PARTICLE PHYSICS AT PRIMARY SCHOOLS: A REPORT ON THE ITALIAN PROJECT

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MOTIVATIONS

- Need of "motivating more young people to engage in science related careers"

- Link science education more closely with the arts and other subjects, using inquiry-based pedagogy, and engaging with a wide range of societal actors and industries"

(Council Recommendation on key competencies for life-long learning of 22 May 2018)

PARTICLE PHYSICS AT PRIMARY SCHOOLS (PPPS)

- Pivotal role of **science teaching in primary schools** in order to **foster key competencies in science-related subjects** and in order to **improve the perception of attractiveness of science** and science-related jobs

- Innovative program by C. Lazzeroni & M.Pavlidou, University of Birmingham, UK (2015 - now): the Particle Physics Workshop

THE ITALIAN VERSION OF THE PPPS PROJECT (2017-NOW)

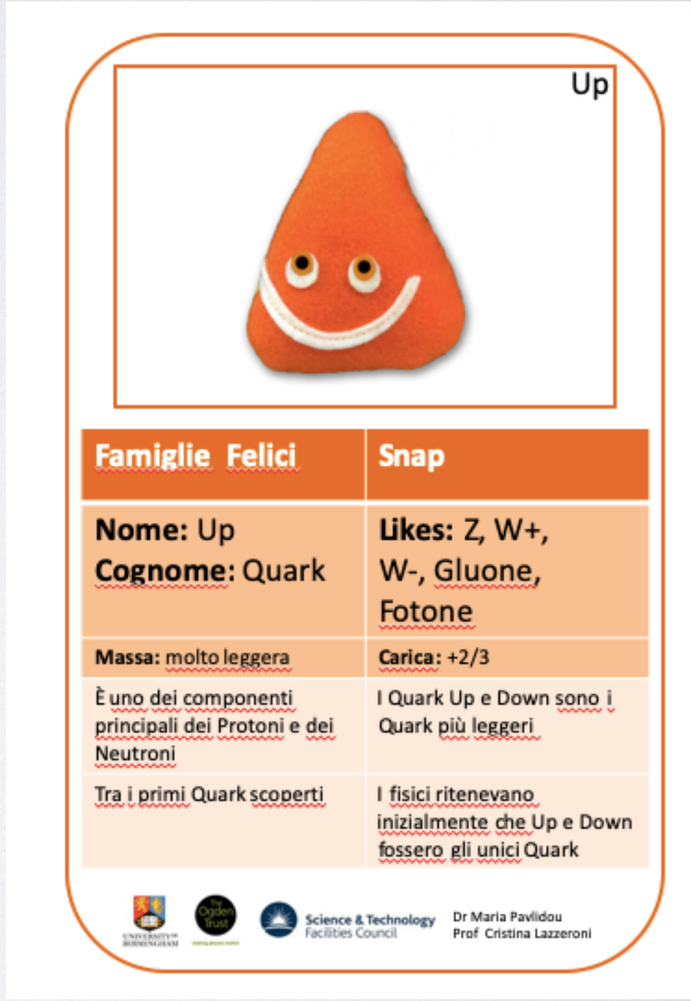
- **Main goals**

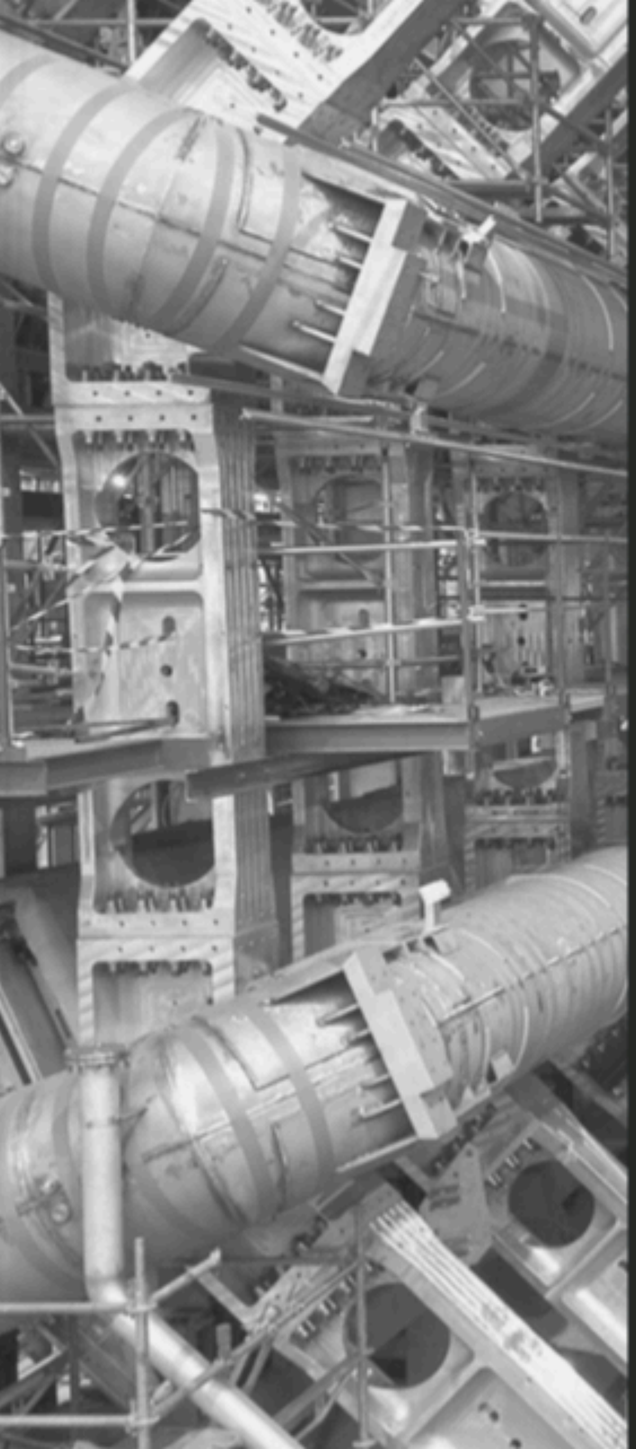
A. To support the education of teachers on particle physics through a direct connection with researchers in the field

B. To support the idea that "teaching by teachers mentored by scientists" can be, on the medium-long term, highly effective

Three primary schools involved

at IC E.Fermi, Carvico

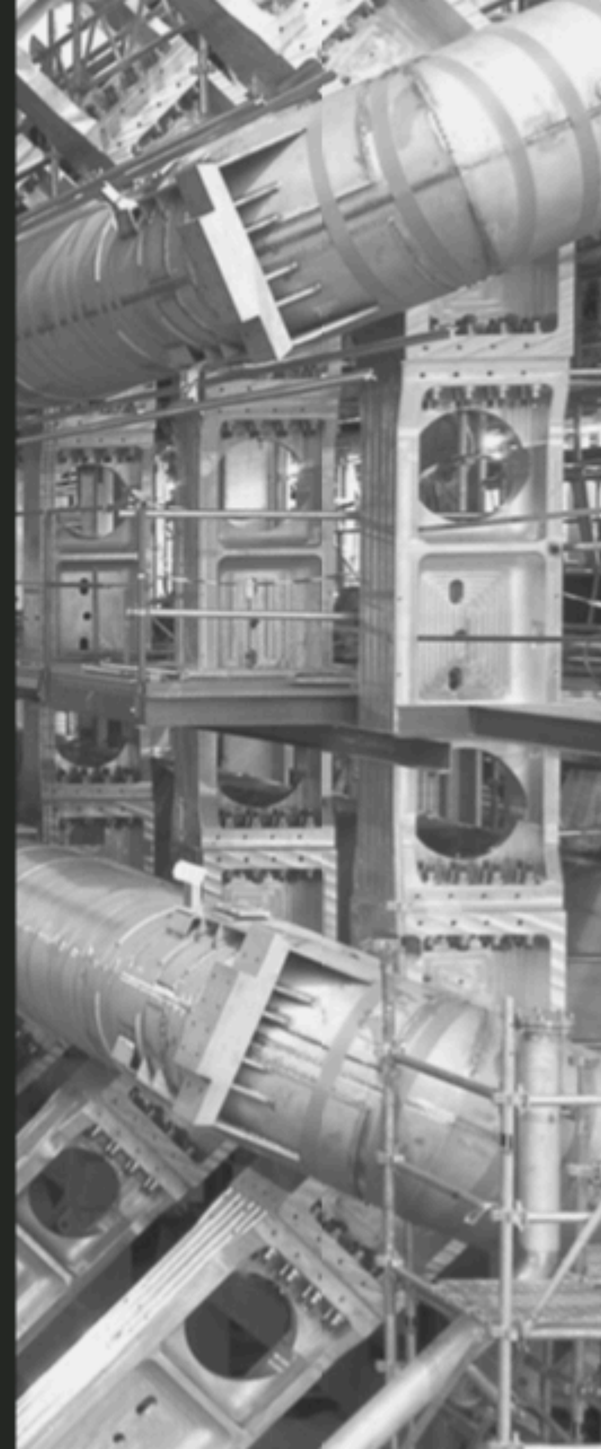


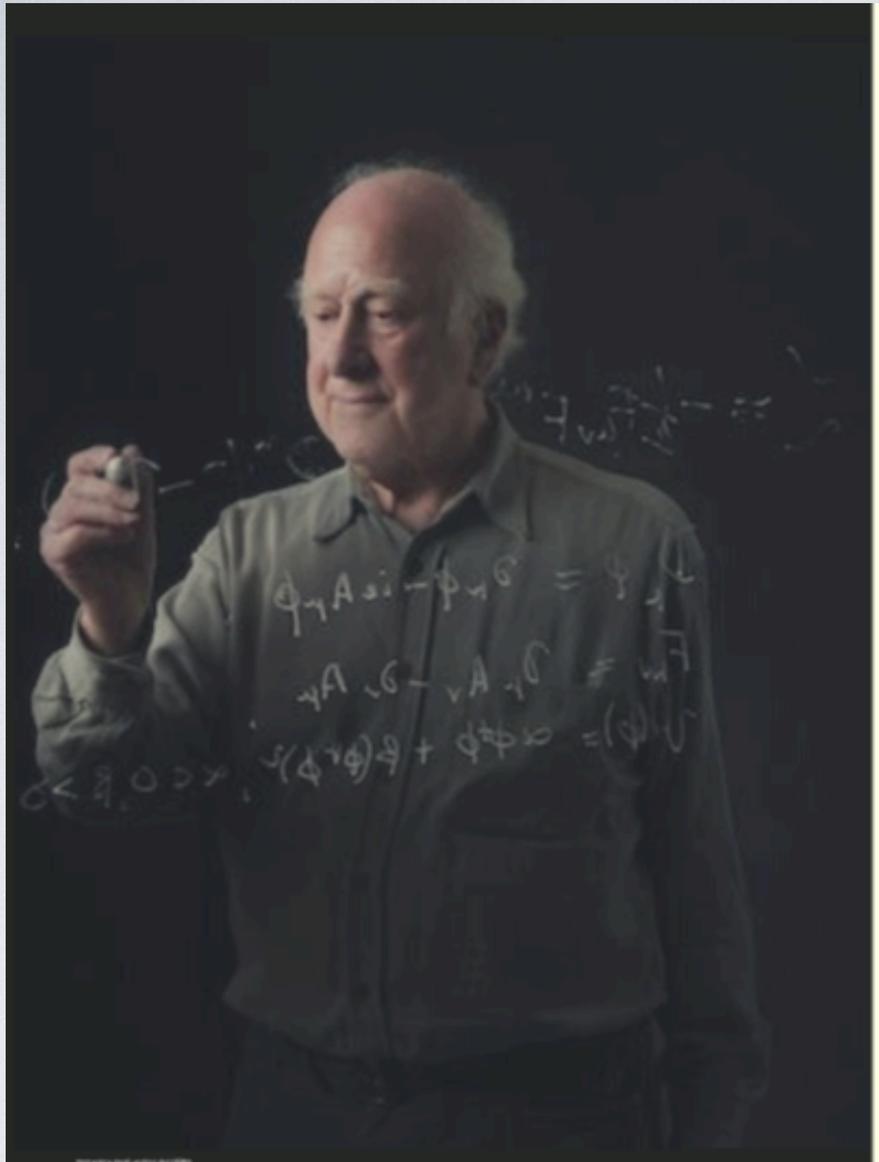


IC E.FERMI CARVICO

ELEMENTARY PARTICLES

Italian version of the original format by
Cristina Lazzeroni and Maria Pavlidou
(University of Birmingham, UK)





IC E.Fermi Carvico 2019

Particle Physics Workshop

Discovering the fundamental constituents of matter

In the last fifty years we have witnessed spectacular progress in the understanding of the fundamental components of matter, crowned by the observation in 2012 at CERN in Geneva (the largest scientific laboratory in the world) of a special particle, the Higgs boson, at the basis of the generation of the mass of all other elementary particles of the Standard Model, the theory that describes with extreme accuracy the matter currently known.

We would therefore like to invite you to an activity dedicated to the children of today and - maybe - to the scientists of tomorrow, with an exceptional guide, Prof. Cristina Lazzeroni of the University of Birmingham, creator, together with Dr. Maria Pavlidou, of a fascinating educational workshop for elementary school students.

The Italian version has been developed at IC E.Fermi of Carvico in A.S. 2017/18 and 2018/19.

METODOLOGY

- Learning materials: Trump Cards
- Activities: build your own particles, game cards, Feynman graphs as story-telling
- Engaging students by intuition and gaming
- Enthusing parents and students alike

THE INFN-MI TEACHERS' TRAINING PROGRAM

- Since 2019 a structured program targeted at teachers in primary schools
- About 90 participants in the 2019 edition
- Two-days workshop with lectures on Standard Model, Accelerator Physics and Cosmology by C.Lazzeroni, S.Malvezzi and D.Binosi
- A workshop session by teachers to teachers on how to implement the program in the classroom
- Evening session for parents by S.Malvezzi
- Final workshop on November 2020. Teaching programs completed despite the SARS-CoV-2 pandemic

RESULTS

- The **interaction between professional researchers and (well-motivated) teachers** is a key issue in ensuring the effectiveness of science-related teaching projects
- **Early exposition to Particle Physics** enhances the appreciation of the subject as an interesting option to be pursued in higher education.
- Follow-up surveys filled in by pupils at the end of the project (about 50 pupils per year starting from 2017) show on the average an **increased motivation about studying science**, with **no significant gendre-related bias.**

CONCLUSIONS

- The **challenge of science teaching** in today's schools requires need to build and maintain a **bridge between cutting edge research and the outreach activities** geared towards teachers in a **interdisciplinary effort**

- **Learning materials** authored by research institutes and universities combined with **direct engagement by teachers**