

- JCP HEP School 1st Lecture

Introduction to Dark Matter and Indirect Detection

Haebarg Kang

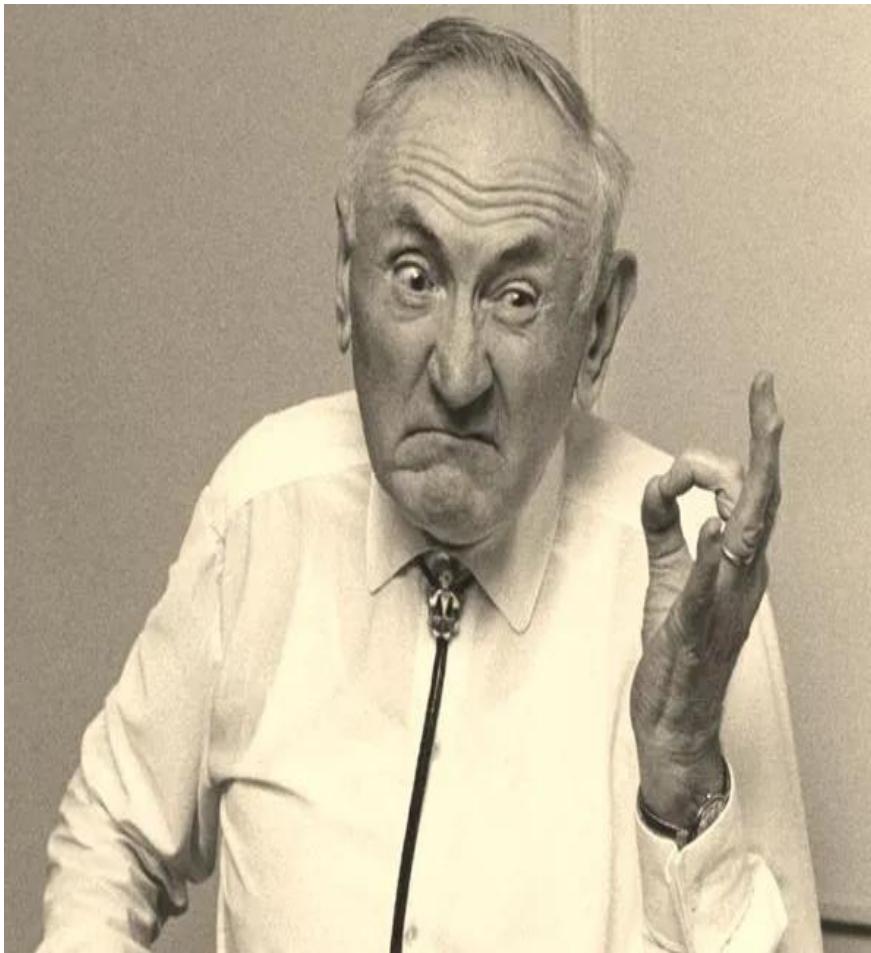
November 8, 2025

NASA, ESA, and J. Lotz and the HFF Team (STScI)

Contents

1. What is Dark Matter and Why must it exist?
2. Thermal Relics and the WIMP Paradigm
3. Limitations of WIMP and Currents Status
4. Dark Matter Indirect Detection

What is Dark Matter?



Fritz Zwicky - Nick D'Alto, Smithsonian magazine



Coma cluster - Estonia

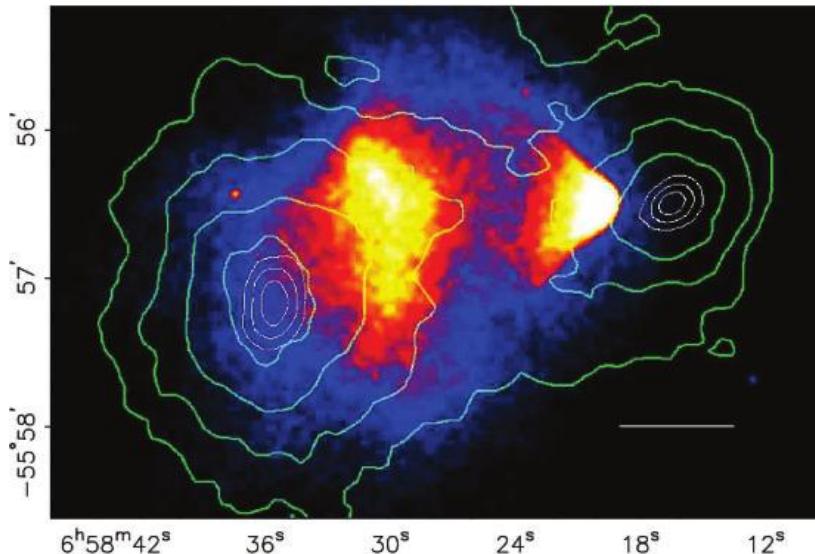
Galaxy rotation curve



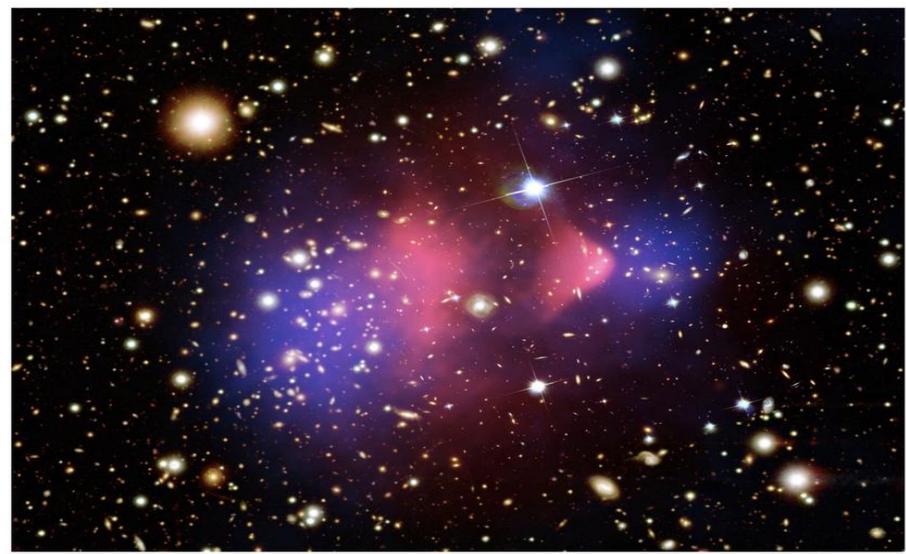
Galaxy rotation curve - wikipedia

Bullet Cluster

NASA's James Webb Space Telescope NIRCam



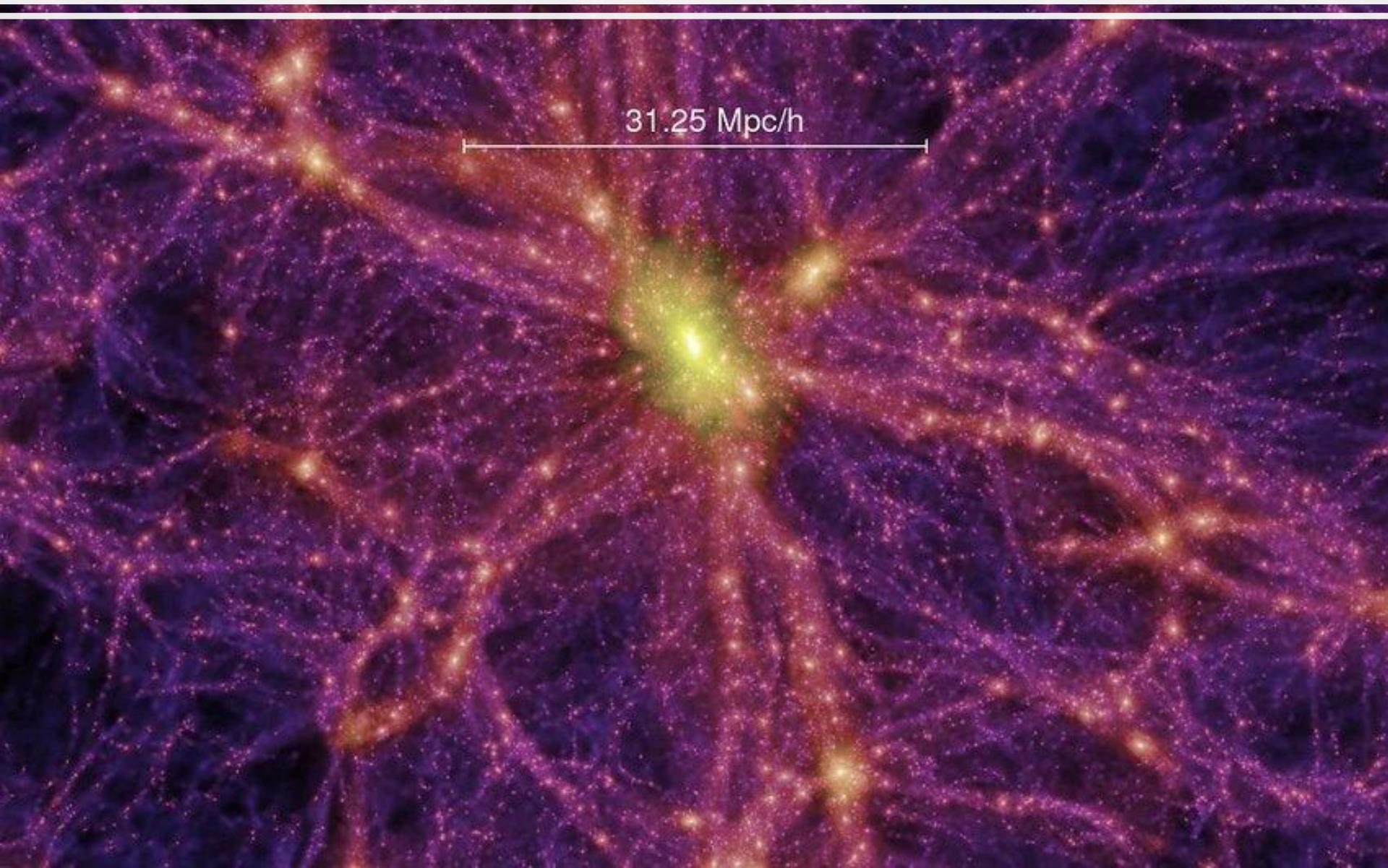
NONBARYONIC DARK MATTER IN COSMOLOGY, Del Popolo



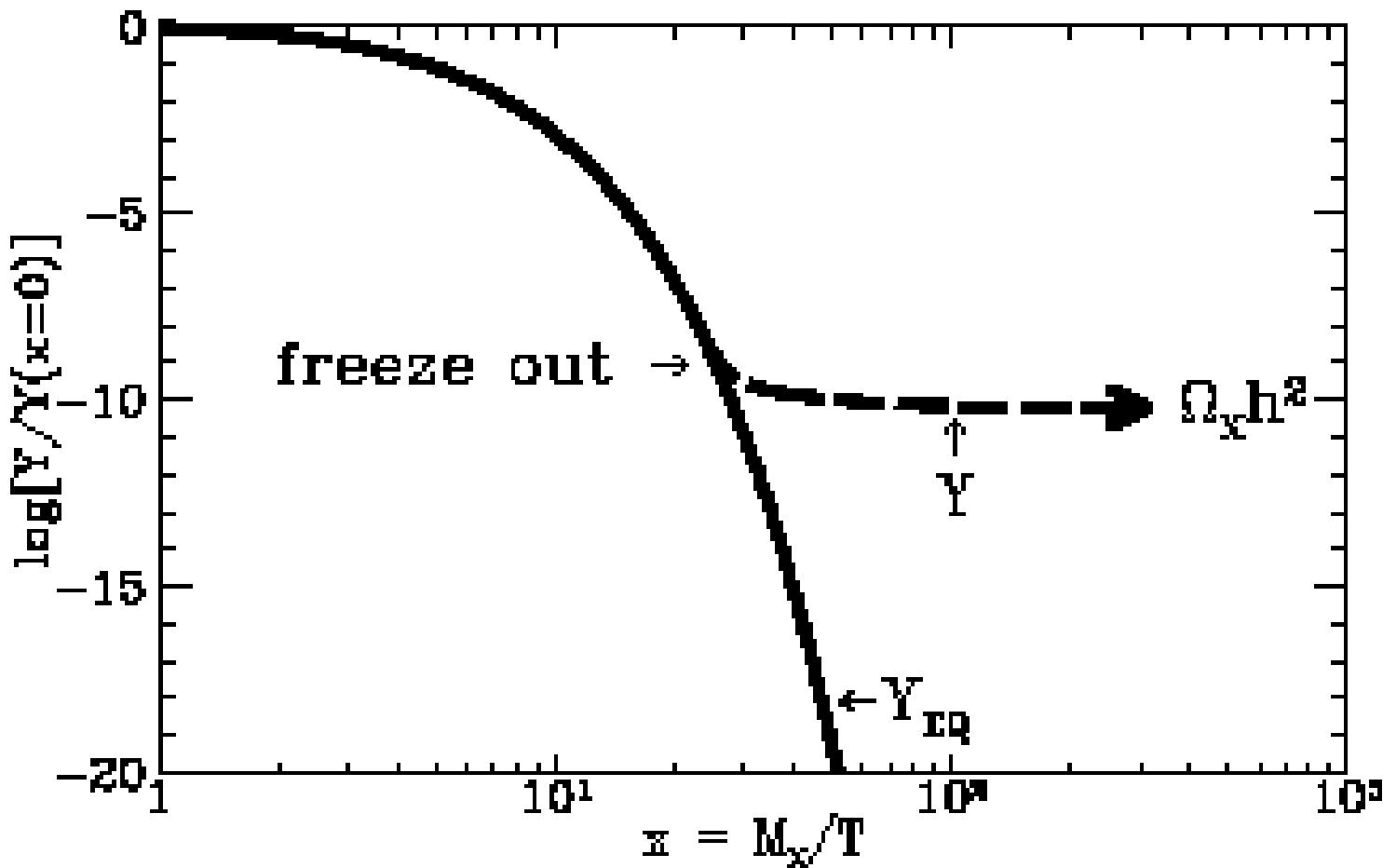
VERITAS Dark Matter search in dwarf spheroidal galaxies: an extended analysis, Chiara Giuri

Large Scale Structure

The Virgo consortium, German Astrophysical Virtual Observatory

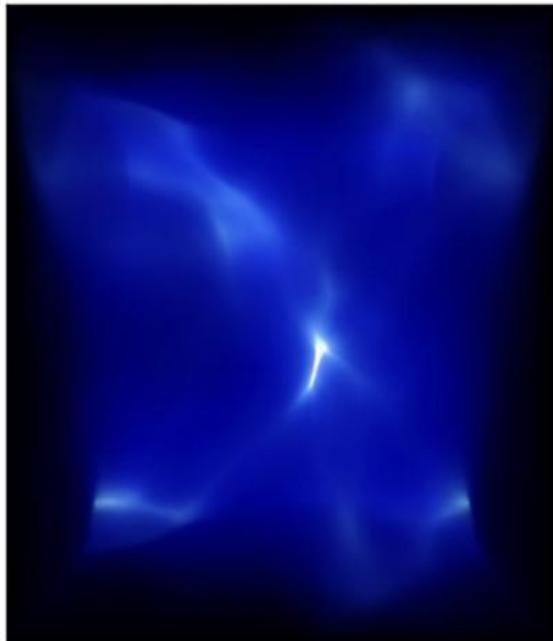


Thermal freeze-out



LSS with HDM, WDM, CDM

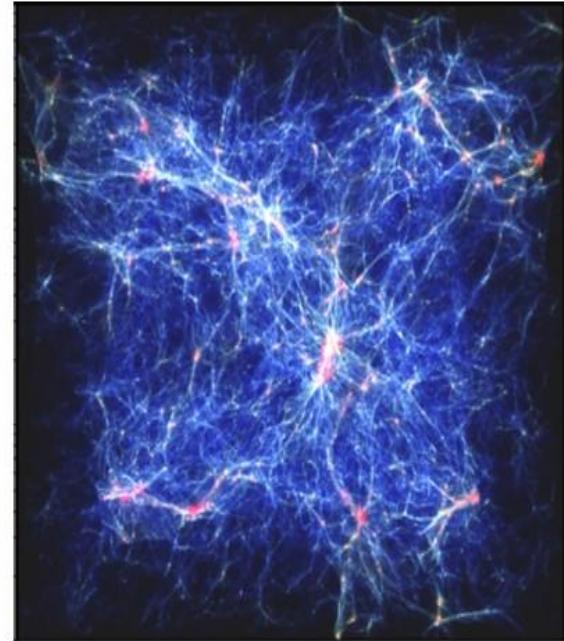
HDM : 0.1 keV

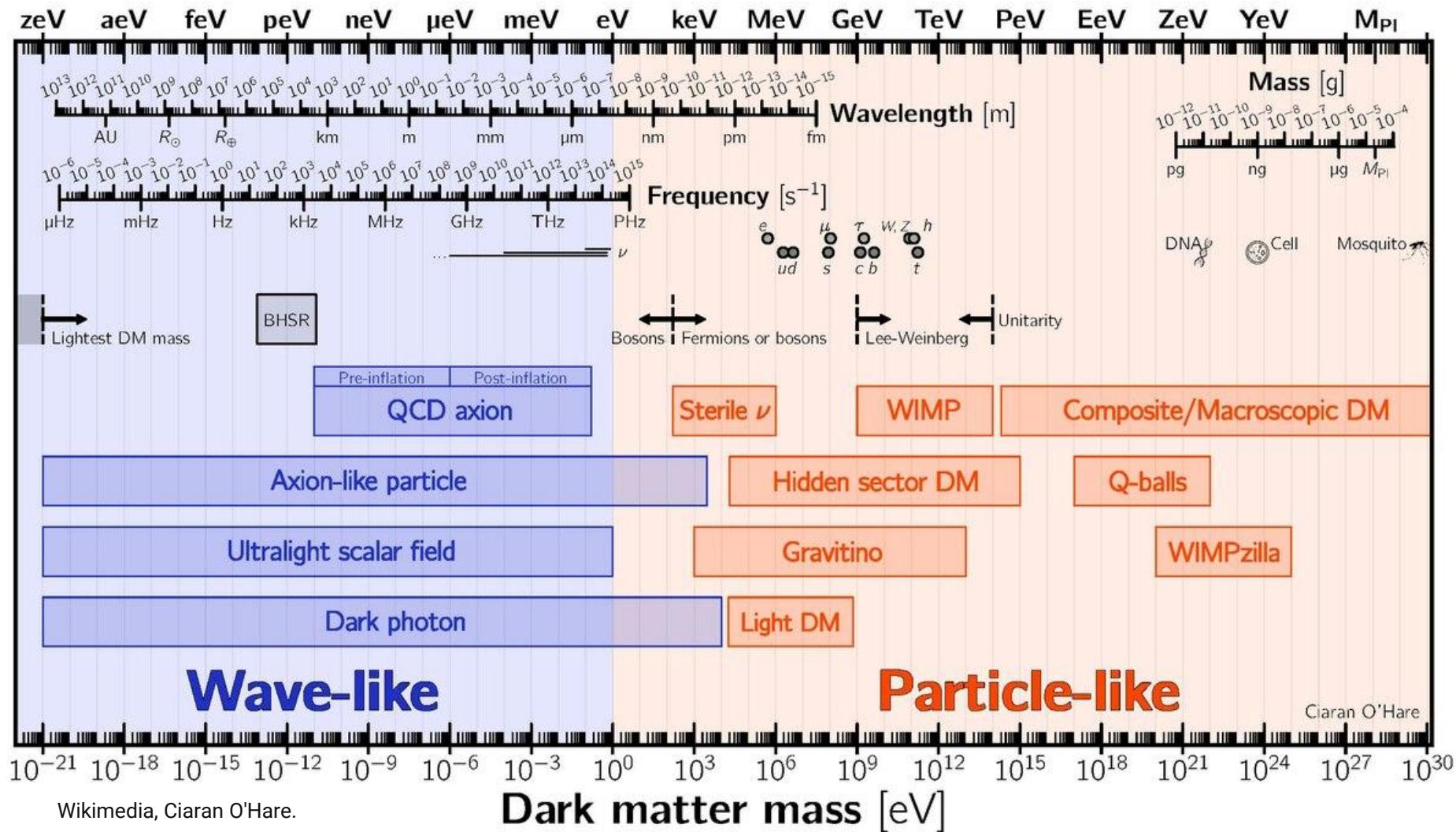


WDM : 0.5 keV

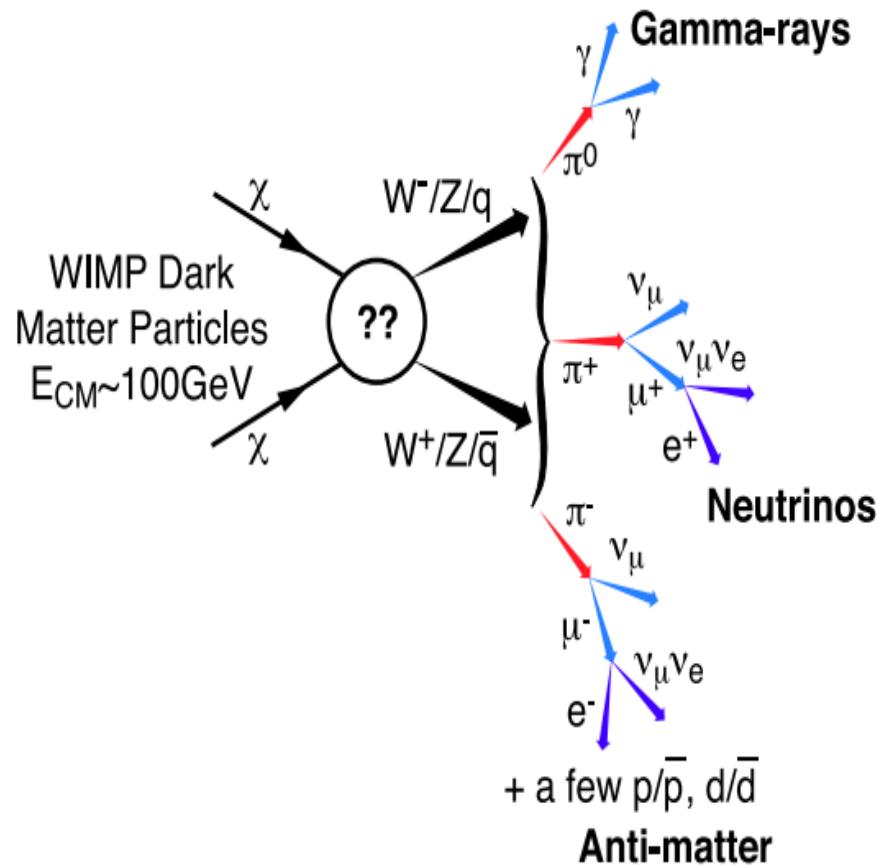
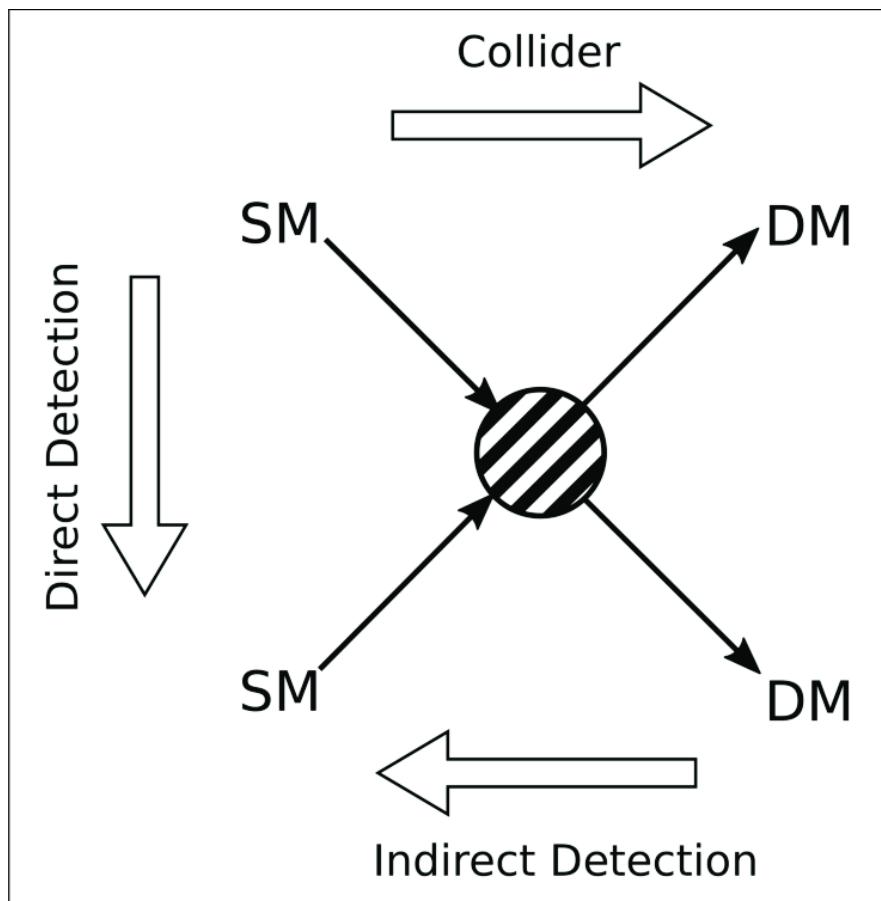


CDM (mass \gtrsim GeV)





Indirect detection



WIMP dark matter searches with the ATLAS detector at the LHC,
Stefano Giagu

Escape2020, Indirect Detetion Methods

The landscape of dark matter annihilation into neutrinos

