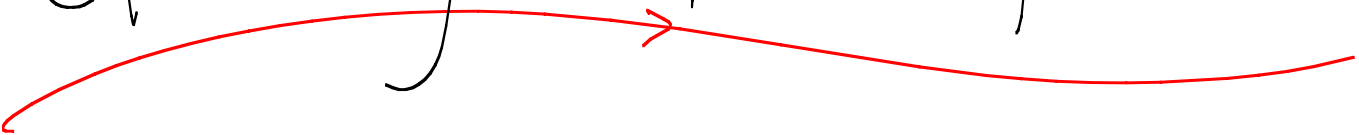


21<sup>st</sup> Century Q's  $\neq$  Q's of 1960's



STAKES ARE LOWER

STAKES ARE HIGHER

Triumph of 20<sup>th</sup> Century

QM + Relativity



Universe is Inevitable

Central Drama of 21st Century

QM + Relativity



Universe (seems) Impossible

★ End of Space-time [Gravity]

Limitations of QM [Cosmology]

★ Why is there a Macroscopic Universe?

Why is it big [CC problem]

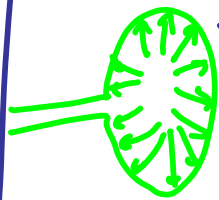
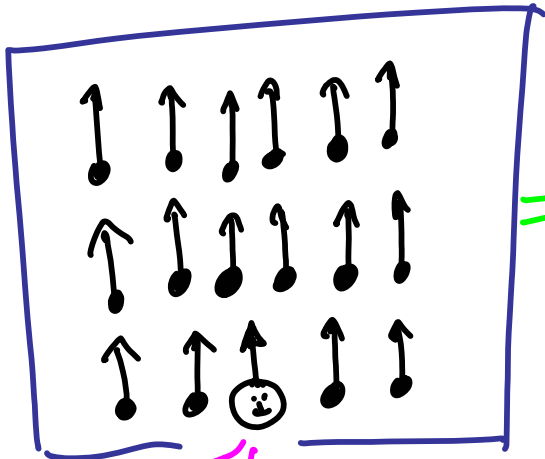
with big things in it [hierarchy problem]?

Higgs Discovery Crucial

Light Higgs

↓  
Our Vacuum is Qualitatively  
Different than Random C.M. System  
[AKA "Crappy Metal"]

Never seen before in "state of nature"




"fine-tuning"

Why are we all pointed in same direction?



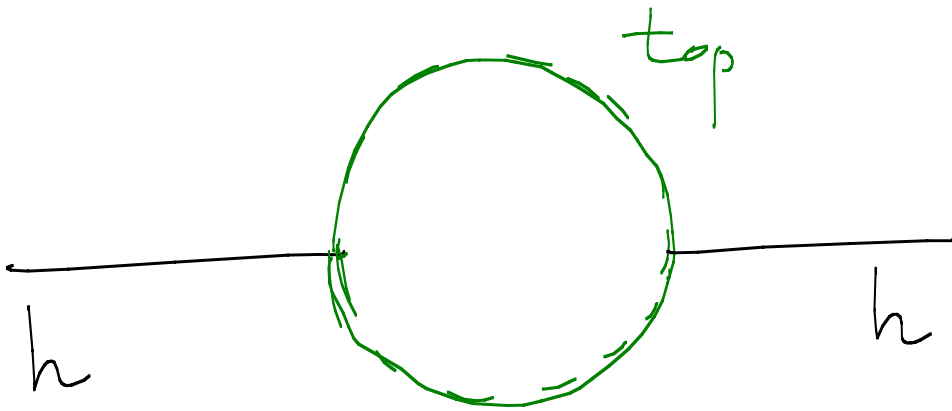
IS WEAK SCALE NATURAL?



HUGE STAKES

BIFURCATORY MOMENT

IN HISTORY OF THE FIELD



$$\left( \frac{\delta m_h^2}{m_h^2} \right) = \left( \frac{\Lambda}{350 \text{ GeV}} \right)^2$$

What is  $\Lambda$ ?



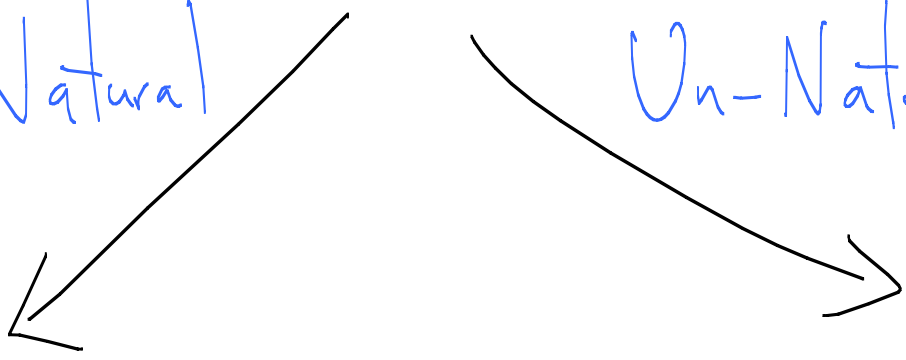
# How will we know?

- Higher Energy, Most Obvious!!
    - \* Find Something! → End of discussion!
    - \* Find Nothing → Tuning  $\propto E_{\text{machine}}^2$
  - Rare processes
  - Precision measurements
- } Indirect,  
Linear  
gain in tuning

No "Nightmare Scenario"

Natural

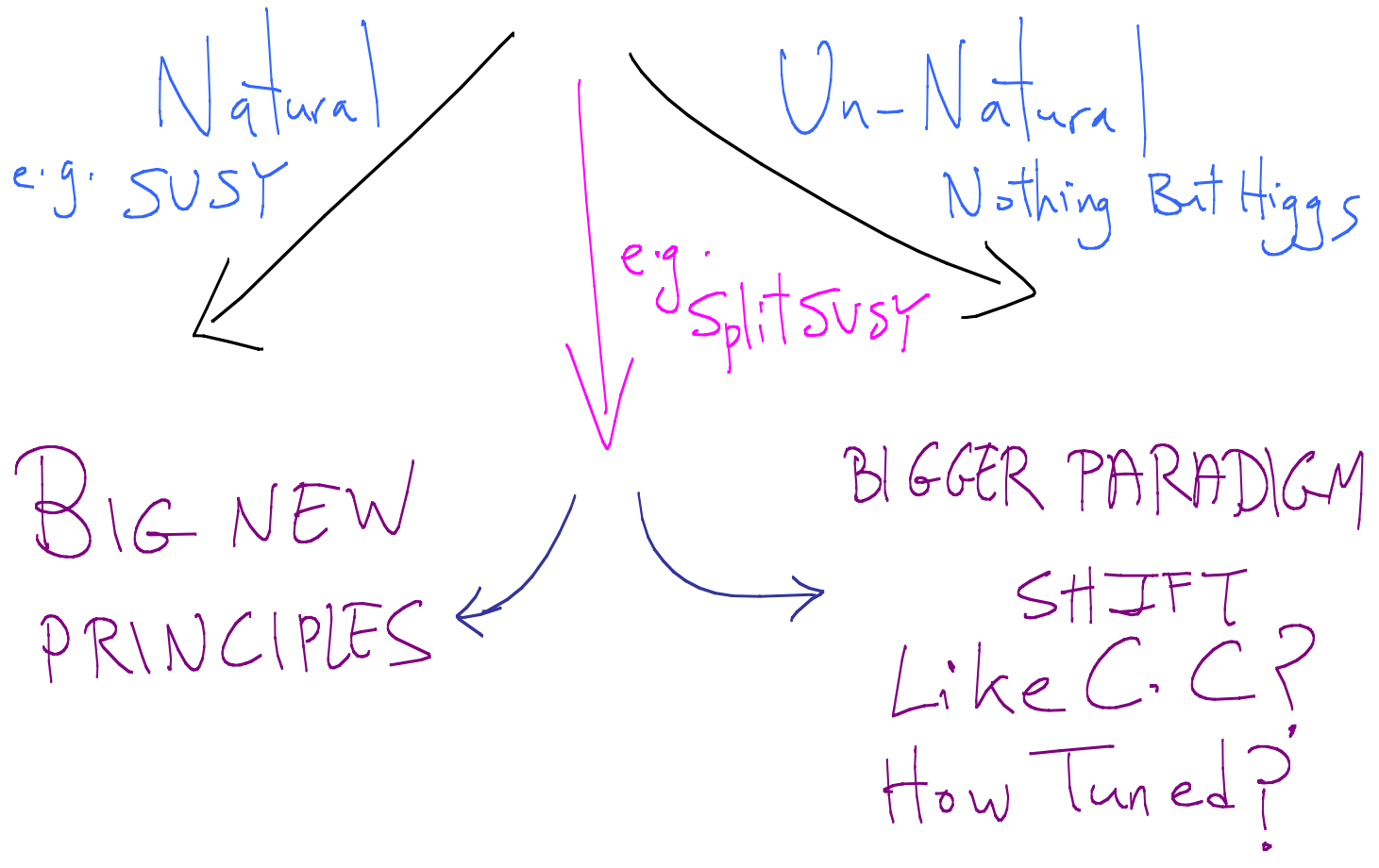
Un-Natural



BIG NEW PRINCIPLES

BIGGER PARADIGM  
SHIFT:  
Like CCP?  
How Tuned?

# No "Nightmare Scenario"



LHC @ 13 TeV : Few % tuning.

LHC @ 33 TeV : Sub-% tuning!

- \* Best for finding heavy particles
- \* Best + most direct quantifier  
of tuning

# Precision Higgs Couplings

"LHC will get to 10%,

Higgs factory to 1%"

★ Can a deviation of 1% be solidly established?

★ Doesn't LHC see underlying NP anyway?

# My wish for US HEP on 20yr Timescale

- ★ All-in with the LHC, Push to 33 TeV
- ★ Carry out important, exciting + cheap fishing expeditions:
  - EDM's, rare FCNC's, low-E hiddensect, DM, axions, .....

# The 10-1000 TeV Scale

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- \* Many reasonable motivations
- \* Can get signals of NP @ these scales from experiment
- \* Feasible to get there on 50-100 yr timescale