Anomaly Mediated Supersymmetry Breaking for Chiral Gauge Theories

BETHANY SUTER, UC BERKELEY

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COLLABORATORS: HITOSHI MURAYAMA, JACOB LEEDOM

About me!

- I'm a rising third year grad student at UC Berkeley (Advisor: Hitoshi Murayama)
- I was born in Virginia (east coast of US), lived in California for 6 years now
- I love reading (especially fantasy books), board games, cooking, contra & waltz and other types of dancing!
- I'm very excited because when I get back home, I'm getting my first dog!

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  - No pictures yet, I'm sorry 😟

Calculating Chiral Dynamics

Lattice Calculations

- Simulates nonperturbative gauge interactions on a lattice
- Unrealistic due to fermion doubling problem

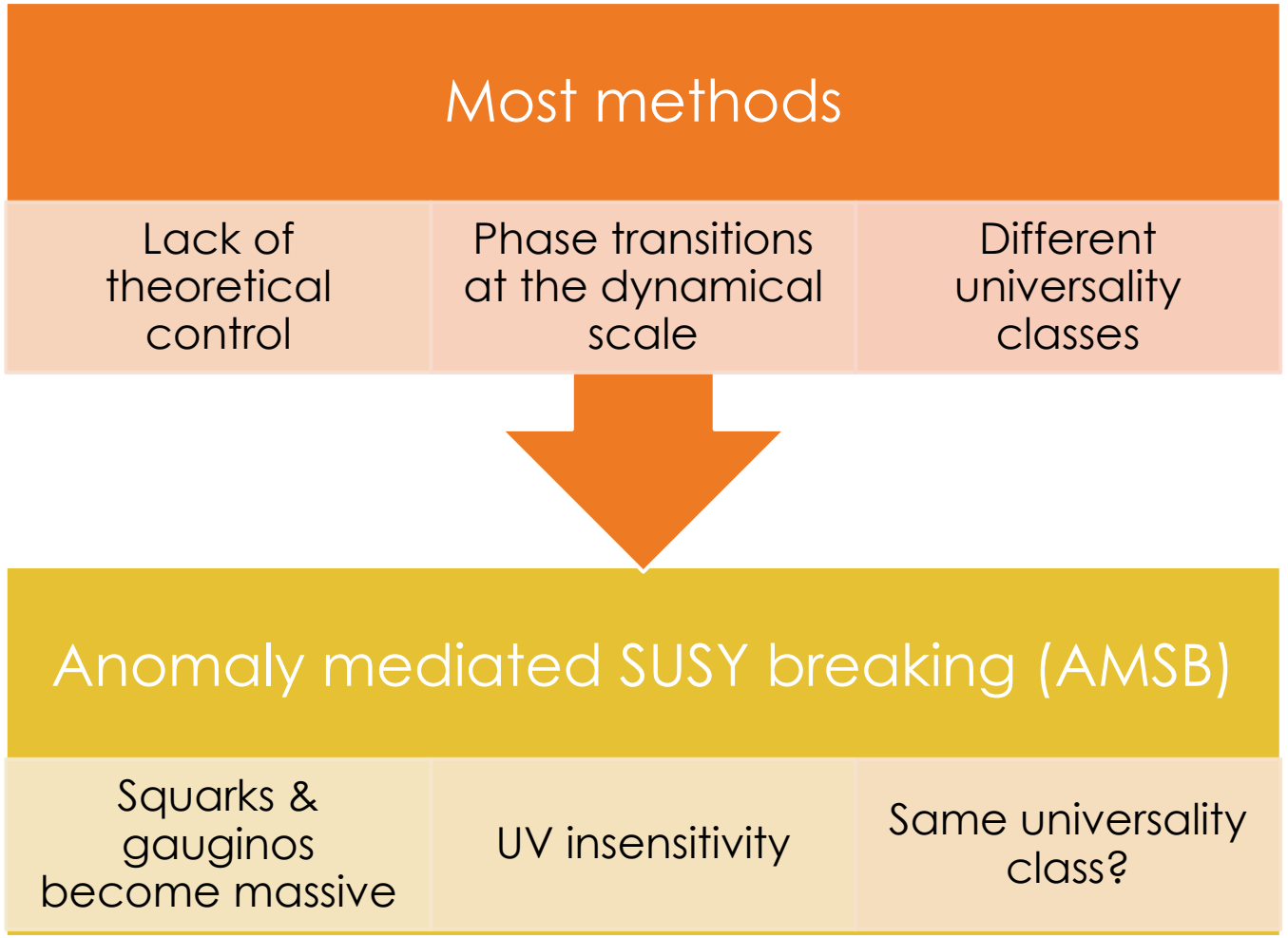
Tumbling

- Postulates condensates that successively break symmetry down to QCD-like theories
- Is still a conjecture

SUSY

- Dynamics are often fully solvable due to holomorphy
- We haven't found SUSY, so we need results for the non-SUSY theories

SUSY Breaking



AMSB Summary

- Additional tree level term in the potential

$$\mathcal{L}_{\text{tree}} = m\left(\phi_i \frac{\partial W}{\partial \phi_i} - 3W\right) + c.c.$$ 2104.01179

- Loop level piece in trilinear couplings, and scalar & gaugino masses

$$m_\lambda(\mu) = -\frac{\beta(g^2)}{2g^2}(\mu)m \qquad m_i^2(\mu) = -\frac{1}{4}\dot{\gamma}_i(\mu)m^2$$

$$A_{ijk}(\mu) = -\frac{1}{2}(\gamma_i + \gamma_j + \gamma_k)(\mu)m$$

- All terms determined from energetically local physics → UV insensitivity
- In the asymptotically free limit, $m_i^2 > 0$, the theory is stabilized

Results

- Large class of chiral gauge theories hep-th/9510148
- With AMSB, we can find:
  - Vacuum structure
  - Broken/remaining symmetries
  - Fermion & scalar masses
  - t'Hooft anomaly matching conditions

Main Takeaways

- AMSB is a great method for approaching many otherwise insolvable theories with strong dynamics
- AMSB only depends on physics at the energy scales of interest: UV insensitivity
- AMSB passes many nontrivial tests, such as t 'Hooft anomaly matching, sum rules and counting of massless particles
- *Bonus: If you look at QCD-like theories, you may be able to predict confinement!*

Questions?