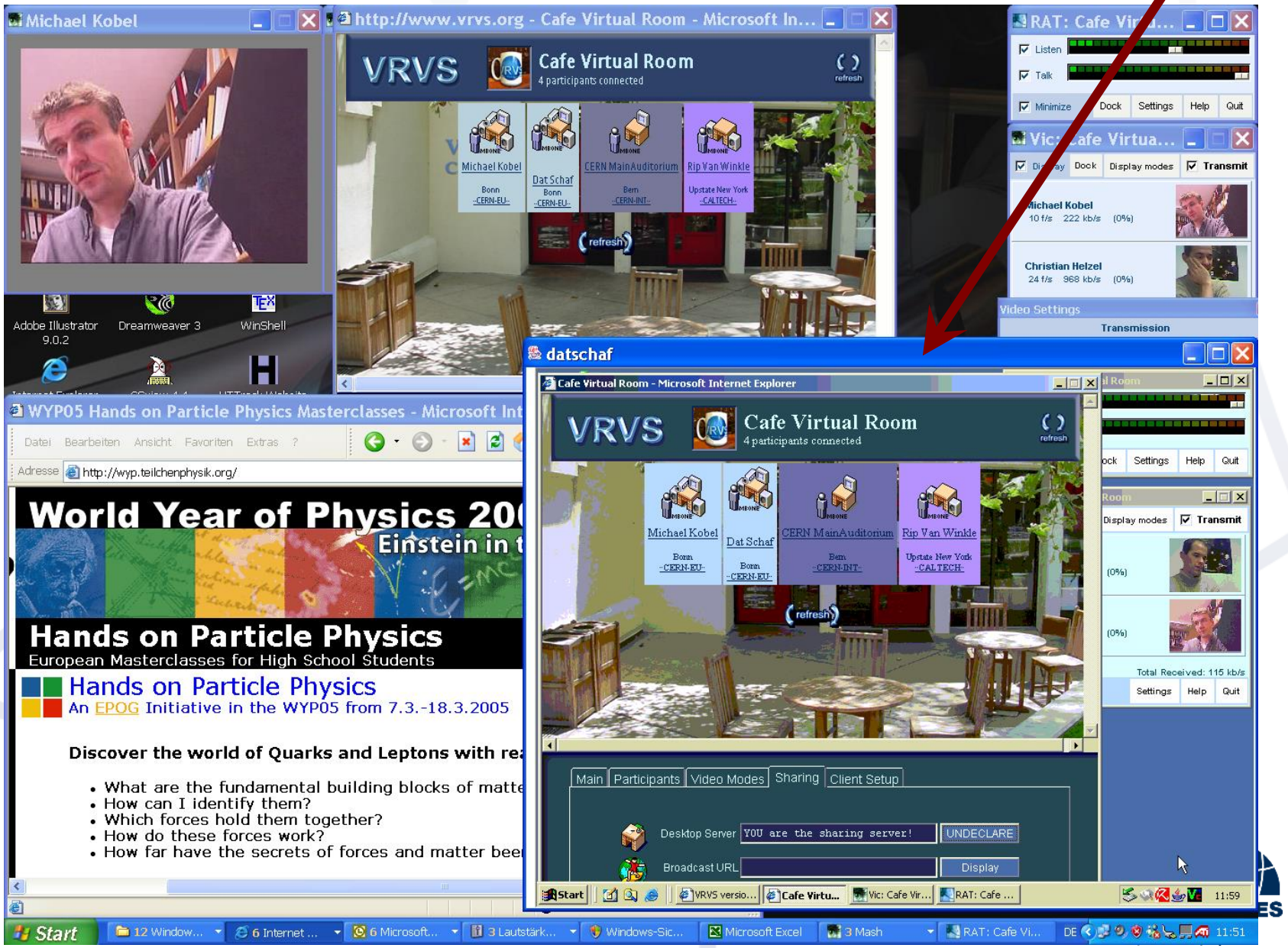
  - Got 3.000 €, continued nevertheless

INTERNATIONAL MASTERCLASSES
hands on particle physics

video conference tool

- OUR SUGGESSTION: VRVS (www.vrvs.org)
  - browser based, in windows (and LINUX, did not try)
  - Easy to use, Ch. Helzel will distribute technical requirements
  - first successful test last week (Hamburg, Dortmund, Bonn)

Allows one partipant to share desktop needed for data average (excel sheet)

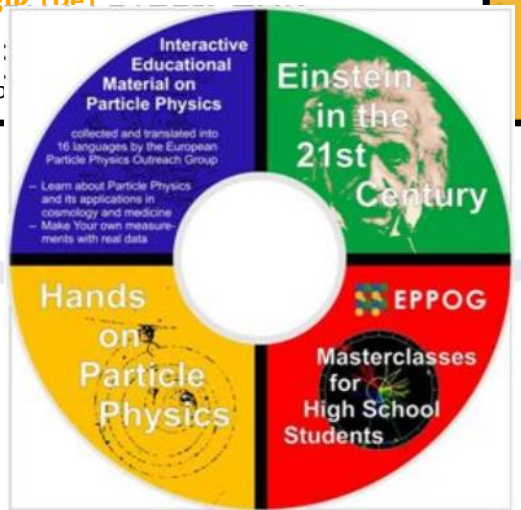


- **What are the fundamental building blocks of matter?**
- **How can I identify them?**
- **Which forces hold them together?**
- **How do these forces work?**
- **How far have forces and matter been understood?**

Find the answers to these and other questions by browsing, reading, and working through the Web systems collected on this CDrom in 16 languages. Most of the material contains interactive elements, some even real particle physics events for making your own measurements.

System requirements: **Web Browser, Java, Shockwave and Media Player**

- **Hands-On-CERN** (Ca, Cz, Dk, En, Fr, Ga, Gr, Hu, It, No, Pt, Sk, Sp, Sv)
  Erik Johansson et al., Stockholm
- **A Keyhole To The Birth Of Time** (En, It, Pl, Sp)
  James Gillies, Richard Jacobsson, et al CERN
- **Identifying Particles** (En, De, Gr, It, Sk)
  Terry Wyatt, Univ Manchester
- **BaBar Particle Physics Teaching Package** (En)
  Heather Lang, David Kirk, Univ Manchester (George Lafferty)
- **Lancaster Particle Physics Package** (En)
  F. Foster et al., Lancaster Univ (Andre Sopczak)
- **KworkQuark** (De)
  DESY (Dirk Rathje, Marc Hermann)
- **Teilchentour I: Reise durch die Welt der Teilchen** (De)
  Dagmar Schmitz, Univ Bonn (Michael Kobel)
- **Teilchentour II: Anwendungen in Kosmologie u. Medizin** (De)
  Alexandra Petri, Univ Bonn (Michael Kobel)
- **Grundlagen der Teilchenphysik** (De)
  German Hacker, Univ Erlangen
- **Le Monde des Particules** (Fr)
  Gwendoline de Hemptinne, Guillaume Leib



Hands on Particle Physics

Interactive educational material on Particle Physics in 16 languages

The material on this CDrom was collected and translated by the European Particle Physics Outreach Group EPOG for the occasion of the

First European-wide Particle Physics Masterclasses 7.3.-19.3.2005

http://wyp.teilchenphysik.org

Gefördert vom Bundesministerium für Bildung und Forschung

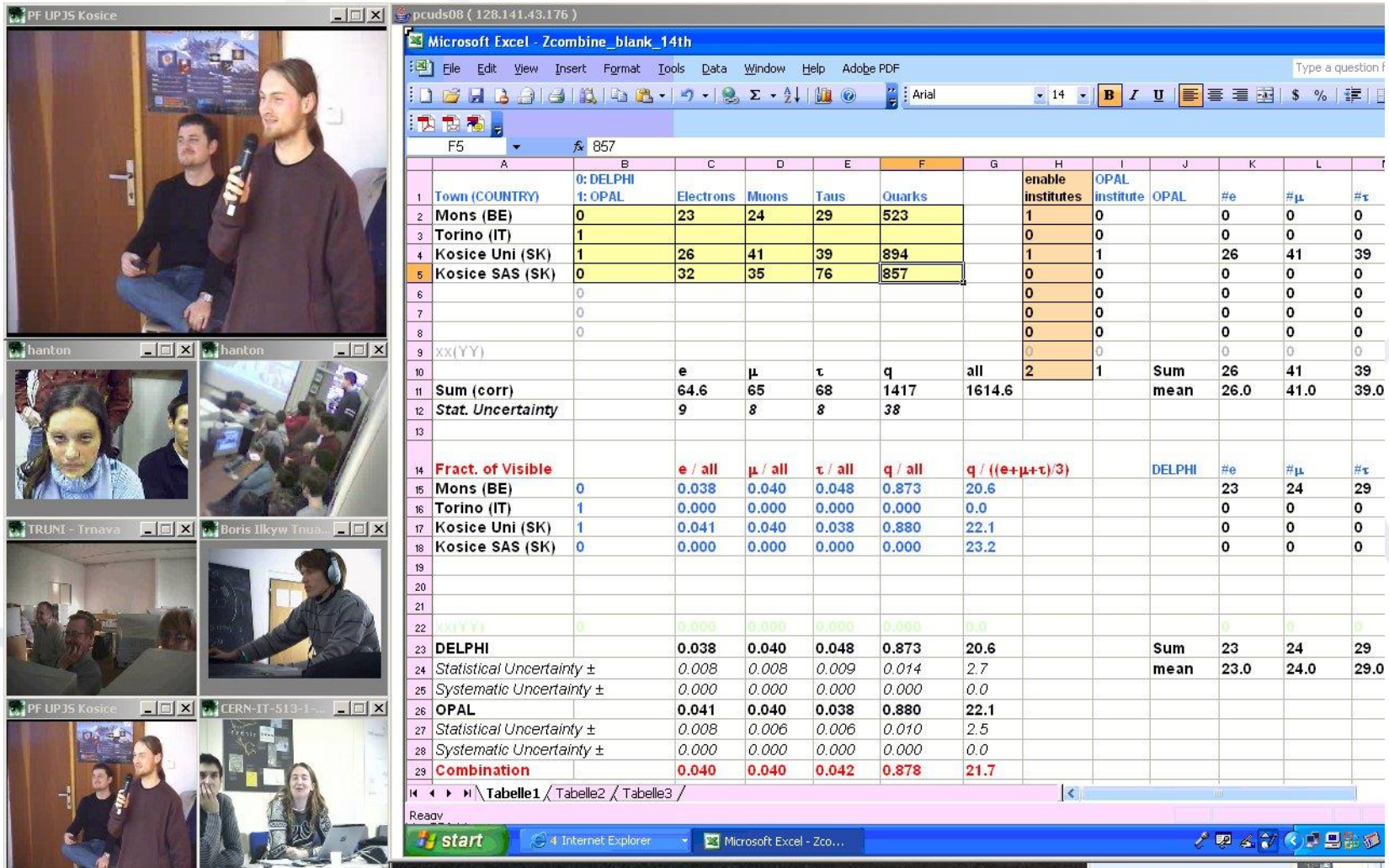
World Year of PHYSICS 2005

INTERNATIONAL MASTERCLASSES
hands on particle physics

Video Linkup

- An international collaboration of students!
- learn about discussing physics

(systematic differences, questions to scientists)



	A	B	C	D	E	F	G	H	I	J	K	L	M
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2	Mons (BE)	0	23	24	29	523		1	0		0	0	0
3	Torino (IT)	1						0	0		0	0	0
4	Kosice Uni (SK)	1	26	41	39	894		1	1		26	41	39
5	Kosice SAS (SK)	0	32	35	76	857		0	0		0	0	0
6		0						0	0		0	0	0
7		0						0	0		0	0	0
8		0						0	0		0	0	0
9	XX(YY)							0	0		0	0	0
10			e	μ	τ	q	all	2	1	Sum	26	41	39
11	Sum (corr)		64.6	65	68	1417	1614.6			mean	26.0	41.0	39.0
12	*Stat. Uncertainty*		*9*	*8*	*8*	*38*							
13													
14	Fract. of Visible		e / all	μ / all	τ / all	q / all	q / ((e+μ+τ)/3)			DELPHI	#e	#μ	#τ
15	Mons (BE)	0	0.038	0.040	0.048	0.873	20.6				23	24	29
16	Torino (IT)	1	0.000	0.000	0.000	0.000	0.0				0	0	0
17	Kosice Uni (SK)	1	0.041	0.040	0.038	0.880	22.1				0	0	0
18	Kosice SAS (SK)	0	0.000	0.000	0.000	0.000	23.2				0	0	0
19													
20													
21													
22	XX(YY)	0	0.000	0.000	0.000	0.000	0.0				0	0	0
23	DELPHI		0.038	0.040	0.048	0.873	20.6			Sum	23	24	29
24	*Statistical Uncertainty ±*		*0.008*	*0.008*	*0.009*	*0.014*	*2.7*			mean	23.0	24.0	29.0
25	*Systematic Uncertainty ±*		*0.000*	*0.000*	*0.000*	*0.000*	*0.0*						
26	OPAL		0.041	0.040	0.038	0.880	22.1						
27	*Statistical Uncertainty ±*		*0.008*	*0.006*	*0.006*	*0.010*	*2.5*						
28	*Systematic Uncertainty ±*		*0.000*	*0.000*	*0.000*	*0.000*	*0.0*						
29	Combination		0.040	0.040	0.042	0.878	21.7						

Adolescence Step 3: keep going

- 2005: 58 institutes in 18 countries participating
  - unanimous poll: all (but 1 pausing) wanted to go on
  - So then, e.g. 2006 in Dresden:

INTERNATIONAL MASTERCLASSES
hands on particle physics

publications and press

FEATURES
www.iop.org/journals/physed

European particle physics masterclasses make students scientists for a day

K E Johansson[1], M Kobel[2], D Hillebrandt[3], K Engeln[3] and M Euler[3]

[1] Department of Physics, Stockholm University, AlbaNova, 106 91 Stockholm, Sweden
[2] Institut für Kern- und Teilchenphysik, Technische Universität Dresden, Zellescher Weg 19, 01069 Dresden, Germany
[3] IPN-Leibniz Institute for Science Education, Olshausenstrasse 62, 24098 Kiel, Germany

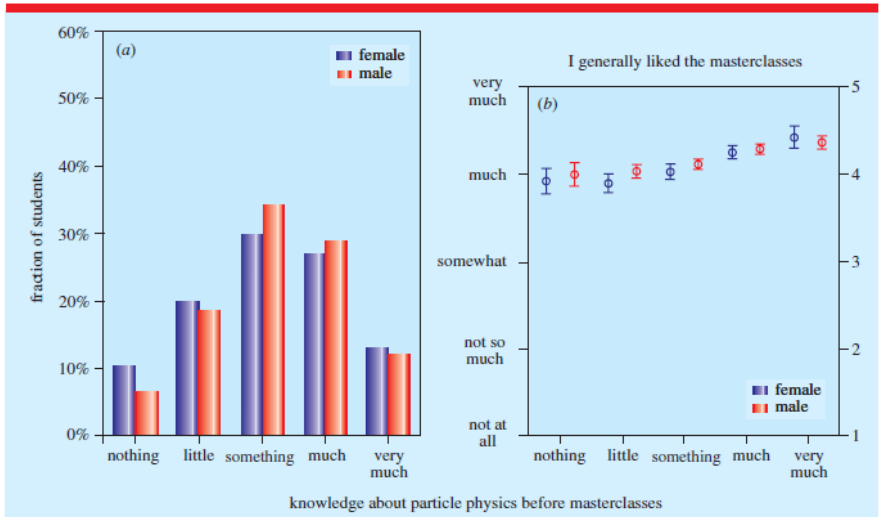


Figure 5. (*a*) The students' pre-knowledge of particle physics, and (*b*) the popularity of the masterclasses as a function of it.

INSIDE STORY

Reflections on a Masterclass

High-school student **Slávka Marcinová** attended the Hands On Particle Physics Masterclasses 2010 at her local university in the Slovak Republic and was pleasantly surprised. In this essay she describes in English her experience.

It was on an ordinary March day when I did something that was way out of character. A friend of mine, who is admittedly a physics geek, told me about something called a Masterclass and suggestively handed me a leaflet with big, friendly "Hands On Particle Physics" on it. Now, I must say that I am the kind of student who would normally like to get her hands OFF particle physics – but then I noticed something that sparked my interest. "A videoconference", the leaflet read, "a chance to analyse real experiment results with foreign universities and the CERN scientists". I said, yes, that sure was something. Then I said that I would come.

My entire preparation consisted of revising what I knew about particle physics (note, that it really wasn't much...) and repeatedly assuring myself that I won't be meeting a roomful of Einstein-like geniuses and therefore look quite stupid; that they will be ordinary high-school students with an interest in physics, looking forward to learning new things... just like me. At least, I hoped so.

The 2010 Masterclass under way in Košice. The annual masterclasses introduce high-school students to particle physics and now attract more than 5000 participants. (Courtesy PJ Šafárik University.)

classes and wrote down notes. The second, a lot more technical lecture, offered us a look into modern physics, something that we definitely didn't know from physics classes, something that got me genuinely interested, as did the still unanswered questions of

International dialogue

After lunch it was time for the videoconference to begin. Without any technical problems, we connected with universities in Debrecen, Budapest, London and with the scientists in CERN. We

INTERNATIONAL MASTERCLASSES
hands on particle physics

Today: IMC19 – the whole picture

7.3. - 16.4.2019

+ satellite dates

+ Spanish VCs

(to accomodate all needs)

54 countries involved

Coord.: QuarkNet / TU Dresden

- 51 institutes (48)
- 54 LHC Masterclasses (50)
  - 22 ATLAS (19)
  - 32 CMS (31)

  (Incl. TRIUMF program)
- 12 MINERvA Masterclasses

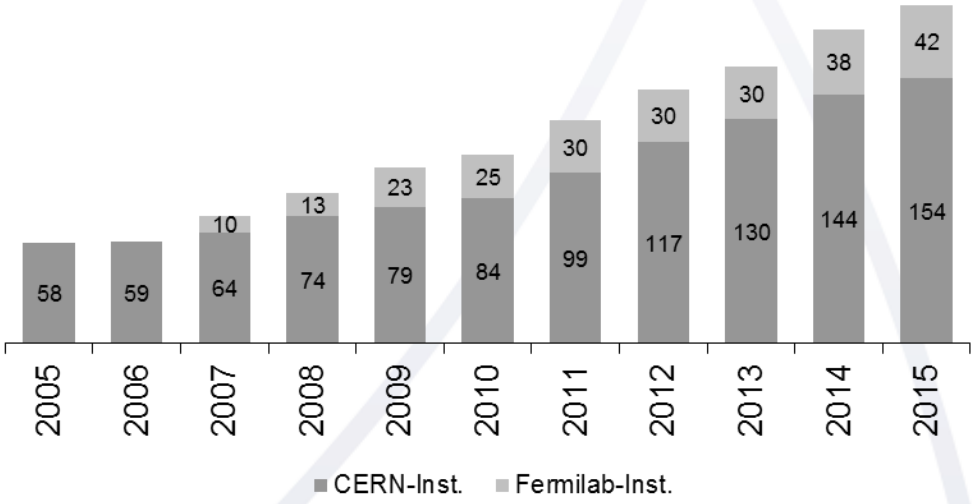
- 188 institutes (177)
- 266 LHC Masterclasses (257)
  - 30 ATLAS W (35)
  - 101 ATLAS Z (104)
  - 64 CMS (58)
  - 41 LHCb (39)
  - 27 ALICE SP (18)
  - 3 ALICE R_AA (3)

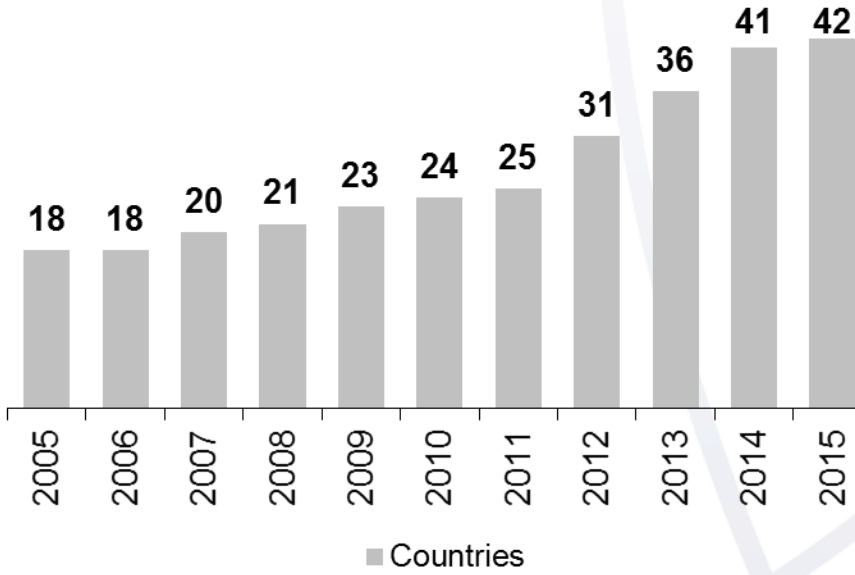
INTERNATIONAL MASTERCLASSES

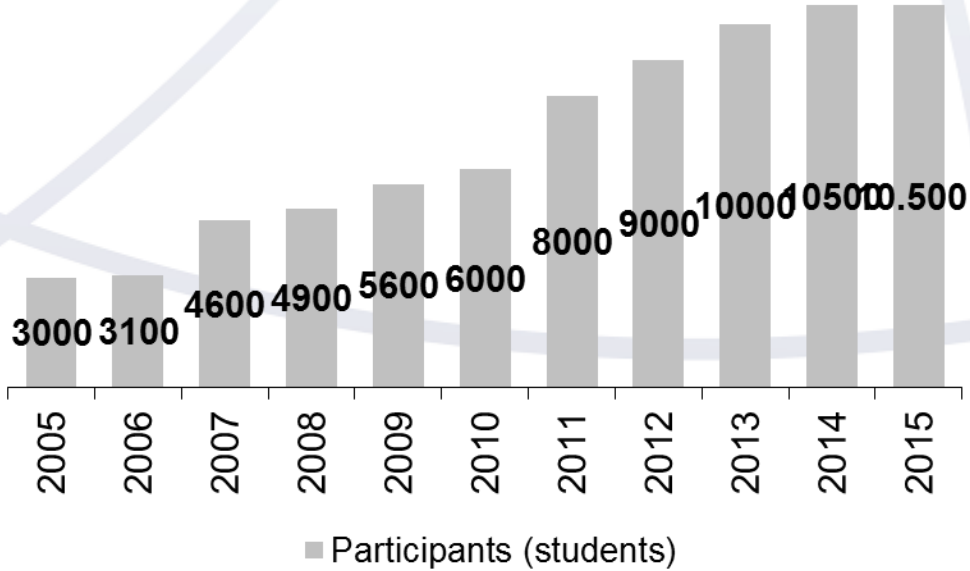
hands on particle physics

Data analysis + video conference

Participation Statistics







- 193 Institutes (154 + 42)
- 255 Masterclasses (213 + 45)
- 10.500 High-school students (estimated) incl. 1040 in Fermilab-

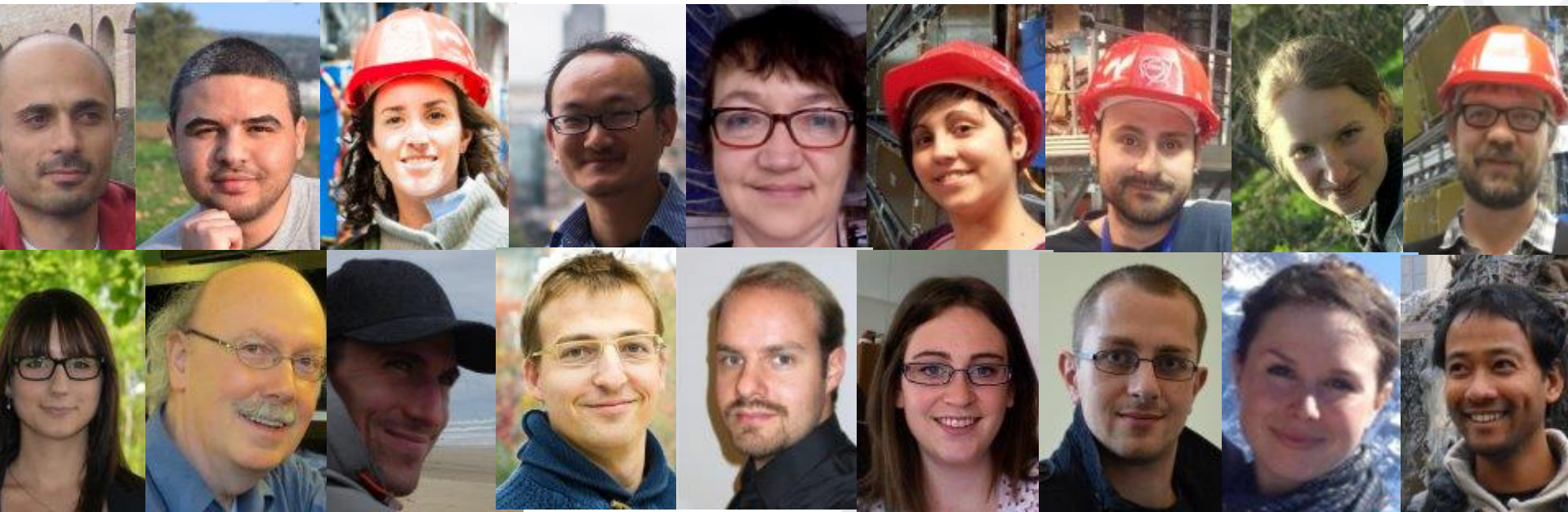
INTERNATIONAL MASTERCLASSES
hands on particle physics

Moderators from ATLAS

- 18 ATLAS members
- 3-4 „shifts“ per moderator
- Training beforehand
- newcomers are paired with „veterans“

Muhammad Alhroob
Mahmoud Alstaty
Barbara Alvarez Gonzalez
Duc Bao Ta
Claire Adam Bourdarios
Noemi Calace
Mirko Casolino

Ina Chalupkova
Ricardo Goncalo
Stefanie Hanisch
Michael Hauschild
Roland Jansky
Konrad Jende
Fabian Kuger
Katharine Leney
Marcus Morgenstern
Kate Shaw
Suyog Shrestha



Legacy of our term of co-chairs

EPPOG
European Particle Physics Outreach Group

IPPOG
INTERNATIONAL PARTICLE PHYSICS OUTREACH GRO

Dave Barney, Michael Kobel

- Overview
- Key objectives
- Motivation
- Next Steps

International Particle
Physics Outreach Group
http://ippog.web.cern.ch

Dear <>,

On behalf of the International Particle Physics Outreach Group – IPPOG – we would like to invite xxx to join our expanding global network.

Since its start-up at CERN in 2008, the world's largest science experiment, the Large Hadron Collider (LHC) has intrigued millions of people worldwide and captured the imagination of the media and public alike in a way that only the Moon landings has done before. Communities across the globe are showing an increased fascination with current research aimed at answering fundamental questions about our universe. Most importantly, young people are being inspired to study not only physics at school, but science in general.

Handover of the IPPOG co-Chairs

INTERNATIONAL MASTERCLASSES
hands on particle physics

Summary

What fun with all of you !

What great memories!

Thanks to everybody supporting us growing up!

INTERNATIONAL MASTERCLASSES

hands on particle physics