A DARK MATTER STUDY THROUGH THE HIGGS PORTAL

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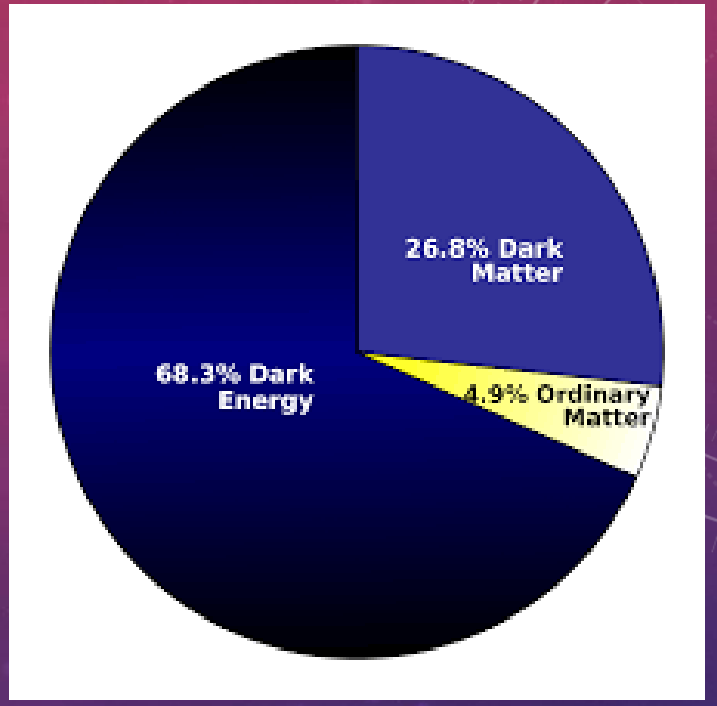
WHAT IS DARK MATTER AND HOW DO WE KNOW IT EXISTS?



Dark Matter (DM) is a form of mass-energy

- Electrically neutral
- Transparent
- Makes up 27% of universe
- May be a new type of particle

How do we know it exists?

- Galaxy rotation curves
- Gravitational Lensing Measurements

What are WIMPs?

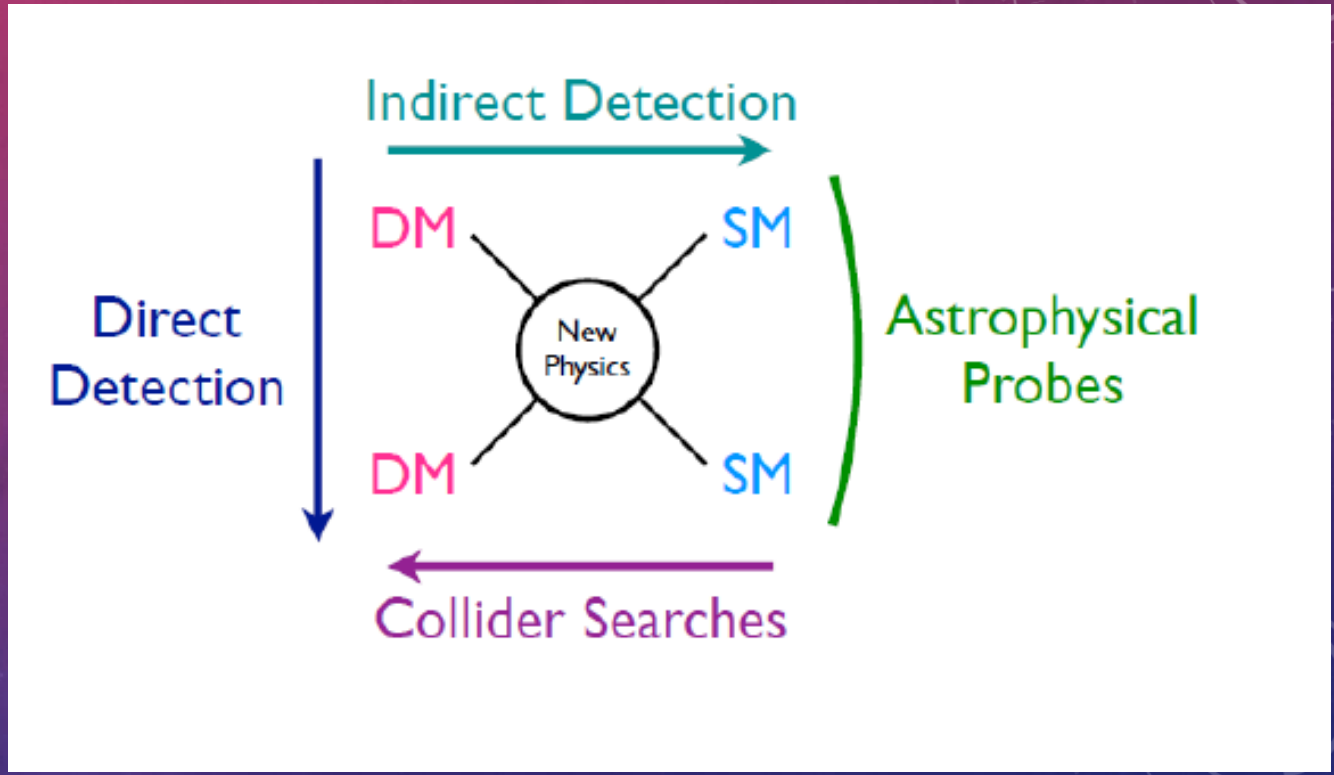
- WIMPs are Weakly Interacting Massive Particles
- Typically 1 GeV-10,000 GeV (mass of proton)
- Proposed new DM particle

3 WAYS OF DETECTING DARK MATTER

1. Direct Detection:
Wait for WIMPs to hit nuclei; measure recoil of nucleus

2. Indirect Detection:
Look for Standard Model (SM) particles left behind from WIMP self-annihilation

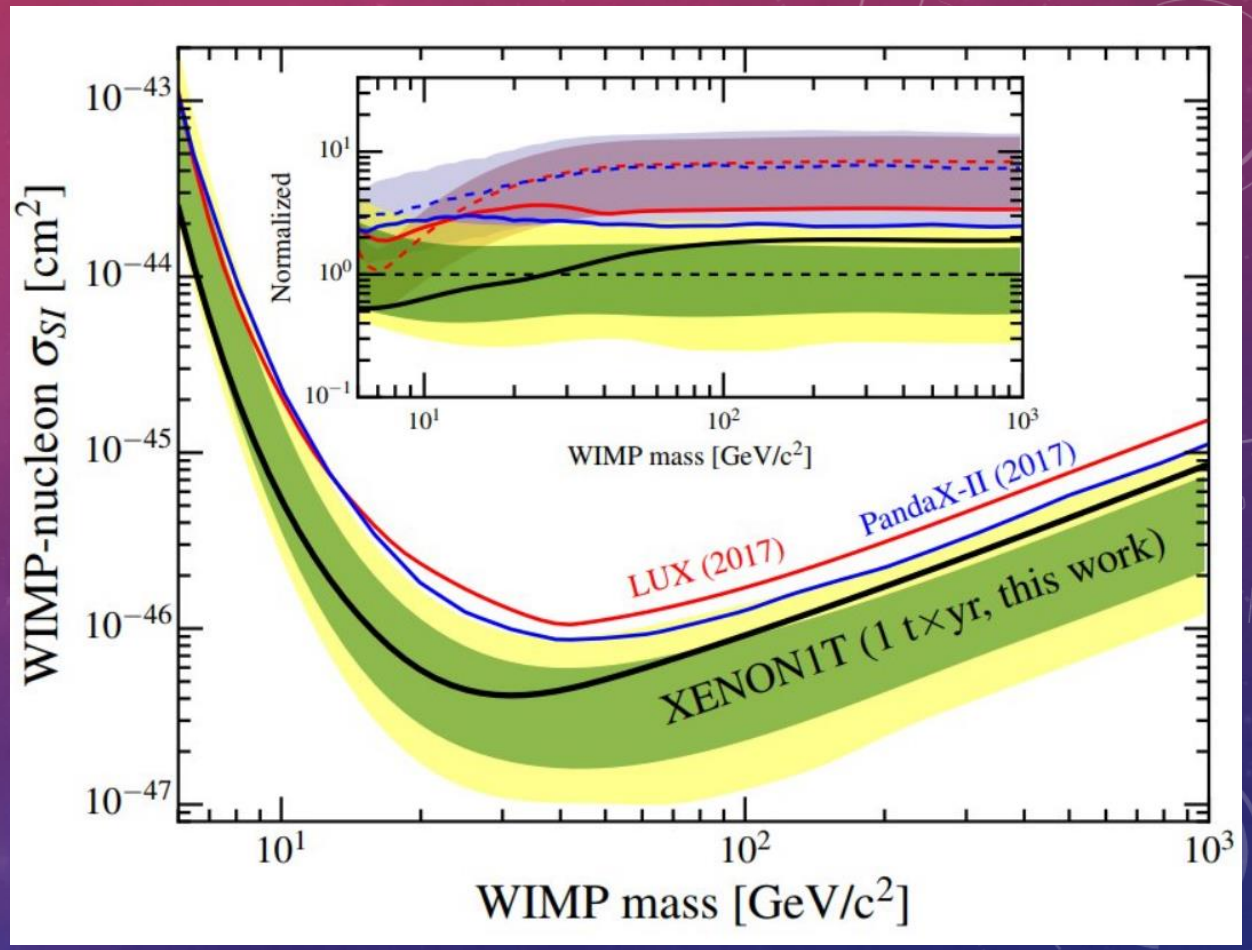
3. Collider Experiments:
Treat WIMPs produced as missing energy and momentum; use conservation laws



Dr. Sinha, 2017

THEORY AND EXPERIMENT

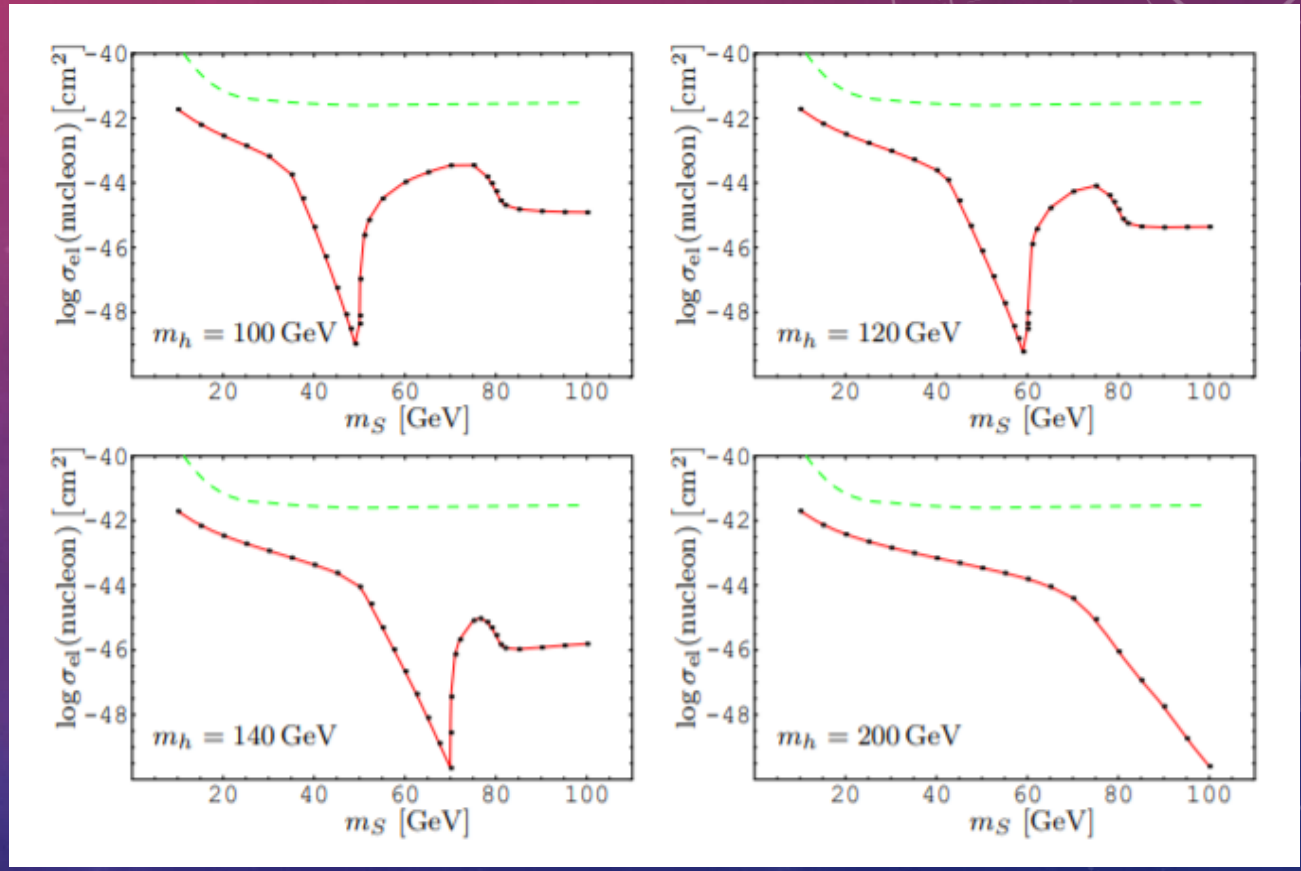
- The XENON1T Experiment
- Constraints on DM parameters
- Start with model; calculations based on WIMPs interaction with SM particles



Xenon1T.org

THE HIGGS PORTAL AND MY SUMMER RESEARCH

- Portals connect SM to dark sector
- The Higgs field gives particles mass
- Higgs portal is a model for mediation between SM and DM
- "The Minimal Model of Nonbaryonic Dark Matter: A Singlet Scalar," C. P. Burgess et al.
- I will study their predictions and analyze the Higgs portal as a model for DM direct detection and attempt to reproduce their plots



C. P. Burgess et al.

QUESTIONS?

THANK YOU!