



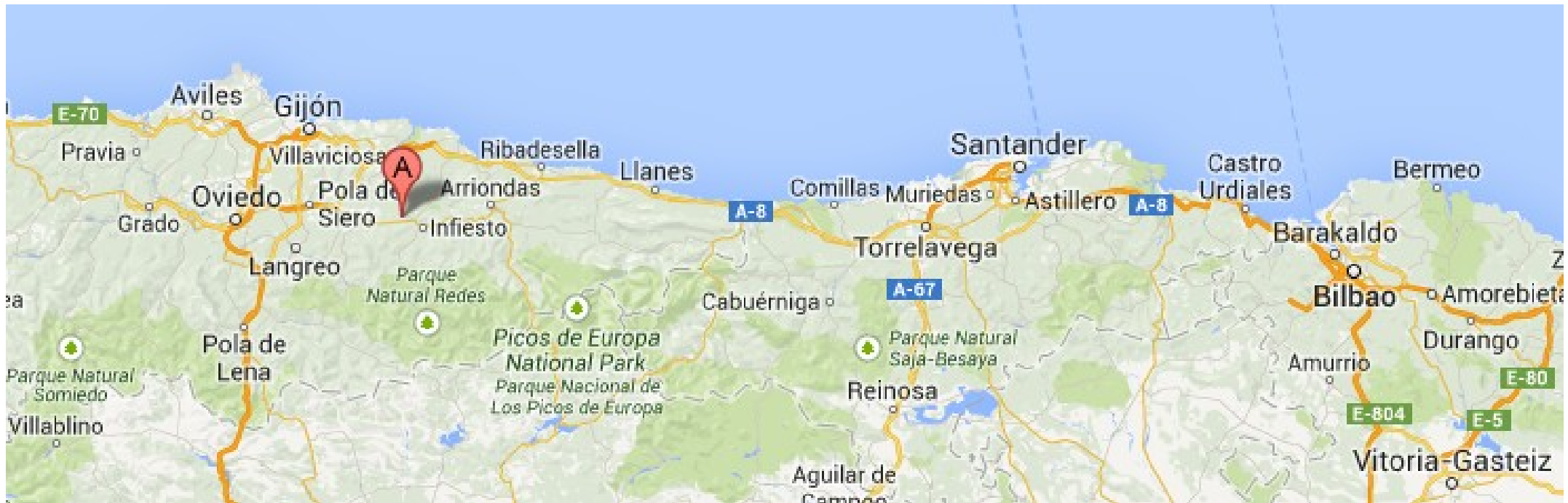
Another World Record

Madrid, 02.10.2001: 21.5 m of diameter, Paella for 110000 people!





QCD Session: The story of two villages



The story from 1992 in YouTube

Klaus Rabbertz, KIT, Karlsruhe, Germany
Shima Shimizu, Kobe University, Kobe, Japan



Villarriba



Perturb&Gamble



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The background image shows a crowd of people, some in green shirts, celebrating in front of a large, classical-style building with many windows. Overlaid on this image are several circular graphics:

- Top Center:** A red circular graphic with a complex, multi-lobed pattern.
- Top Right:** A red text label $N^k\text{LO (+PS)}$ above a Feynman diagram showing a quark line emitting a gluon, which then splits into a quark and an antiquark.
- Below Top Right:** Red text labels $\alpha_s, \alpha, \alpha_w$.
- Center:** A circular graphic containing the LHCb and LHC logos, a red circular pattern, and a diagram of a particle detector cross-section.
- Bottom Center:** A circular graphic containing the ATLAS logo, a golden globe, and a diagram of a particle detector cross-section with the text "CIS" and "Jets".
- Bottom Right:** A circular graphic containing the CMS logo and a colorful abstract design.



Villarriba



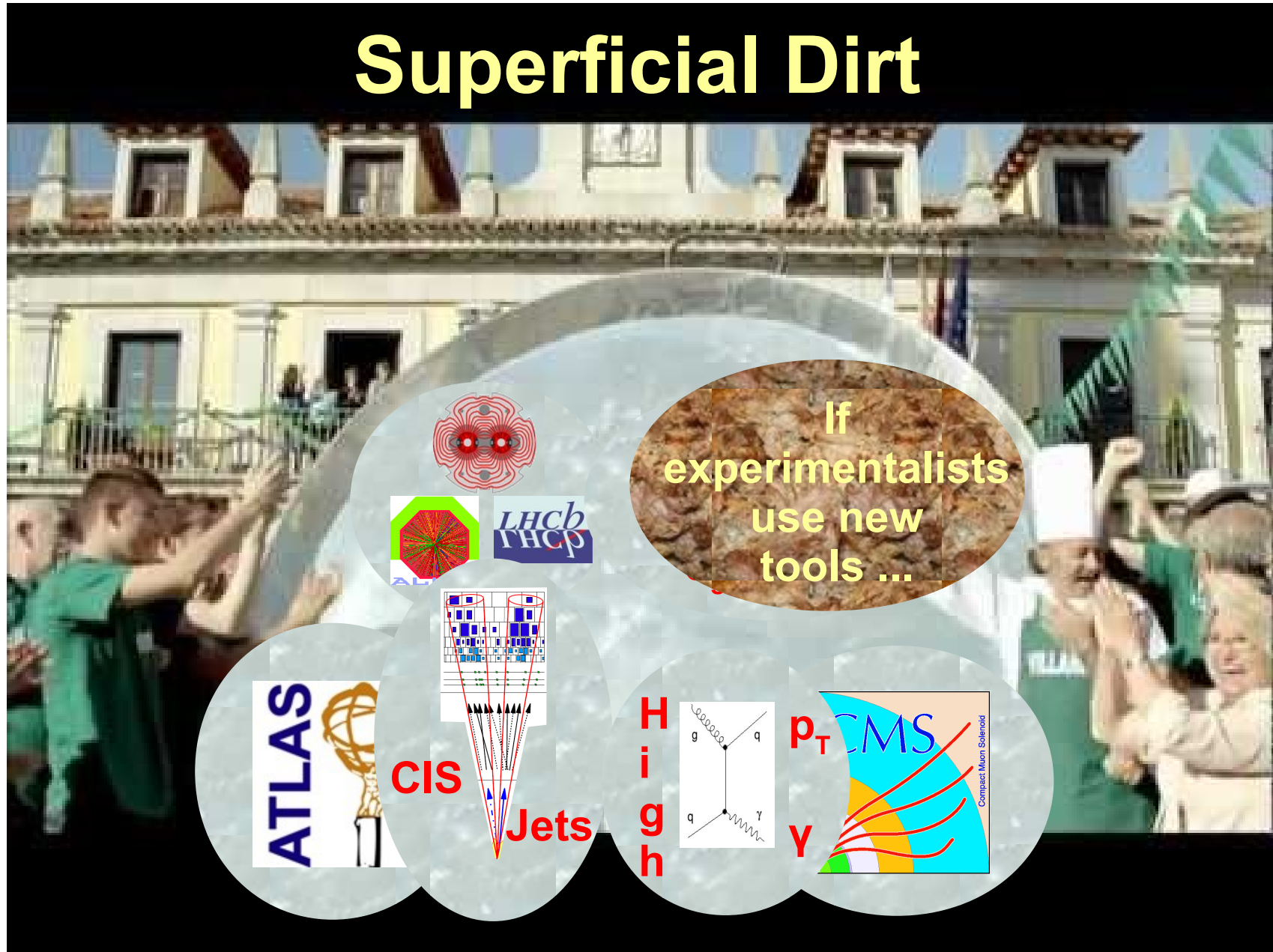
Perturb&Gamble

The collage features several physics-related elements:

- Top Left:** A red and white Feynman diagram showing a loop structure.
- Top Center:** A circular diagram with a red and green pattern, labeled **LHCb** and **ΓCP**.
- Top Right:** The text **N^kLO (+PS)** in red, with a Feynman diagram below it showing a loop with external lines.
- Middle Right:** The text **α_s, α, α_w** in red.
- Bottom Left:** The text **ATLAS** in blue, next to a golden globe-like structure.
- Bottom Center:** The text **CIS** in red, with a diagram of a particle detector or jet structure below it.
- Bottom Right:** The text **Jets** in red, with a diagram of a jet structure below it.
- Far Right:** The text **High** in red, with a Feynman diagram showing a loop with external lines labeled *g*, *q*, and *γ*.
- Far Right:** The text **p_T** in red, next to a colorful circular diagram labeled **CMS** and **Compact Muon Solenoid**.



Superficial Dirt



If experimentalists use new tools ...

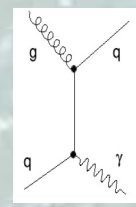
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ATLAS

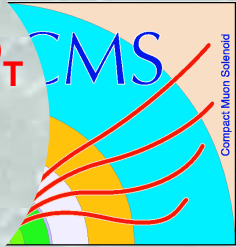
CIS

Jets

High

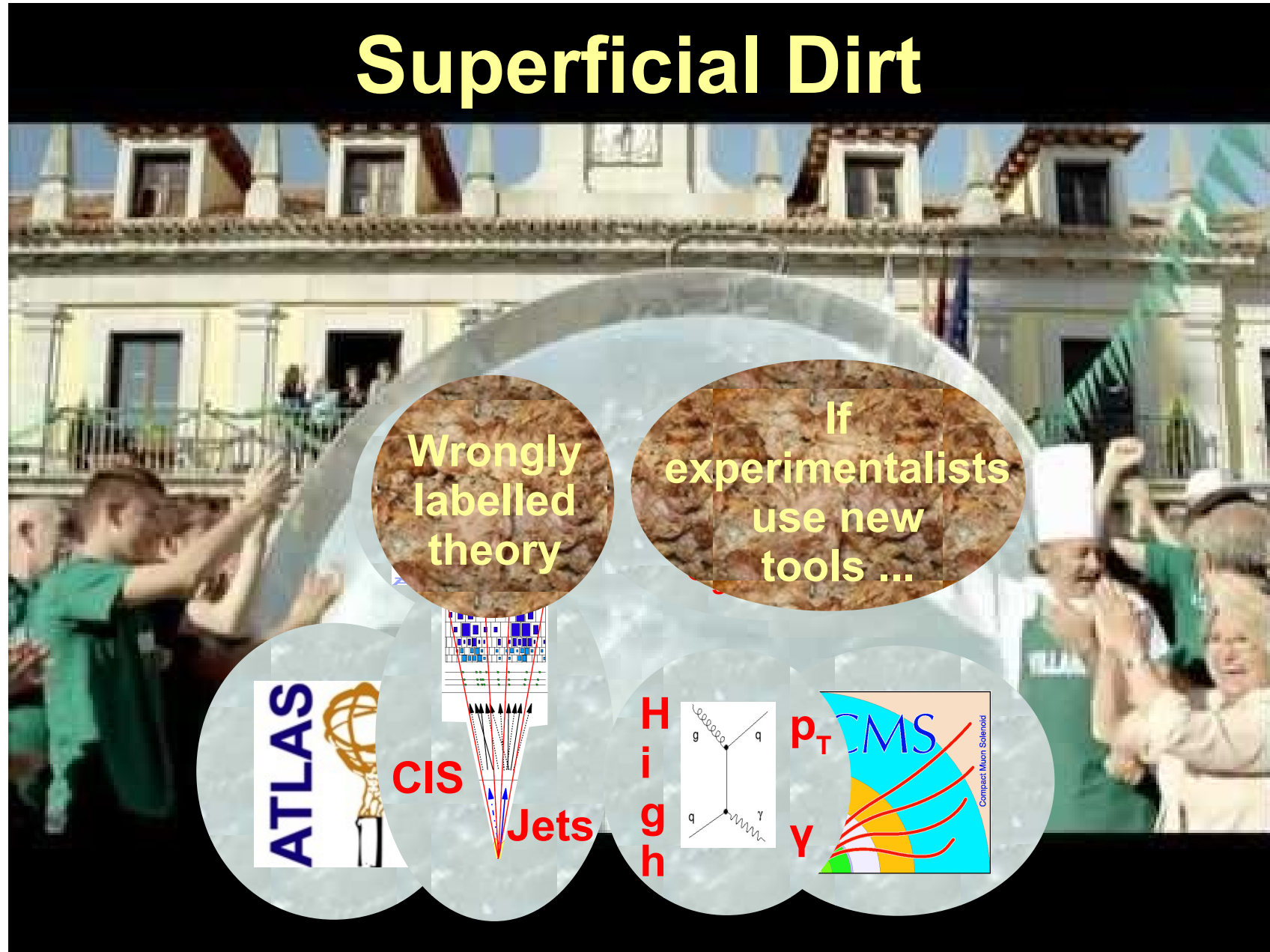


p_T
 Y





Superficial Dirt



Perturb&Gamble



Perturb&Gamble

Superficial Dirt

Wrongly labelled theory

If experimentalists use new tools ...

ATLAS

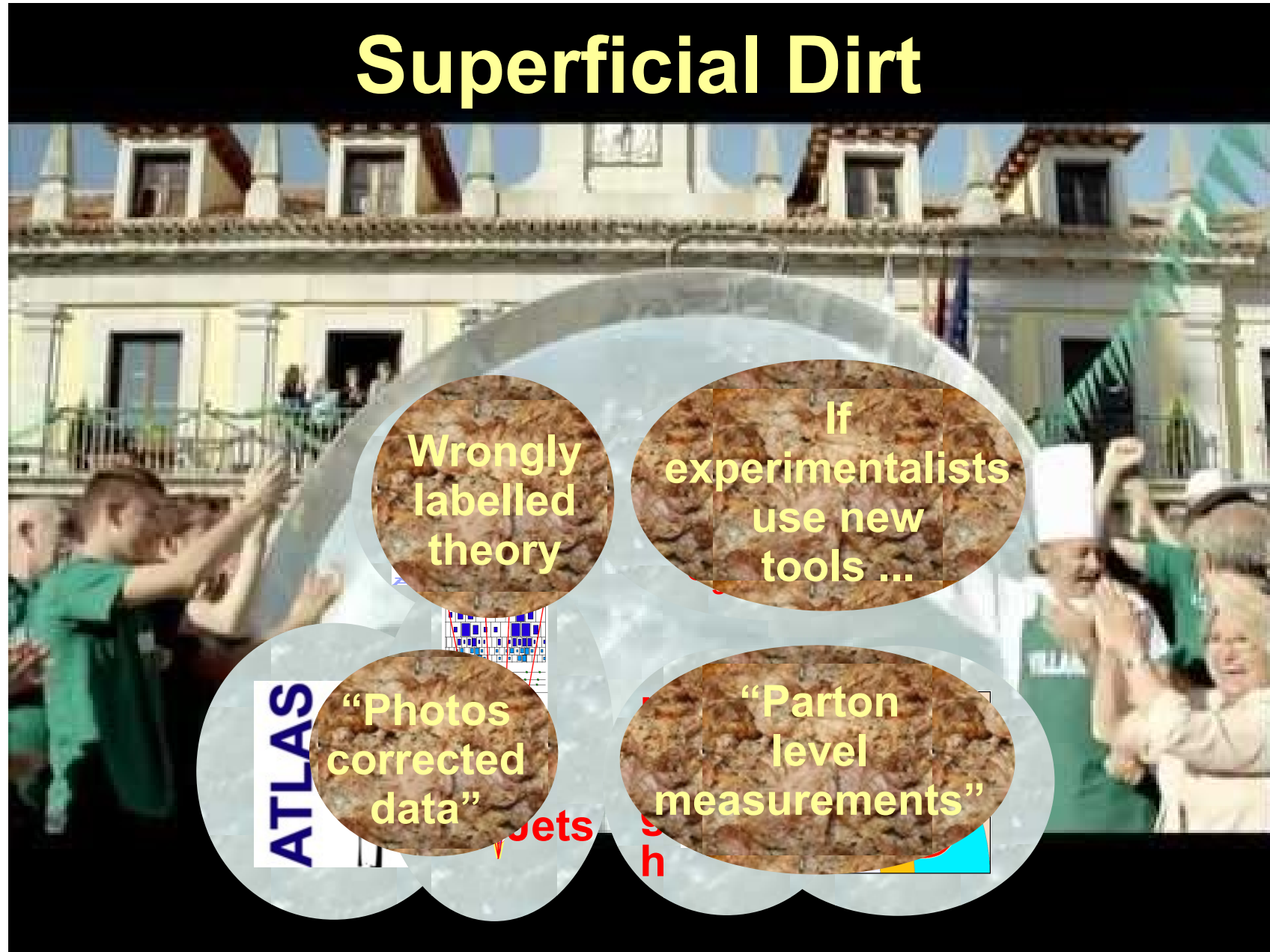
CIS

Jets

“Parton level measurements”



Superficial Dirt



Perturb&Gamble



Superficial Dirt





And now to Villabajo ...





for tougher problems!





Discussion – “Trivia”

- ➔ **“Trivia”:**
 - ➔ **Correctly label theory, not e.g. NNLO for NLO+some approximation, or Alpgen if you really mean Alpgen+Pythia**
 - ➔ **Correctly name “measurements” and “parameter determinations; “something corrected to parton level” is NOT a “measurement”; always report the measurement, theory corrections will change ...**
 - ➔ **Avoid entangling “detector measurement” and e.g. “PHOTOS corrections”; Dressed electrons ? Recommendation ?**
 - ➔ **We´re using two general purpose detectors ... if possible use two equivalent theory tools (MC) as well**



Discussion – Hard QCD

- ➔ **The past NLO; the future NNLO :-)**
- ➔ **The past: scale uncertainties; the future ?**
- ➔ **Strong coupling: Lowish or highish value? Uncertainty?**
 - ➔ **Need better understanding of uncertainties**
 - ➔ **Need better understanding of potential discrepancies**
 - ➔ **Need better combination procedures, combine precise NLO and NNLO ?**
 - ➔ **Same conclusions as in Mainz workshop on fundamental constants ...**
- ➔ **Resummation: Agreement between NLL Orders ?**



Discussion – PDFs

- ➔ **Photonic corrections:**
 - ➔ **Determination and usage of photon PDF?**
 - ➔ **Interplay with ewk corrections e.g. in (di)jets?**
 - ➔ **Observables to measure? WW, ... ?**
- ➔ **Discrepancies in gg predictions even between CT, MSTW, NNPDF ...!**
- ➔ **The past: PDF4LHC envelope; the future ? Certainly, LHC data help ...**
- ➔ **Strange PDF constraints from ATLAS and CMS, check consistency in global fit.**
- ➔ **Inclusion of photon data**



Discussion – Match/Merge/Tune

- ➔ Less tunes for Pythia, more for Herwig++/Sherpa :-)
- ➔ Tuning of NLO+PS, mostly not done yet
- ➔ General MC tuning strategy: Proposals for improvements ?
- ➔ Gluon splitting [$g \rightarrow cc$ in V+HF production] in MC generators ? What can experiments do ?
- ➔ Photon + b,c data not well described by NLO ...?
- ➔ Measurements to confront matching/merging scheme differences with data (“Break the tools!”) ?
 - ➔ Correlations between light and HF jets ...?
 - ➔ Jet multiplicity in $t\bar{t}$
- ➔ Written recommendations ($\Delta\chi^2 = 10??$) for uncertainty evaluations in MC generators, NLO+PS etc.
 - ➔ Avoid double-counting
- ➔ “Scale uncertainties” reborn ?



Proposals ?

- ➔ **Photon + multijets measurements ?**
- ➔ **Suggestions for new measurements at 13 TeV low pile-up? Full pile-up?**
- ➔ **“Missing” calculations: NNLO + EWK for $2 \rightarrow 3$ processes, e.g. 3-jet**
 - ➔ **See Les Houches 2013 wishlist**
- ➔



Notes



Two real villages in Asturia

