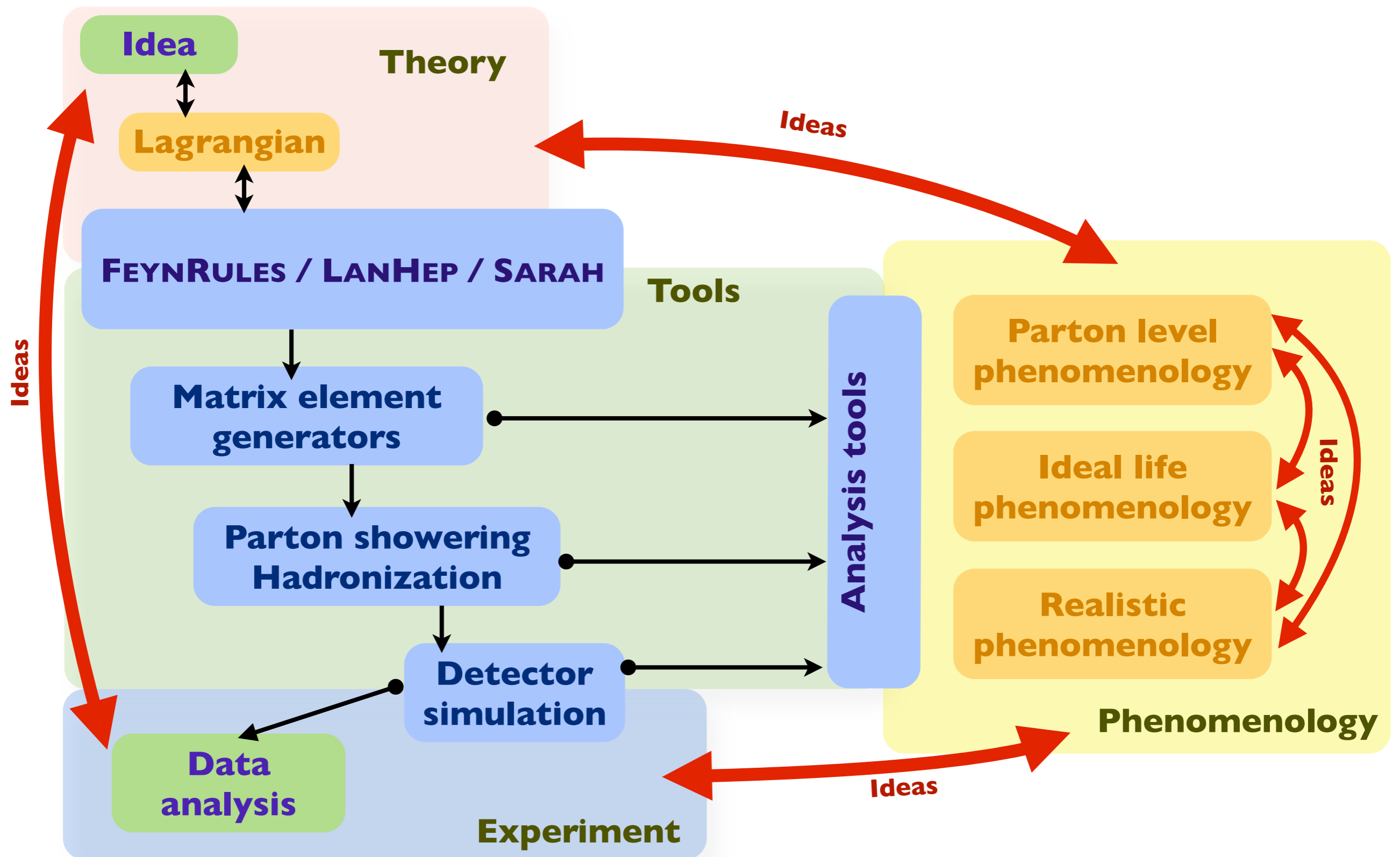# Tools and Monte Carlo triggers for Les Houches 2013

Benjamin Fuks (CERN / IPHC Strasbourg)
Peter Richardson (IPPP Durham)
Sezen Sekmen (CERN)

Kick-off meeting @ Les Houches

June 12th, 2013

A modern vision for LHC analyses and phenomenology

Communication: event formats

✦ Standardized event file formats:
- ❖ Parton level: LHE
- ❖ Hadron level: STDHEP, HEPMC
- ❖ Reconstructed level: LHCO

✦ Extending the standards (already discussed in session 1 → see the wiki)
- ❖ HEPMC: vertex tags (hard, decay, *etc*); reweighting information (scales, parton densities)
- ❖ LHE: additional init tags (generator info, *etc*); reweighting information

✦ Storing events
- ❖ Large files currently needed → is there a better way
- ❖ At least for pheno analyses: can we avoid it?

Around the generators

✦ **Supersymmetric spectra**
- ❖ Extension of the SLHA-2: cross section information
 (LO, NLO, NLL, weights, *etc*)

✦ **Detector simulation**
- ❖ DELPHES and PGS have been (and are) widely used
- ❖ Many new features have been recently developed (pile-up, *etc.*)
- ❖ Is anything else crucial and missing? → *e.g.,* long-lived particle simulation
- ❖ Detector simulation and analyses (interfacing)

✦ **Analyzing events, reinterpreting analyses: RIVET, MADANALYSIS 5**
- ❖ RIVET discussed in session 1 → see the wiki
- ❖ Weights treatment?
- ❖ See Peter's talk on RIVET this afternoon

✦ **More tutorials (depends on the demand and on the wave-function of the program authors):**
- ❖ ROOSTATS / ROOFIT
- ❖ MADANALYSIS 5
- ❖ Anything else?
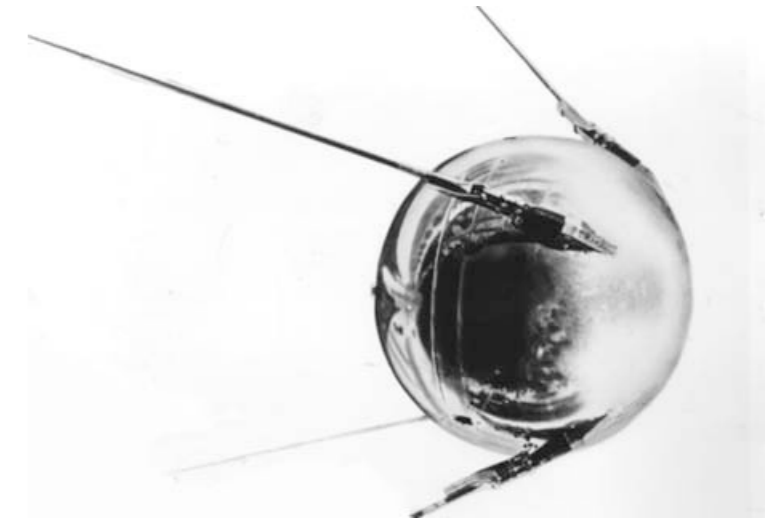
Towards (new) physics: some problems

✦ See also the other talks of this morning!

✦ Cascade decays (in supersymmetry and in general)
   ❖ In the context of LO Monte Carlo generators
   ❖ Precision for the shapes can be reached (multiparton matrix element merging)
   ❖ When several new physics particles: double-counting when generating inclusive samples

$$pp \rightarrow \tilde{g}\tilde{g}, \tilde{g}\tilde{g}j, \tilde{g}\tilde{g}jj$$

$$pp \rightarrow \tilde{q}\tilde{q} \rightarrow (\tilde{g}j)(\tilde{g}j)$$

   ❖ General methods may be needed
   ❖ The problem holds at NLO

Towards (new) physics: simplified models

✦ What is a simplified model
  ✤ Standard Model plus some (but not that much) stuff
  ✤ Based on a particular signature
  ✤ The minimal (but as general as possible) requirements to produce the signature

✦ ATLAS and CMS have dedicated analyses

✦ LHC results:
  ✤ In terms of visible cross sections
  ✤ Efficiency maps (masses, widths) → more and more available

✦ Towards reinterpretations

✦ Library / database with simplified models, the associated analyses, *etc.*