



Max Klein

Approaching the Update of the European Strategy. Outlook Session of the Orsay Workshop, 29.6.18

Towards the European Strategy in Particle Physics

15/15.11. ECFA Symposium at CERN about Future Colliders

December 2018: Submission of 10 page summaries (portals to more information JdH)

February 2019: Update of the CDR to appear [A Main Topic of this Workshop]

May 13, 2019: Symposium in Spain

January 2020: Council + Secretariat Meeting in Bad Honnef (D)

Spring 2020: Update of the 2013 Strategy

Large Hadron Electron Collider on one page

$E_e = 10\text{-}60\text{ GeV}$, $E_p = 1\text{-}7\text{ TeV}$: $\sqrt{s} = 200 - 1300\text{ GeV}$. **Kinematics**: $0 < Q^2 < s$, $1 > x \geq 10^{-6}$ (DIS)
Electron Polarisation $P = \pm 80\%$. Positrons: significantly lower intensity, unpolarised
Luminosity: $O(10^{34})\text{ cm}^{-2}\text{ s}^{-1}$. integrated $O(1)\text{ ab}^{-1}$ for HL LHC and 2 ab^{-1} for HE LHC/FCCeh
e-ions $6 \cdot 10^{32}\text{ cm}^{-2}\text{ s}^{-1}$ $O(10)\text{ fb}^{-1}$ in ePb. $O(1)\text{ fb}^{-1}$ for ep F_L measurements



Physics: QCD: develop+break? The worlds best microscope. BSM (H, top, ν , SUSY..)
Transformations: Searches at LHC, LHC as Higgs Precision Facility, QCD of Nuclear Dynamics
The LHeC has a deep, unique QCD, H and BSM precision and discovery physics programme.

Time: Determined by the Large Hadron Collider (HL LHC needs till ~ 2040 for 3 ab^{-1}) 1802.04317
LHeC: Detector Installation in 2 years, earliest in LS4 (2030/31).
HE LHC: re-use ERL. In between HL-HE, 10 years time of ERL Physics (laser, $\gamma\gamma$..)
Very long term: FCC-eh

<http://lhec.web.cern.ch>

Challenges: Demonstration of ERL Technology (high electron current, multi-turn)
Design 3-beam IR for concurrent ep+pp operation, New Detector with Taggers - in 10 years.

The LHeC is a great opportunity to sustain deep inelastic physics within future HEP.
The cost of an ep Higgs event is $O(1/10)$ of that at any of the 4 e^+e^- machines under consideration
It can be done: the Linac is shorter than 2 miles and the time we have longer than HERA had.

CERN and world HEP: Vital to make the High Luminosity LHC programme a success.



A Higgs Facility Resolving the Substructure of Matter

Update on the 2012 LHeC Report
on the Physics and Design Concepts for Machine and Detector

LHeC Collaboration



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Road to ES2020 and to go beyond

10 pages for LHeC

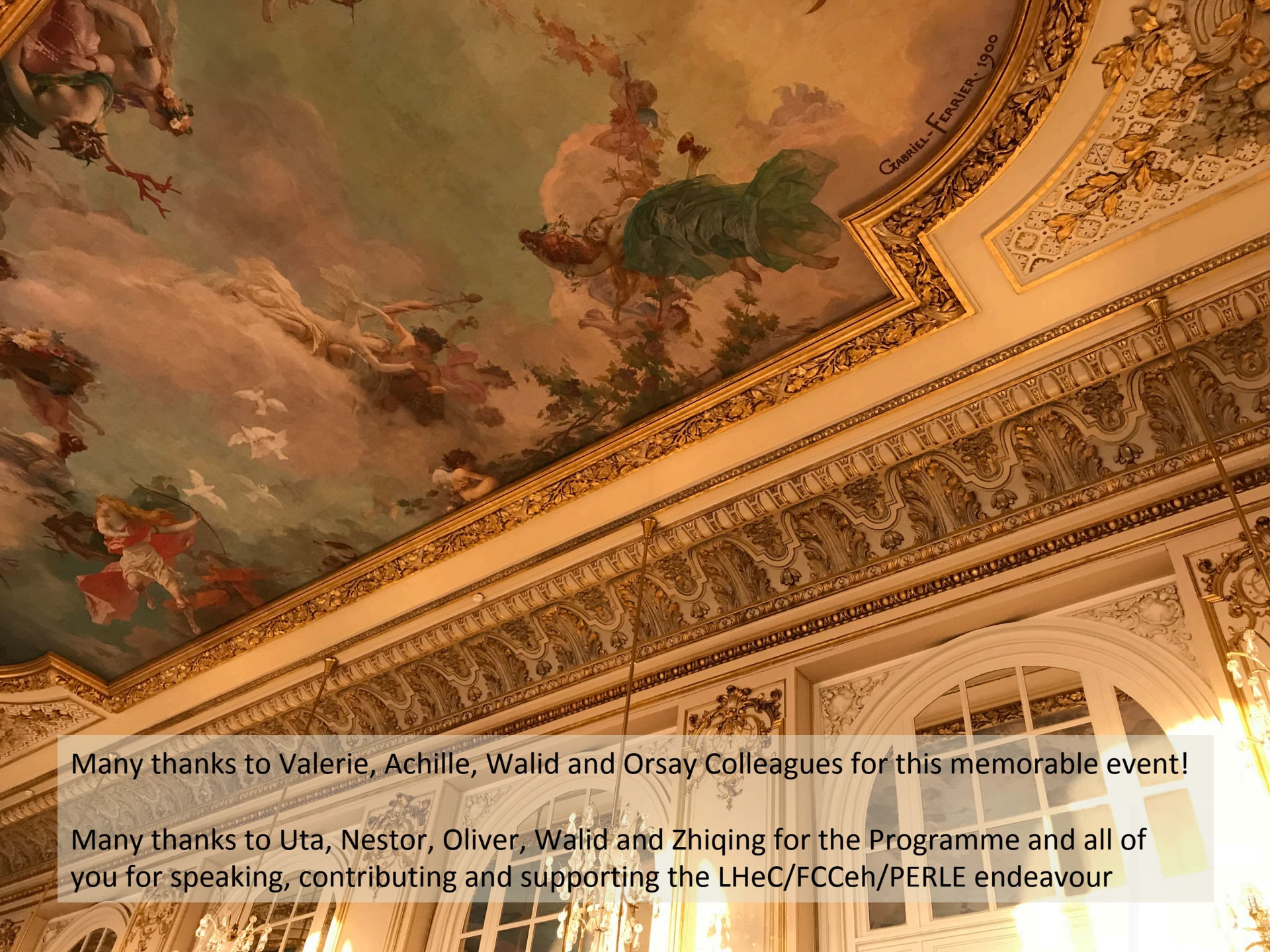
Few pages for FCCeh as part of FCChh

9 pages for PERLE

Contributions to the FCC Submission (Detector, Acc)

Update of the CDR LHeC (1034, HL and HE LHC) by February 2019
as also a reference for FCC which will not describe the ERL

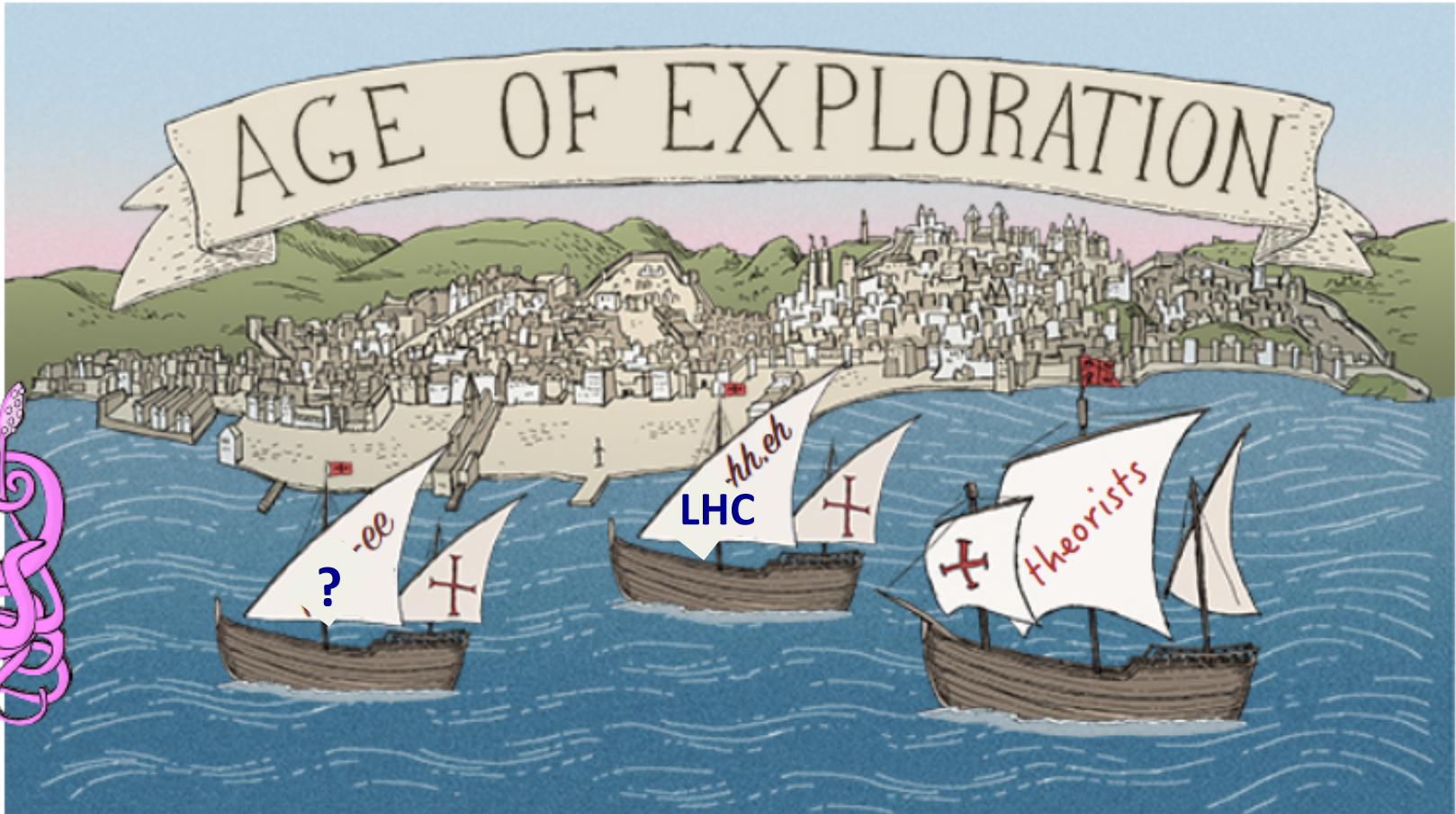
TDR for PERLE by Mid 2019 – IB of today



Many thanks to Valerie, Achille, Walid and Orsay Colleagues for this memorable event!

Many thanks to Uta, Nestor, Oliver, Walid and Zhiqing for the Programme and all of you for speaking, contributing and supporting the LHeC/FCCeh/PERLE endeavour

Time comes to unite pp with ep and ee at TeV scale



Jo Ruderman, modified

A currently best bet is HL/HE LHC, ep with both, and CepC: a realistic program for exploring the SM deeper and leading beyond, for the next 40 years ahead.