

# Welcome to the CERN – Latin-American School of High-Energy Physics!

Nick Ellis

Director, CERN Schools of Physics



# CERN

European Organisation for Particle Physics Research

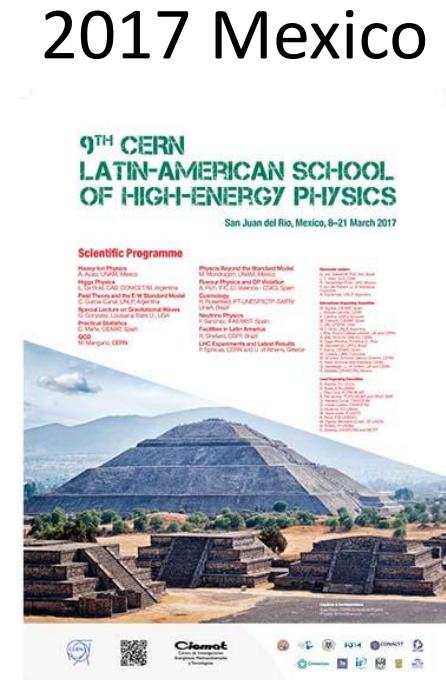
# PLEASE!

- Please put your mobile phones, tablets, etc. on Airplane mode!
  - We need to keep all the available internet bandwidth for the video link to CERN

# CERN

- Based in Geneva, Switzerland
  - Spanning the Swiss-French border
  - More than 10000 users from all over the world, including Latin America
- Home of the Large Hadron Collider (LHC)
  - Colliding counter-rotating beams of protons to probe the fundamental constituents of matter and their interactions
  - Huge detector facilities (ALICE, ATLAS, CMS, LHCb) each built and used by many hundreds of physicists
  - Where the Higgs boson was discovered in 2012 by ATLAS and CMS
    - Nobel prize in 2013 for theorists who predicted it
- Many challenges in engineering and informatics, often with spin-off relevant for society, e.g.
  - World-Wide Web
  - Medical applications: PET scanners, hadron therapy, ..
  - Also a driving force in Open Access publishing
- The “E” in CERN (“European”) has become “Everywhere”

# History of this School



# Organizers

(those present at the School this morning)

- International Organizing Committee members
  - Nick Ellis (Director, CERN Schools of Physics)
  - Martijn Mulders (Deputy Director, CERN Schools of Physics)
  - Kate Ross (Administrator, CERN Schools of Physics)
- Local Organizers
  - Malena Tejeda , USON, Mexico (Chair)

# Lecture courses

## Scientific Programme

### **Heavy-Ion Physics**

A. Ayala, UNAM, Mexico

### **Higgs Physics**

L. Da Rold, CAB, CONICET/IB, Argentina

### **Field Theory and the E-W Standard Model**

C. Garcia-Canal, UNLP, Argentina

### **Special Lecture on Gravitational Waves**

G. Gonzalez, Louisiana State U., USA

### **Practical Statistics**

C. Maña, CIEMAT, Spain

### **QCD**

M. Mangano, CERN

### **Physics Beyond the Standard Model**

M. Mondragon, UNAM, Mexico

### **Flavour Physics and CP Violation**

A. Pich, IFIC (U. Valencia - CSIC), Spain

### **Cosmology**

R. Rosenfeld, IFT-UNESP/ICTP-SAIFR/  
LineA, Brazil

### **Neutrino Physics**

F. Sanchez, IFAE/BIST, Spain

### **Facilities in Latin America**

R. Shellard, CBPF, Brazil

### **LHC Experiments and Latest Results**

P. Sphicas, CERN and U. of Athens, Greece

# Lectures

- Lectures last 1h15, plus some time for questions
  - Please don't be shy to ask questions, even if they seem basic to you!
  - Handouts before each lecture of the slides
    - Insofar as possible
    - Make notes on your handouts
    - Take them to the discussion sessions

## Discussion sessions

- The students are assigned to five groups that meet in parallel in the afternoons to discuss the material from the lecture courses and more general issues
- Each group is led by an experienced physicist who leads (or stimulates) the discussion and helps to answer questions
- The lecturers also visit the discussion groups to answer more detailed questions on their courses
- The same groups of students perform collaborative group projects, with most of the work done in their “free time”

# Please!

- Lectures and discussion sessions
  - Attendance is compulsory
  - Arrive on time
  - No laptop computers
  - No phones or other electronic devices

# Programme for today

(see web pages for the full programme)

- 08h30 Welcome and practical announcements
- 08h45 Opening of the School with VIP guests
- 09h00 Special lecture on Gravitational Waves, **Gabriela Gonzalez**
- 10h30 Coffee break
- 11h00 Field Theory and EW Standard Model, **Carlos Garcia-Canal**
- 12h30 Lunch
- Free time
- 15h30 Practical Statistics, **Carlos Maña**
- 17h00 Coffee break
- 17h30 Discussion sessions – until 18h45
- 19h00 Welcome drink
- 19h30 Dinner

# About the students

- We have nearly 80 students at this School
  - From 19 different countries!
  - Including 27 students from Mexico
- About  $\frac{3}{4}$  from Latin America
  - Other students mainly from Europe
- Mix of experimentalists and phenomenologists working on particle physics and related subjects
  - Mainly working towards PhDs or MScs
- The School was oversubscribed by > factor of two
  - I.e. more than twice as many applications as available places
  - Many very valid candidates had to be rejected
- Please make the most of your time at the School!

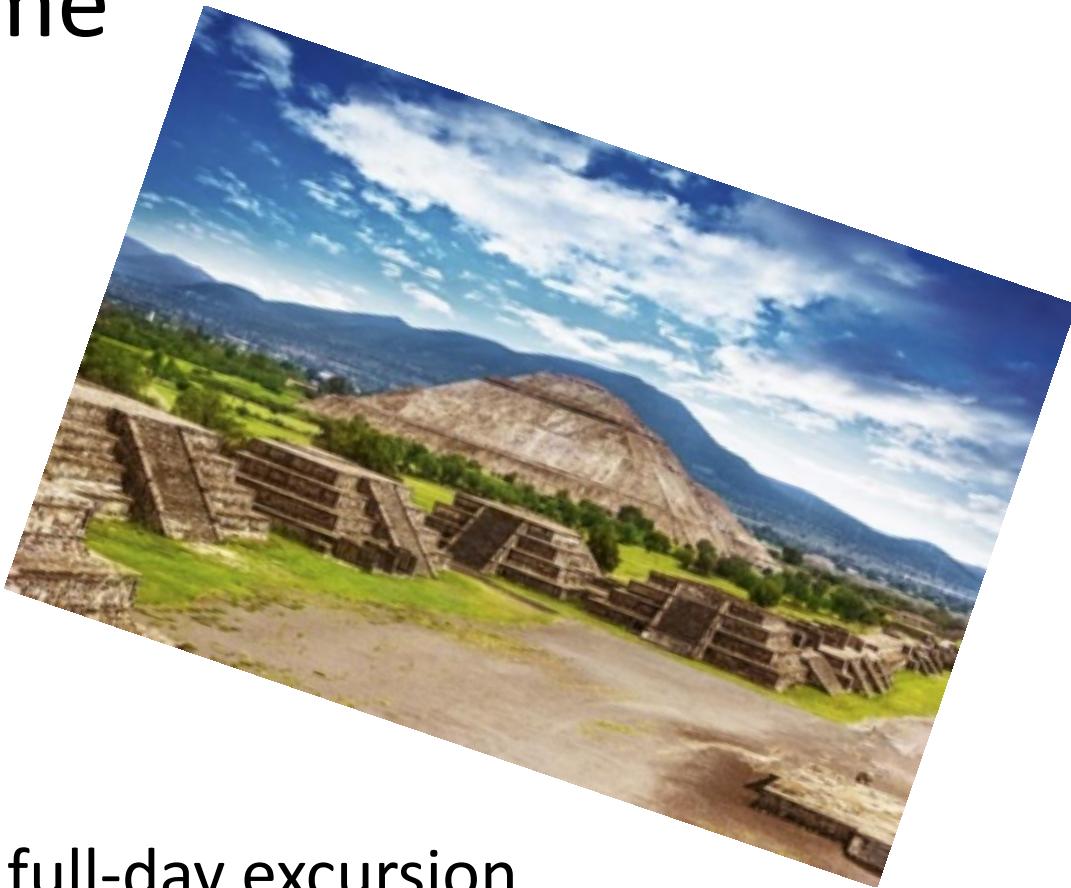
# Active student participation

- On Sunday 12 March there will be a student poster session after dinner
  - Unique opportunity for students to discuss their own work informally with each other and also with senior scientists
- On Sunday 19 March there will be an after-dinner session in which student representatives from each group will present the results of their collaborative projects
  - Briefing to the students on this tomorrow afternoon, so I won't go into details now

# Cultural exchange and networking

- In addition to teaching the science, the School aims to promote cultural exchange and networking between young scientists from different countries
  - Mix students from different countries (Latin America / Europe, etc.) in the groups for the discussion sessions and collaborative projects, and also in shared sleeping accommodation
  - The projects and the student poster session promote discussion and perhaps even future scientific collaboration between participants

# Social programme



- One half-day, and one full-day excursion
- There are many possibilities for sports and leisure activities at the hacienda
  - Albeit with limited time to enjoy them!

# Other educational activities

- Several activities organized around the School for the benefit of a larger community in Mexico
  - Lectures for local undergraduate students given last week at Juraquilla campus by colleagues from Mexican universities
    - Angel Sanchez Cecilio, Gabriela Murguia, Alfredo Raya
  - Lectures for the general public and seminars for physics undergraduates organised at Juraquilla university campus, benefitting from the presence of eminent scientists at this School
    - Gabriela Gonzalez, Carlos Garcia-Canal, Maria Elena Tejeda Yeomans, Michelangelo Mangano, Antonio Pich, Federico Sanchez, Paris Sphicas, Alejandro Ayala, Myriam Mondragon

# Important outreach event yesterday

- Yesterday was International Women's Day, and this was reflected in the programme:
  - Message from Julia Tagüeña Parga, Deputy Director for Scientific Development, CONACyT
  - Message from Fabiola Gianotti, Director General of CERN (pre-recorded with subtitles)
  - Lecture on Gravitational Waves by Gabriela Gonzalez, Spokesperson of LIGO
  - Q&A session
- If you are interested, a recording can be found on Channel 2 of the UNAM webcast service, see:
  - [http://webcast.unam.mx/?page\\_id=17](http://webcast.unam.mx/?page_id=17)

# Enjoy the School!

End of part 1

# Opening Ceremony

# CERN – Latin-American School

# of High-Energy Physics

Nick Ellis  
Director, CERN Schools of Physics

On behalf of the International Organizing Committee

# Opening Session

- Introduction
  - Nick Ellis, on behalf of the International Organizing Committee
- A few words of welcome from
  - Malena Tejeda, Local Director for the 2017 School
  - Julia Tagüeña Parga, Deputy Director for Scientific Development, CONACyT
  - Fabiola Gianotti, Director General of CERN
- Q&A session
  - Julia and Fabiola are happy to discuss with you!
- Special lecture on Gravitational Waves by Gabriela Gonzalez, Spokesperson of LIGO
  - Following last year's announcement by LIGO of the first experimental observation of gravitational waves

# A few words on sponsorship

- These Schools are only possible because of very generous support from funding bodies in Europe and in Latin America
  - All students from Latin-American institutes are receiving support
    - In some cases, all costs (travel and fee)
    - In other cases, partial or full waiver of the fee
  - Sponsorship also covers costs for teachers attending the School, etc.
- The international sponsors are CERN and the Spanish funding agency CIEMAT
- I would particularly like to thank the funding bodies and universities in Mexico that have contributed very generously:
  - BUAP, Cinvestav, CONACyT, MCTP, SMF, UCOL, UGTO, UMSNH, UNAM, USON
  - Their support has been absolutely critical, allowing us to significantly increase the number of students from Mexico and other Latin-American countries benefitting from the School

# Welcome to...

- The students
  - We're here for you!
- The lecturers
  - Carlos Garcia-Canal, Gabriela Gonzalez, Carlos Maña and Michelangelo Mangano
- The Discussion Leaders
  - Javier Cobos-Martinez, Gero von Gersdorff, Roger Hernandez Pinto, Federico von der Pahlen, Alejandro Szynkman
- The local organising team
  - Malena Tejeda has done a fantastic job over the last year!
- The international organizing team
  - My CERN colleagues Martijn Mulders and Kate Ross
  - Arnulfo Zepeda, Mexican representative on the International Organizing Committee
- Senior Mexican members of the ALICE and CMS collaborations
  - Arturo Fernandez-Tellez (ALICE), Isabel Pedraza (CMS)
- Very important guests from two organizations whose support has made this School possible
  - Fabiola Gianotti, Director General of CERN (from CERN by video link)
  - Julia Tagüeña Parga, Deputy Director for Scientific Development, CONACyT

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