Phenomenology

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Snowmass
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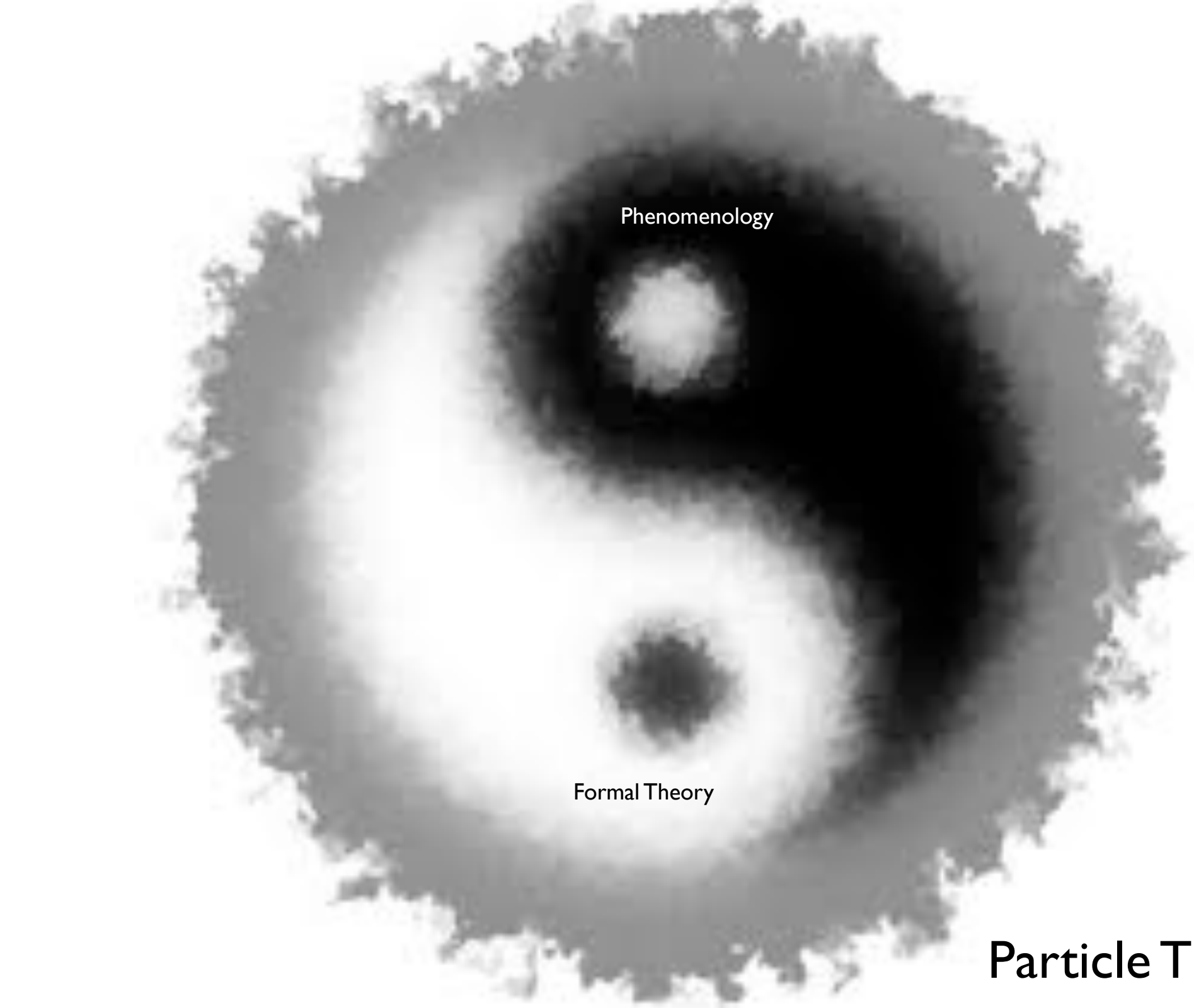
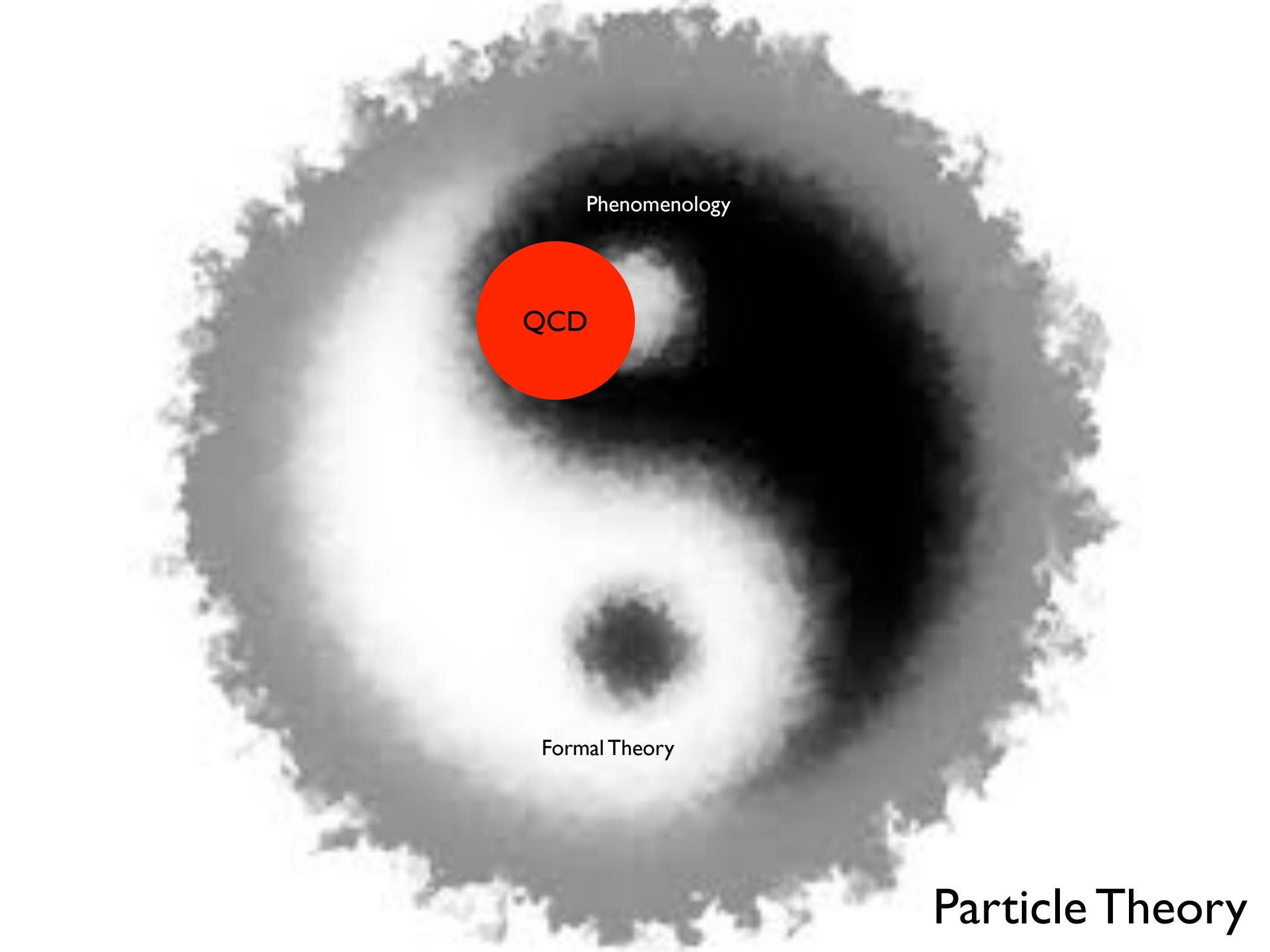
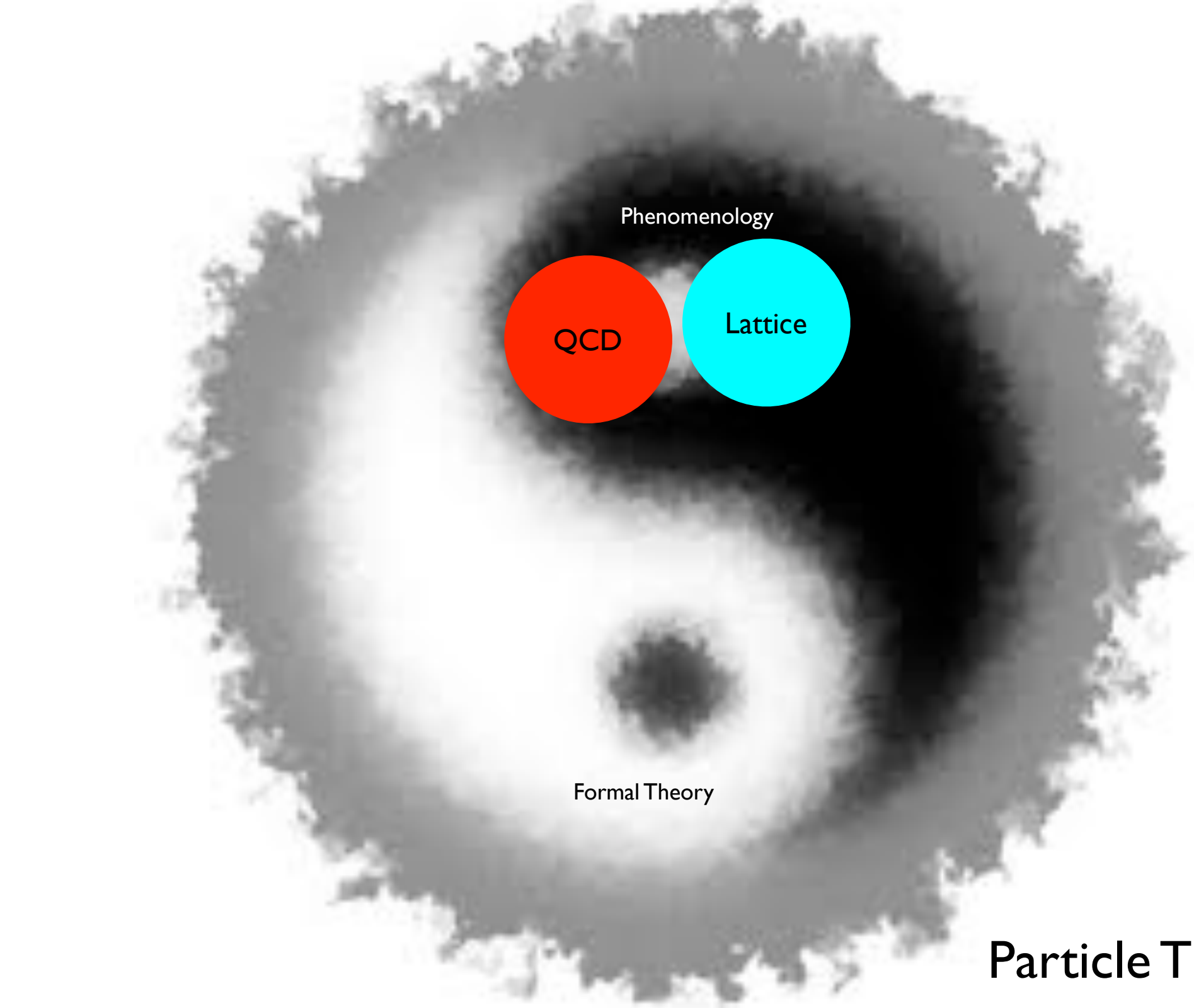


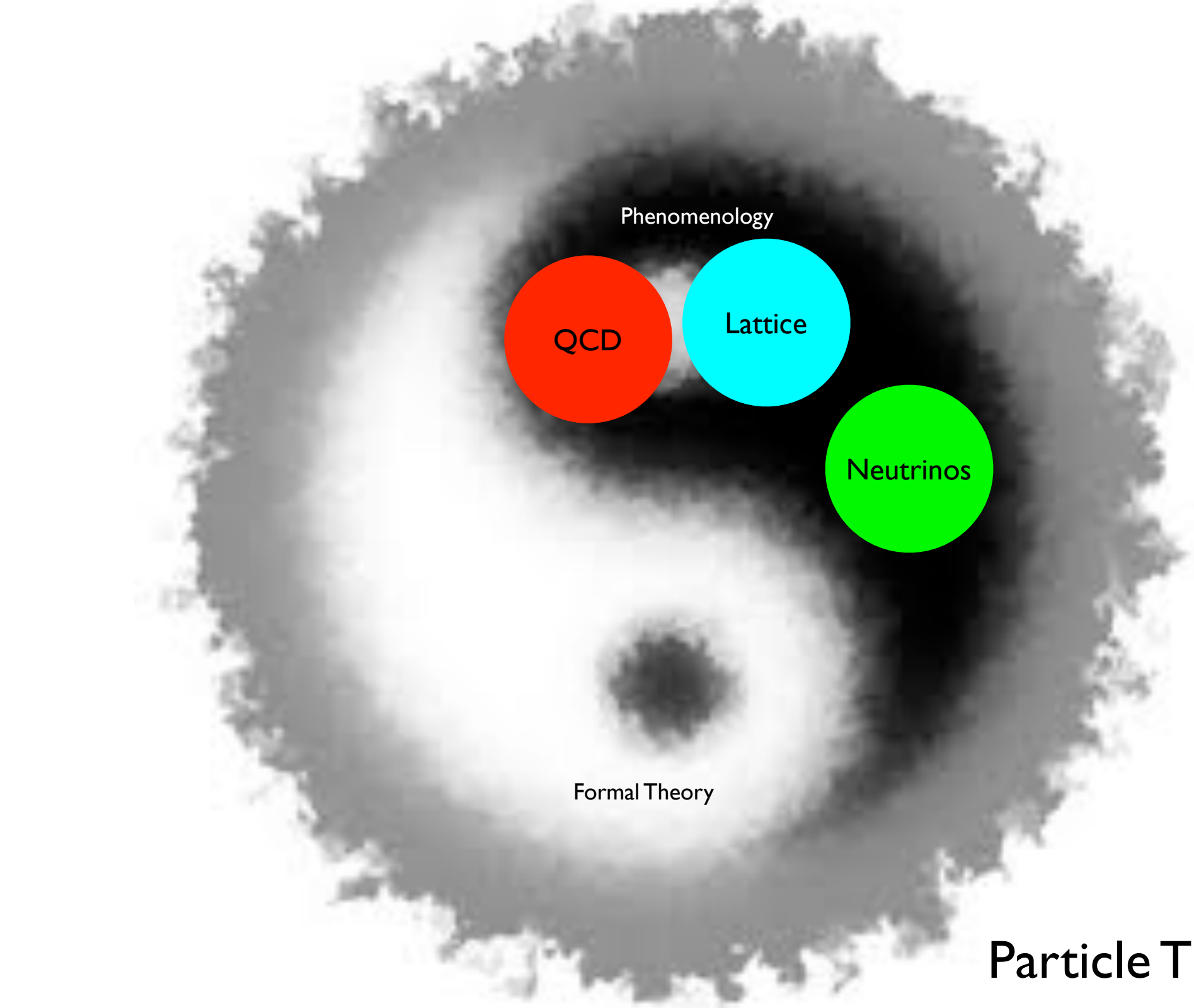
Particle Theory



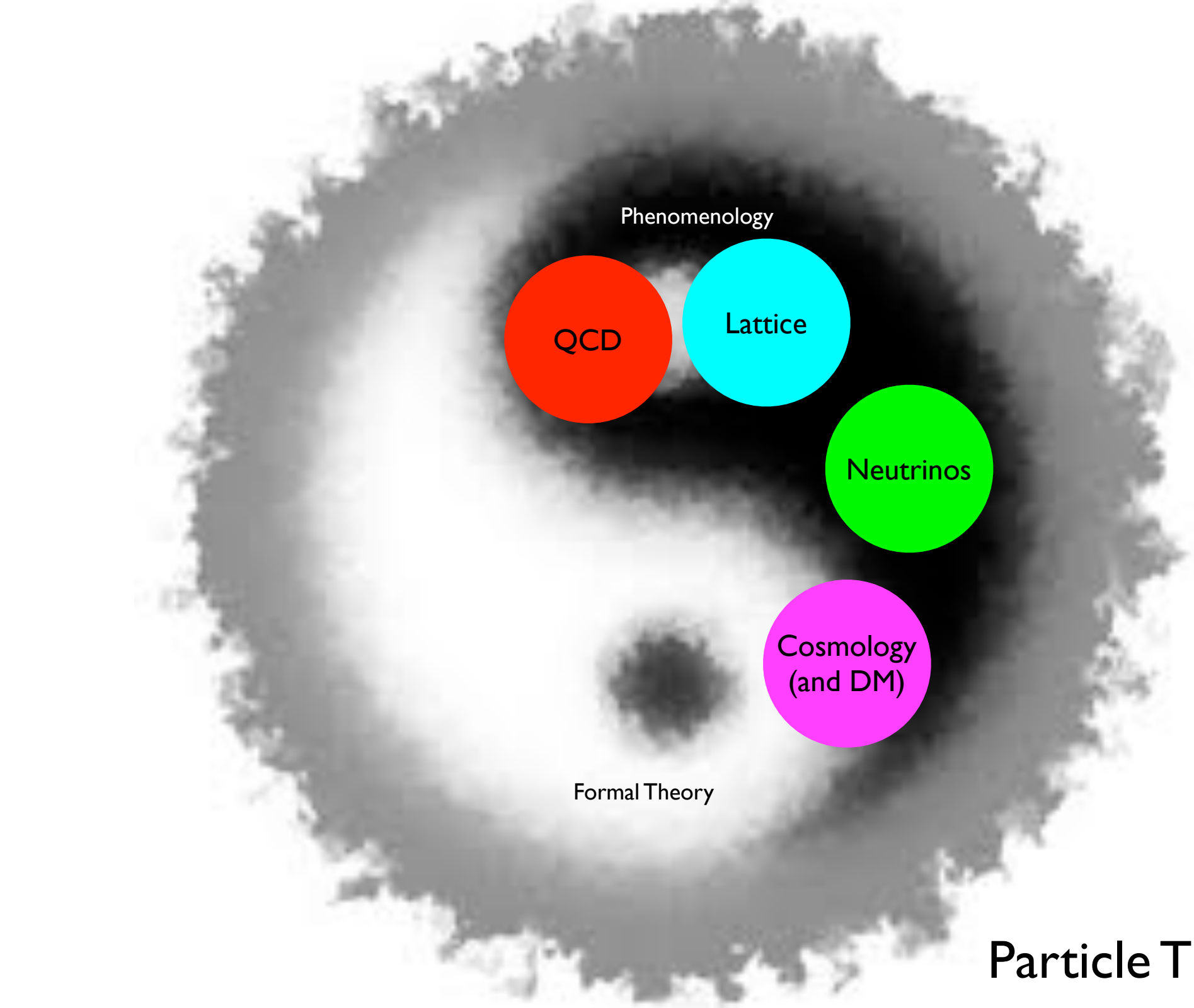
Particle Theory



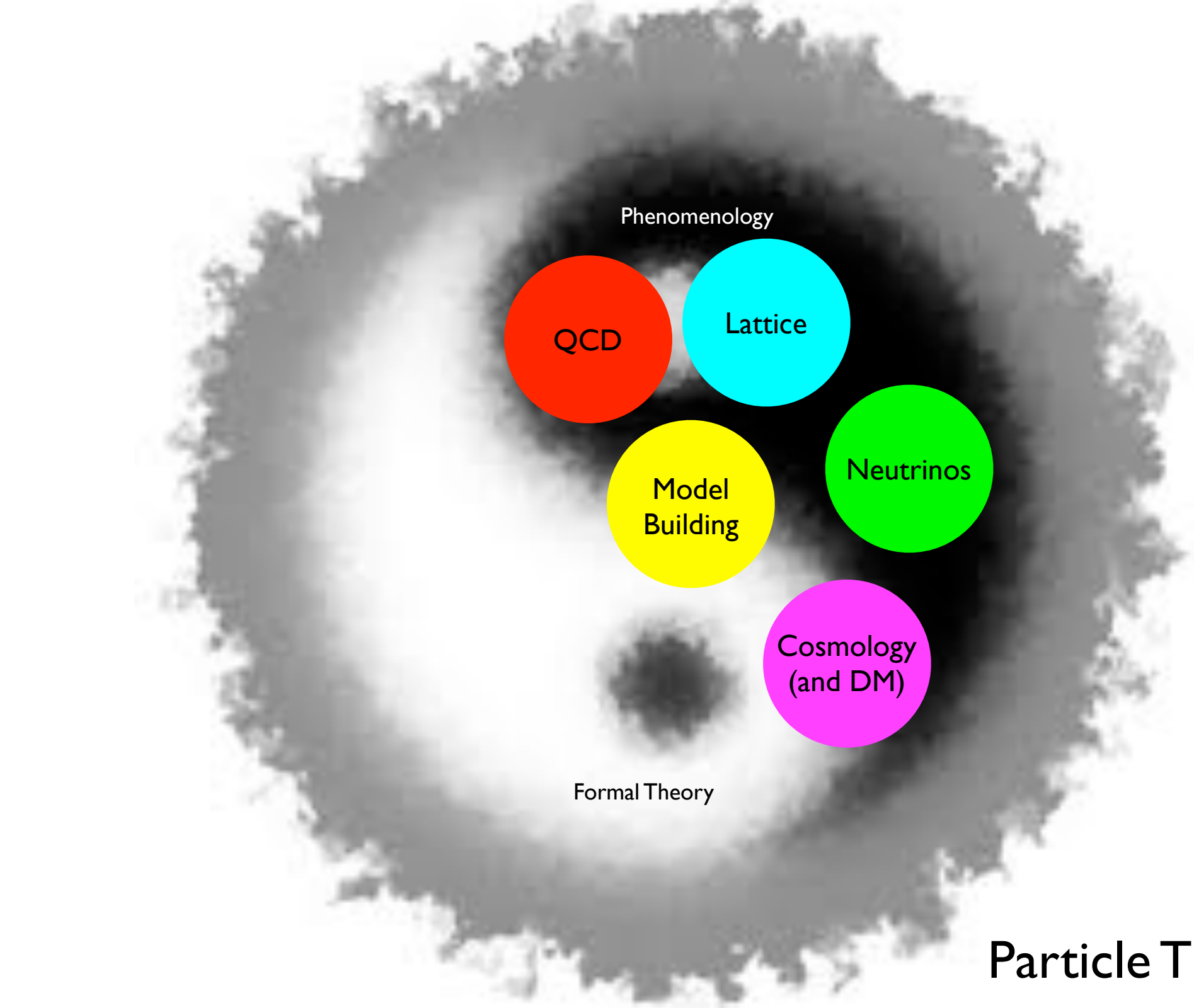
Particle Theory



Particle Theory



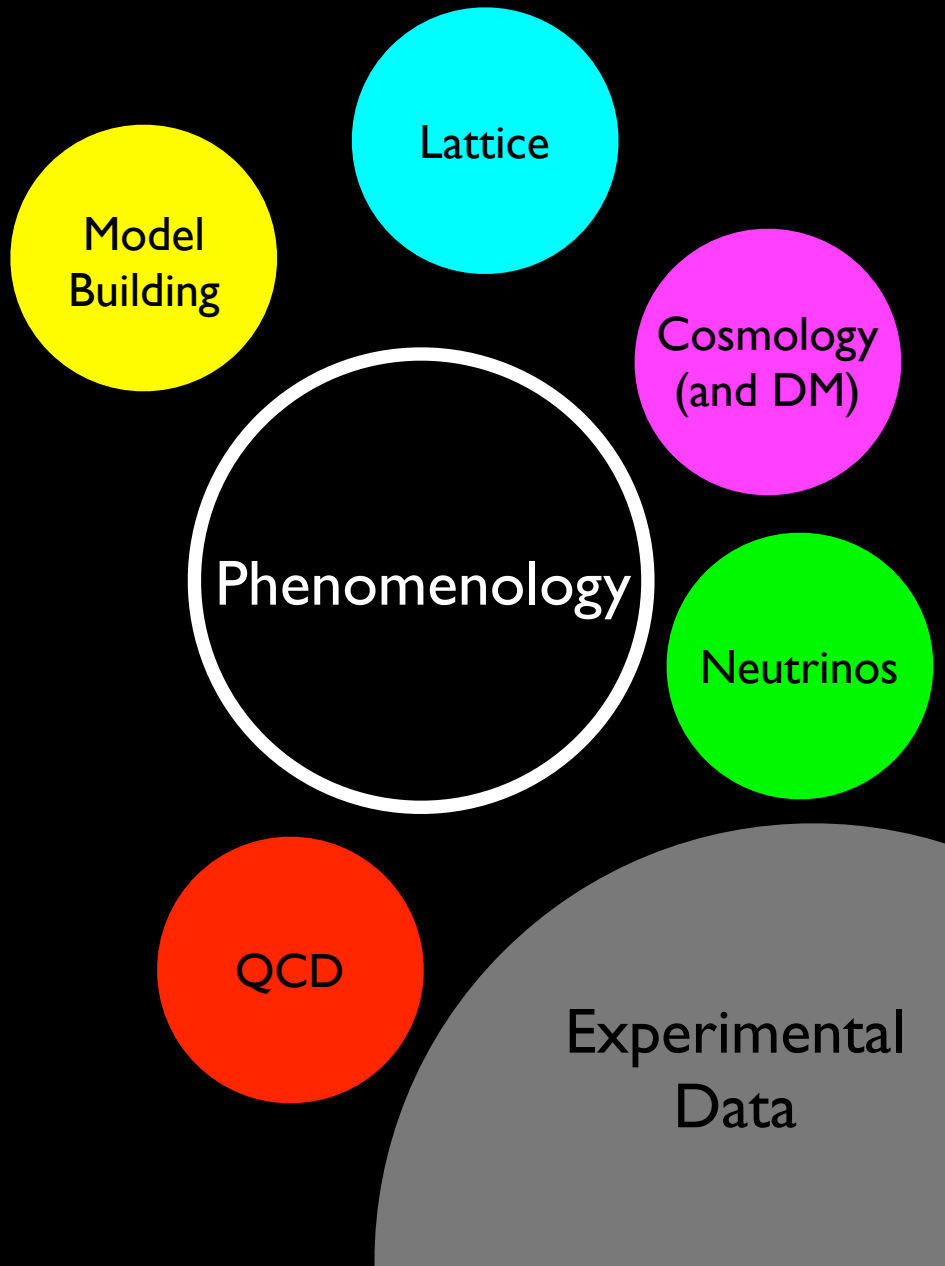
Particle Theory



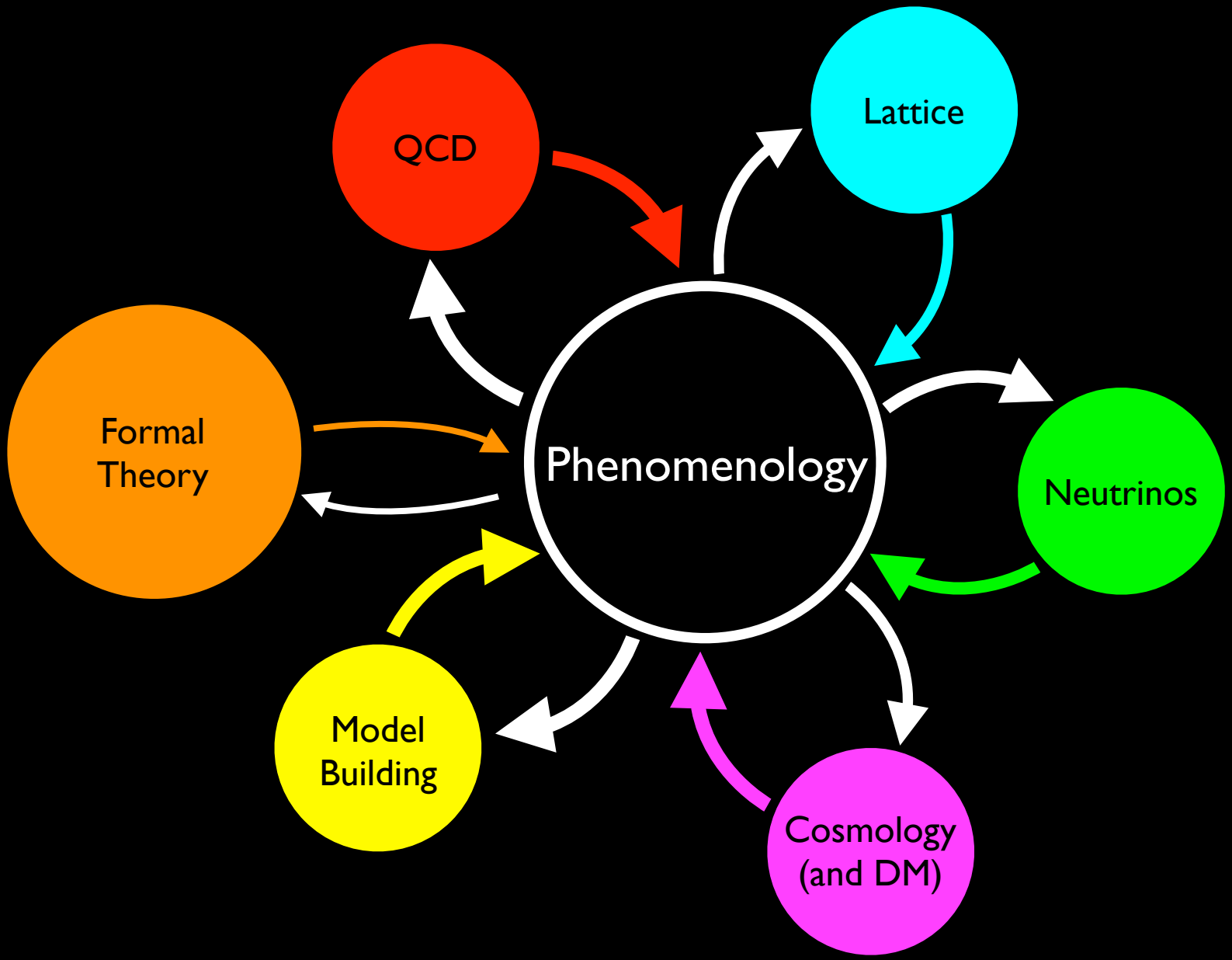
Particle Theory

Working Definition

- As a working definition for this presentation, I'm going to consider phenomenology the parts of theory which interact directly with experiments.
- This could be either something like:
  - A suggestion for how to search for some kind of fundamental physics [including improving on existing searches].
  - Taking a feature in data and providing the "theory support" needed to put it in context.

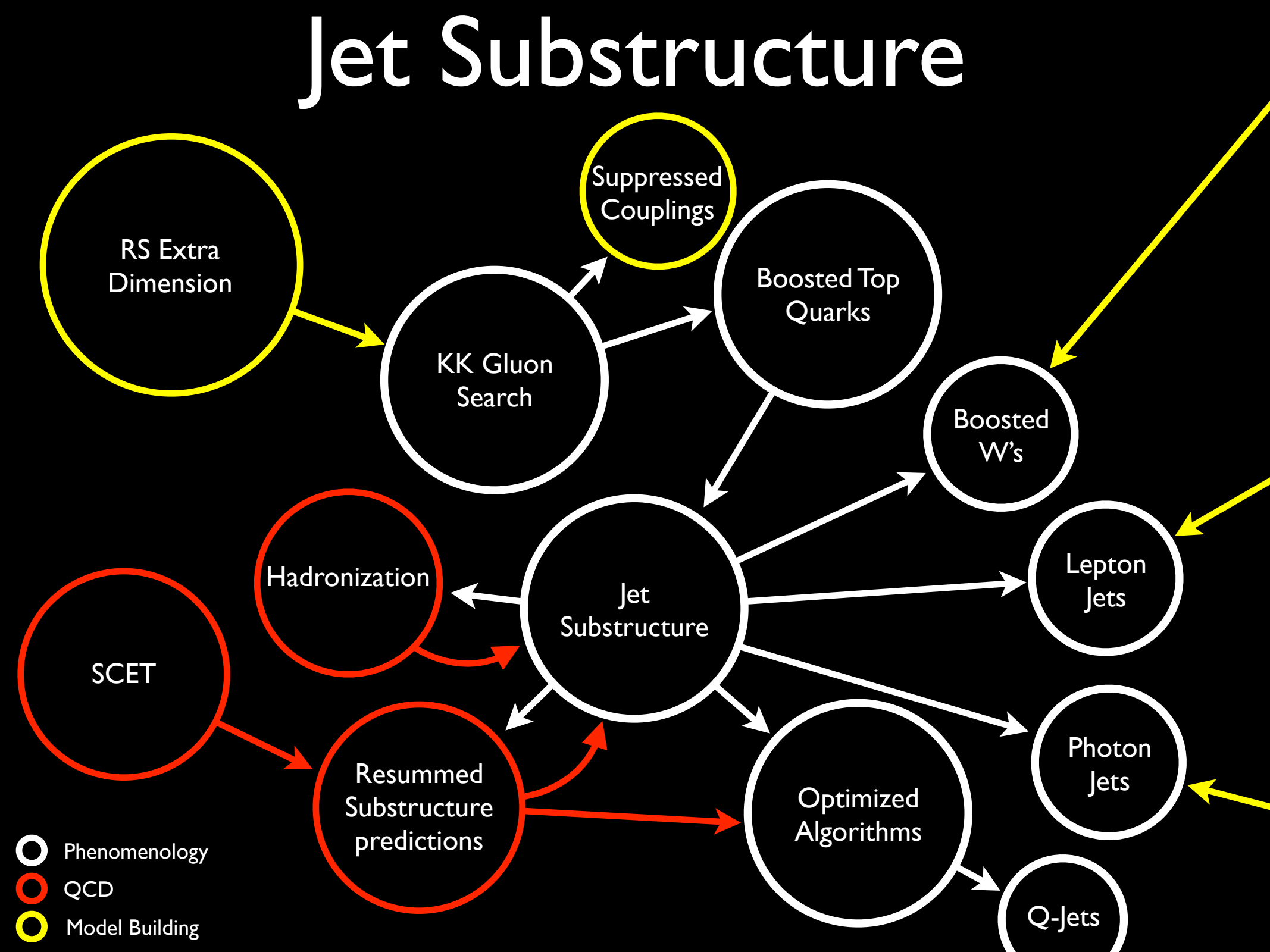


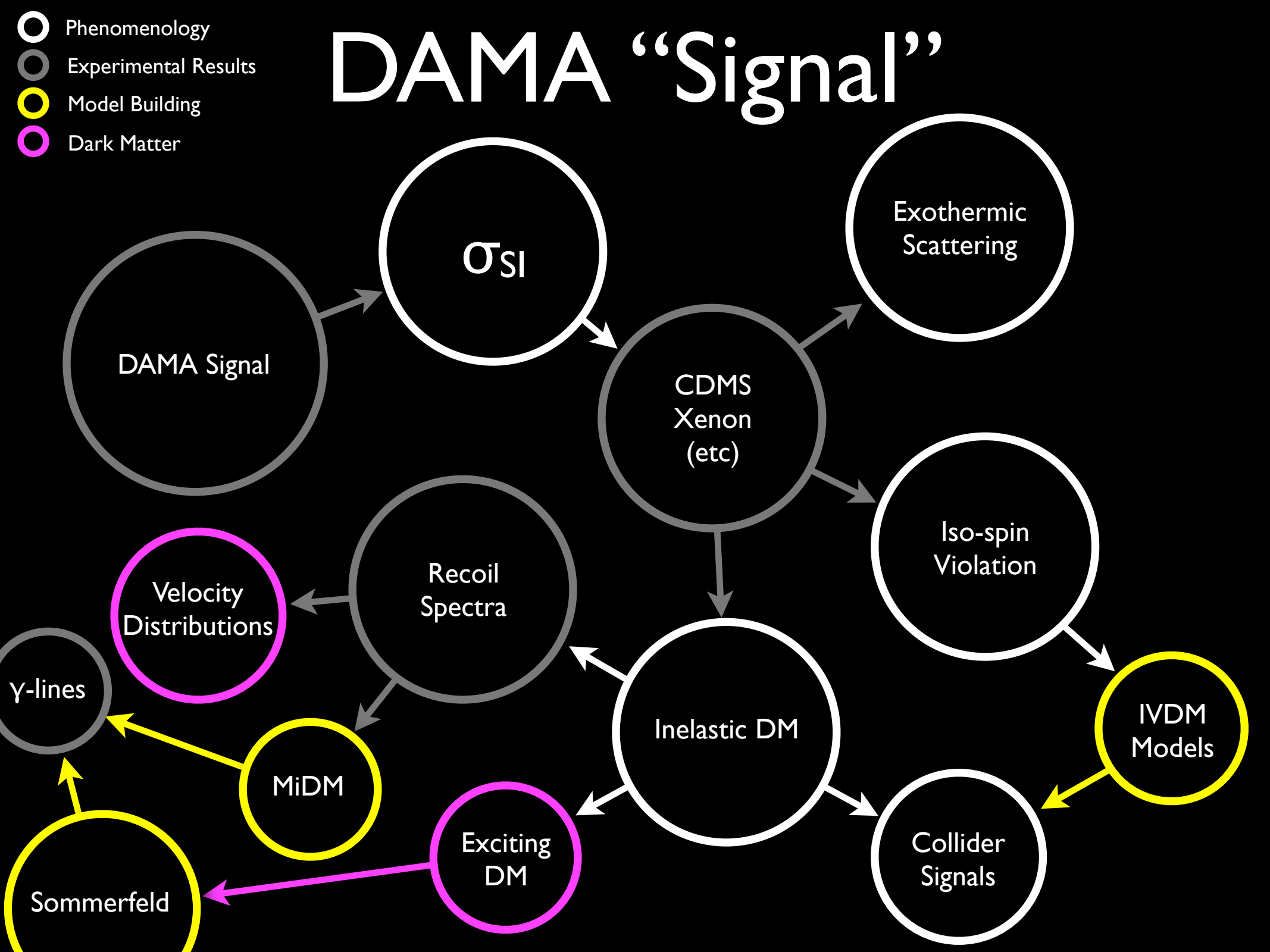
Connections



(Random) Examples

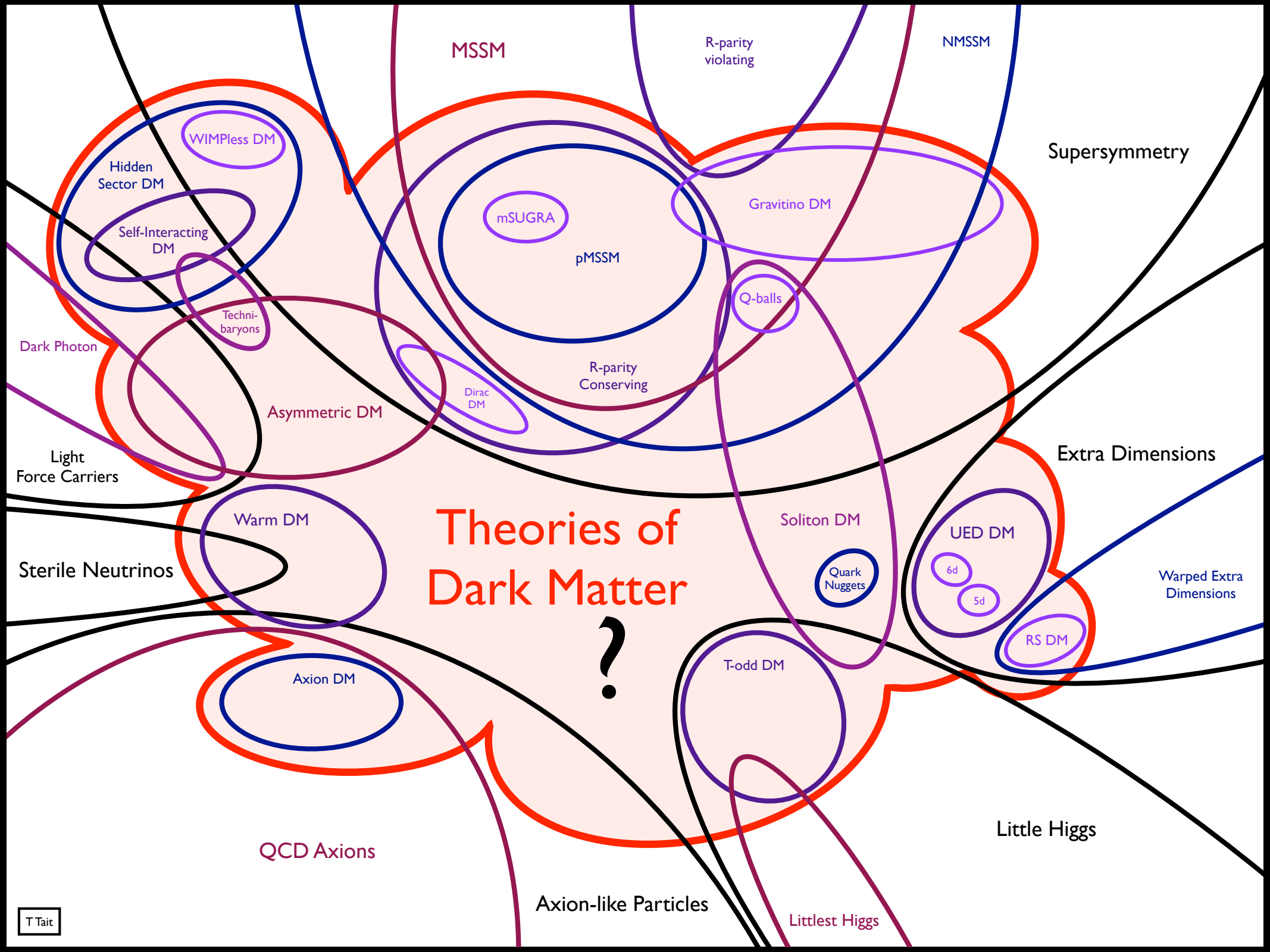
Jet Substructure




Phenomenology
Experimental Results
Model Building
Dark Matter
DAMA "Signal"
DAMA Signal
σ_{SI}
Exothermic Scattering
CDMS Xenon (etc)
Iso-spin Violation
Recoil Spectra
Velocity Distributions
γ-lines
MiDM
Sommerfeld
Inelastic DM
Exciting DM
IVDM Models
Collider Signals

Outlook

- Phenomenology is the glue that holds many areas of particle theory together and interfaces it with experimental data.
- The last decades have illustrated this point very well. We saw a couple of specific (but randomly chosen) examples. Many, many more exist.
- The next decade is hard to predict with any accuracy; but the essential role is established, and the importance of phenomenology in interpreting and guiding the current "data rich" era is very easy to appreciate. A few one could easily imagine in the next ten years:
  - Taking experimental discoveries of dark matter and distilling them into a particle physics Lagrangian.
  - Measuring the parameters of the (N)MSSM$^{(++)}$ from collider measurements.
  - Contrasting our newest and greatest theories attempting to explain flavor with measurements to indicate hints that they are (in)correct.


MSSM
R-parity violating
NMSSM
Supersymmetry
WIMPless DM
Hidden Sector DM
Self-Interacting DM
mSUGRA
pMSSM
Gravitino DM
Q-balls
Techni-baryons
Dark Photon
R-parity Conserving
Dirac DM
Asymmetric DM
Light Force Carriers
Extra Dimensions
Warm DM
Theories of Dark Matter
?
Soliton DM
Quark Nuggets
UED DM
6d
5d
Warped Extra Dimensions
Sterile Neutrinos
RS DM
Axion DM
T-odd DM
Little Higgs
QCD Axions
Axion-like Particles
Littlest Higgs
T Tait