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- if there is new physics, …**ALL of it!**

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more serious, perhaps less deep, examples:

- Composite light flavor partners (RH charm)
  - why: composite flavor symmetries (ε_K)
  - benefits: hide compositeness in Higgs rates, flavorful naturalness

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- Composite light flavor partners (RH charm)
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- CPV BSM Higgs sector ($\tilde{W}^{\mu\nu} W_{\mu\nu} H^\dagger H$ at ~1TeV)
  - why: LEP+EDM ok, so why not?
  - how: lepton asym. in WH production

some questions?

- There might also be light comp. charm partners:
  - *how well can one tag charm-jets?*
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- *more naive/philosophical:*

  Have all CP phases to be ~o(1)?

e.g. EDMs don't see new physics down to very short distance, should we worry? CP relaxation mechanism?

Points

1. **Well-Motivated Signatures:** Some have been overlooked
   - Example: $(\tilde{H}) : \tilde{t}_R : \tilde{\tau}_R : \tilde{G} \Rightarrow b\bar{b}\tau^+\tau^- + \not{E}_T$

2. **Simple Signatures:** Not every signature has coverage
   - Example: High multiplicity $b-$jets (≥ 5)
   - Example: $t\bar{t} + n$-jet resonances

3. **Higher Luminosity:** Many opportunities to seize
   - Example: rare t, Z, W and h decays

4. **Quirks:** Most exotic quirk signatures completely uncovered
   - Tracks that bend against the magnetic field
   - Straight highly ionizing tracks (may explode in the detector)
   - Charged tracks that “lose mass” as they propagate (may explode)
   - Wobbly tracks
   - ...and more

Questions

1. **Cut-and-Count Searches:**
   - In the space of all possible prompt signatures, are there gaps?

2. **Exotics Objects:**
   - Are all possible LHC accessible exotic objects known?
   - Is there a finite set of searches that can span this space?

3. **Trigger:**
   - Last minute crazy trigger-defying models?

“INTERESTING” POINTS

- Exotics is experimentally undersubscribed
- Displaced vertices across entire range of lifetimes are interesting but difficult
- Large multiplicity of displaced vertices evades all current searches

QUESTIONS FOR DISCUSSION

- Can we make a connection between exotic signatures and naturalness?

- Are there (novel) experimental observables which are sensitive to a broad class of new models? Can they be incorporated into a trigger?

- Is there a feature in the design of future detectors that could allow discovery of something impossible at the LHC?

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Could there be something subtle wrong with SM QFT?

- Looking for higher dim operators or some other problem with NLO QFT
- Probably has to avoid flavor -- probably in gauge sector
- SM measurements!

- Pushing into QCD –
  - Test 3,4 jet pt-ratio, angular distributions at highest possible E
  - Test multi-jet distributions more than just S_T distribution
    - Extend and develop your “black hole” measurement!

- Gluon-EW boson interactions
  - Study via jets + EW boson at highest possible E

- Detailed look at EW dibosons.

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- So within theory of theories, selection bias **does require** choosing sample of vacua/theories/regions with small cosmo constant & hierarchy of scales

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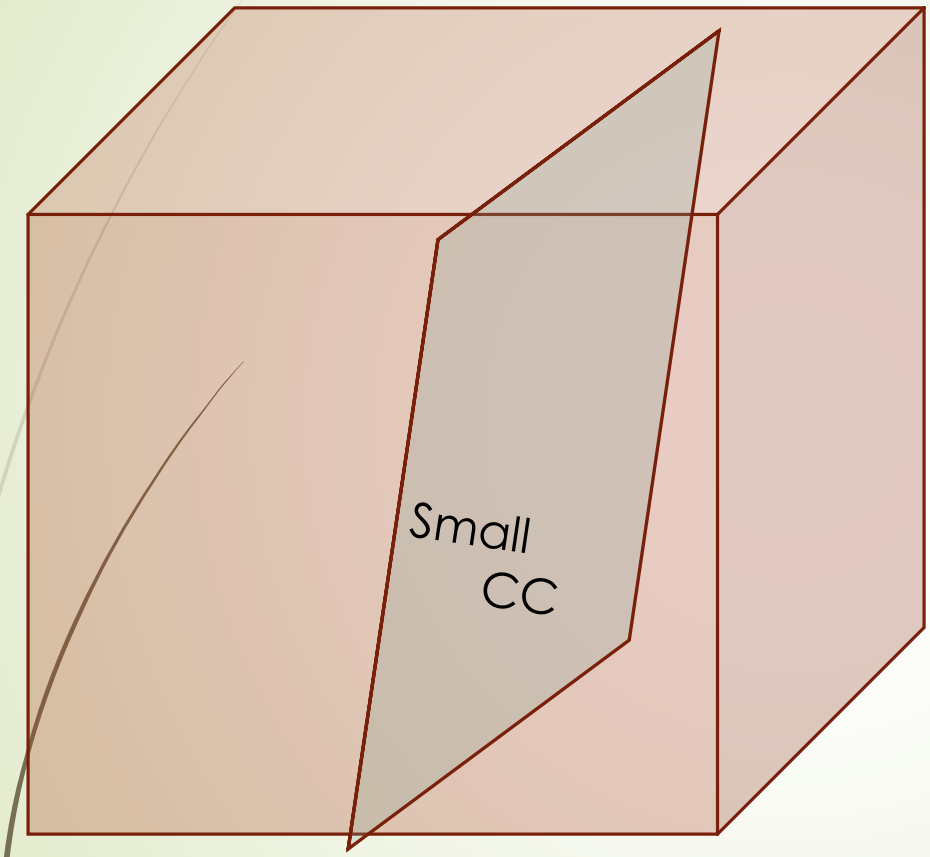
AN OBSERVABLY-LIGHT ELEMENTARY SM HIGGS BOSON?

NOT REQUIRED!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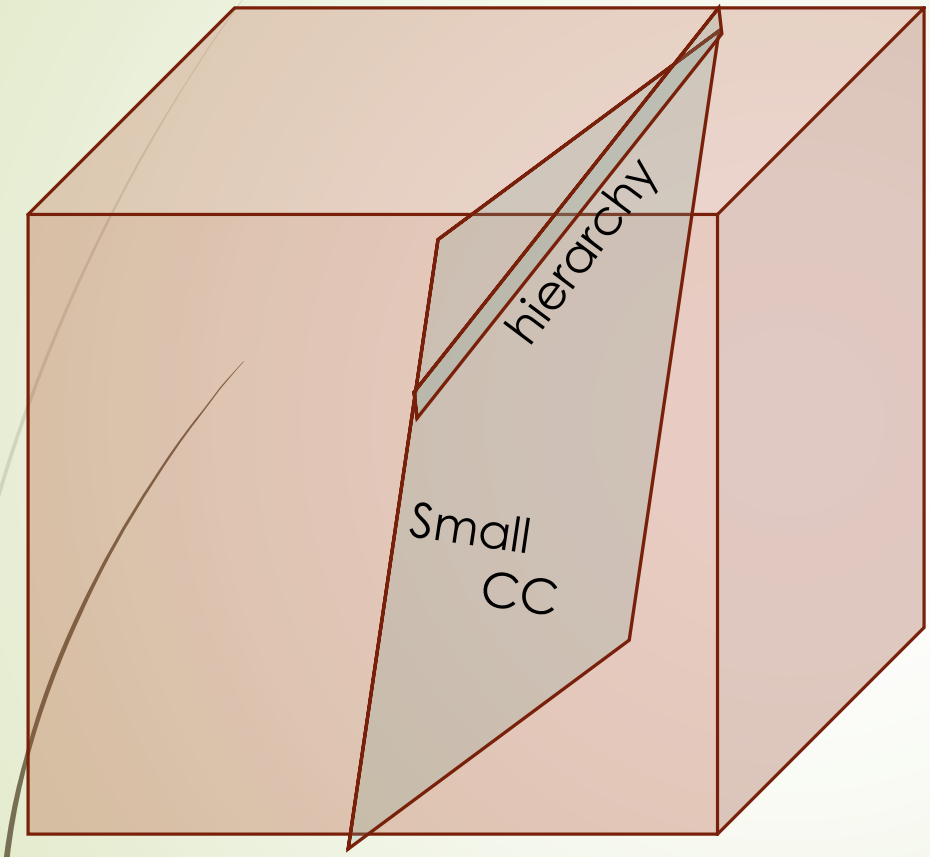
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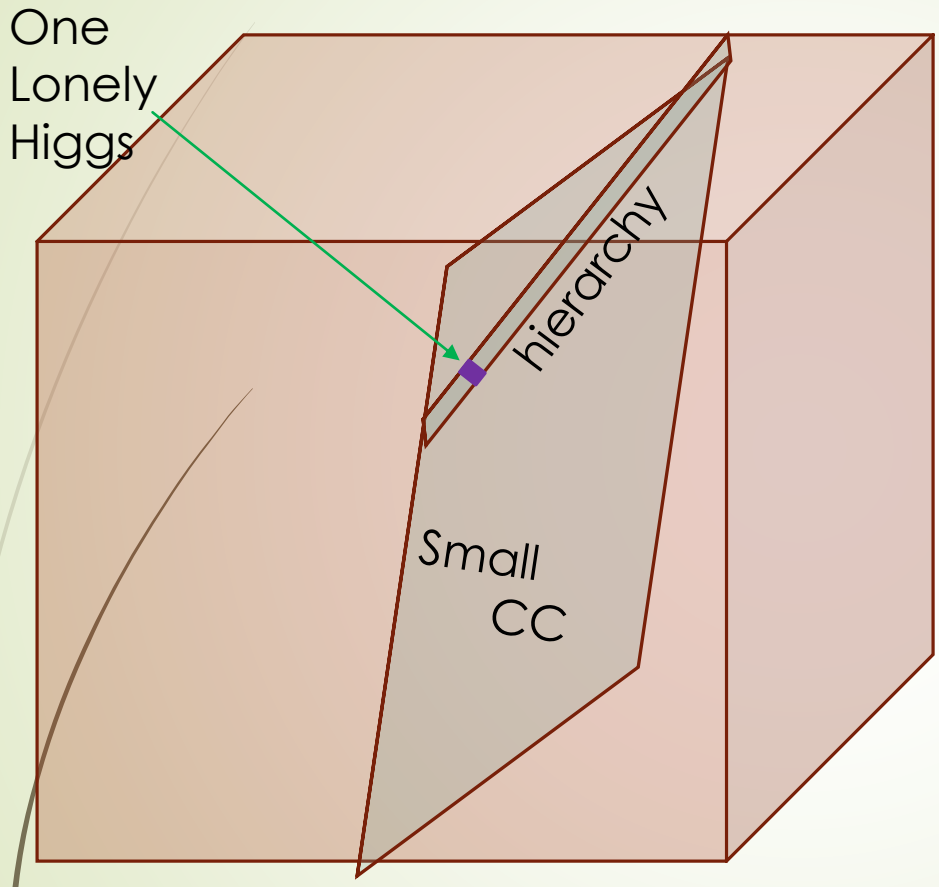

- Technicolor, SUSY, small Yukawas are all acceptable; will appear in this sample
- Statistics of vacua in a theory of theories reintroduces the naturalness problem!
- To avoid this conclusion, need a theory of theories with very special statistics
  - E.g. Arkani-Hamed & Dimopolous in “Scanning”; they consider theories with SM particles and forces, not allowing any changes to particle/field content. Highly non-generic