



# TeV Particle Astrophysics

Fermilab, Batavia, Illinois

July 13-15, 2005

## Organizing Committee

John Beacom Ohio State U.

Gianfranco Bertone FNAL (chair)

Elliott Bloom SLAC

Marcela Carena FNAL

Scott Dodelson FNAL

Chris Hill FNAL

Dan Hooper Oxford U.

Rocky Kolb FNAL

Olga Mena FNAL

Angela Olinto U. of Chicago



Image courtesy of NASA



Image courtesy of A. Ashara

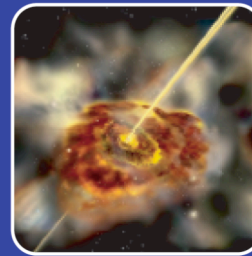


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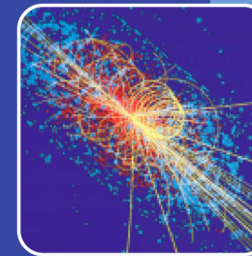


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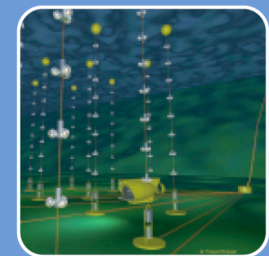


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## TOPICS TeV Gamma-Rays Experiments

Air Cherenkov Telescopes  
HESS, CANGAROO,  
VERITAS  
Prospects for GLAST

## Dark Matter Detection

Update on Indirect detection  
Dark Matter Dynamics  
Profiles and Substructures  
Direct Detection

## Astrophysics & Cosmology

TeV Gamma-ray sources(BHs,  
AGNs, SNRs)  
The Galactic center  
Gamma-Rays from Clusters  
Gamma-Rays from Intergalactic  
Shocks

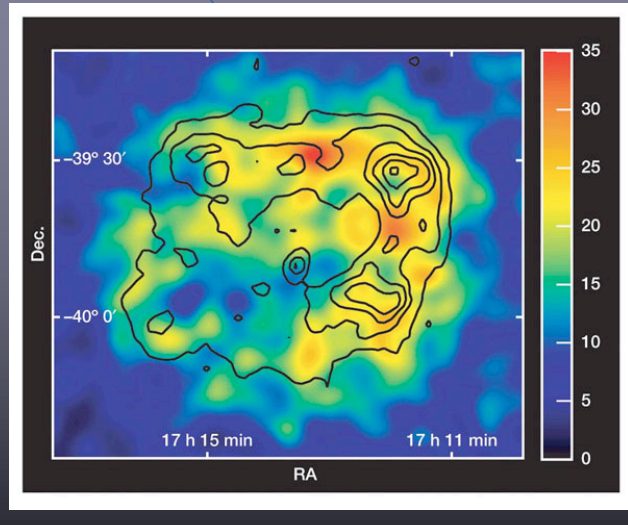
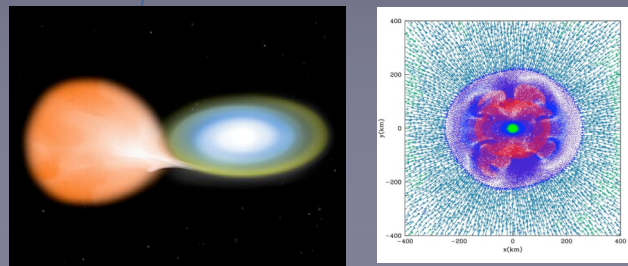
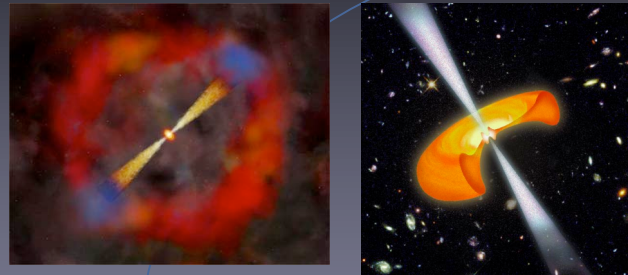
## Dark Matter Theory

SUSY candidates  
Extra-dimensions candidates  
TeV Particle Physics  
Accelerator searches

## Neutrinos

Astrophysical Sources  
High Energy Neutrino Experi-  
ments (Antares, Icecube)  
Constraints on Ultra-High  
Energy Neutrinos

# Astrophysical Sources of HE and UHE Radiation



## Open Questions

- What are the possible sources?
- What should new generation telescopes (gamma-ray and neutrinos) look for?
- What can we learn on the origin of CRs?
- What can we learn on astrophysical sources?

## What will be discussed here?

- Gamma-rays from Intergalactic shocks, GRBs, SN, AGNs, Star Forming regions etc.
- Astrophysical sources of (HE and UHE) Neutrinos
- Connection TeV Gamma-rays -- Cosmic Rays
- Latest results on UHECRs

# Gamma-Rays, experiments

Whipple - Veritas, AR



HESS, Namibia



MAGIC, Canary Islands



CANGAROO, Australia



CACTUS, CA



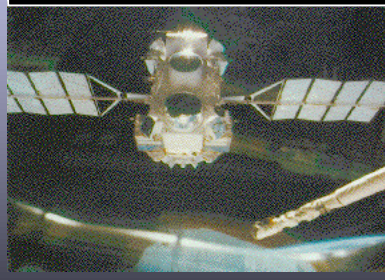
Milagro, NM



STACEE, NM



EGRET



GLAST



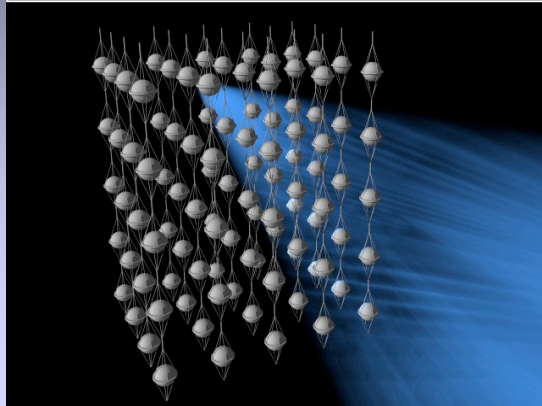
Credit: Hytec

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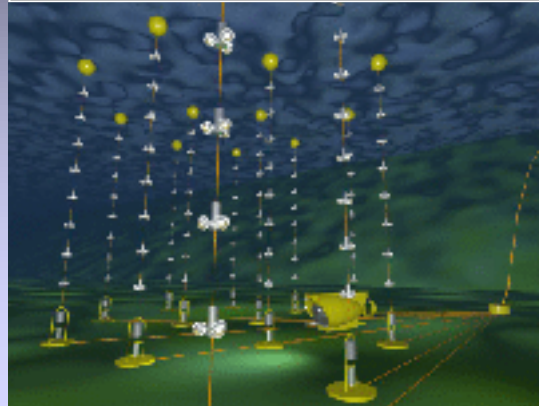


# High-Energy Neutrinos, experiments

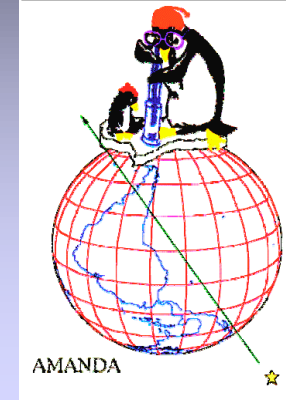
IceCube



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AMANDA II



RICE

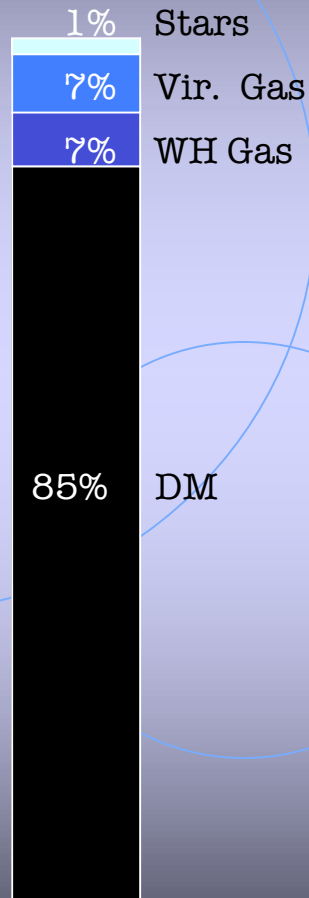
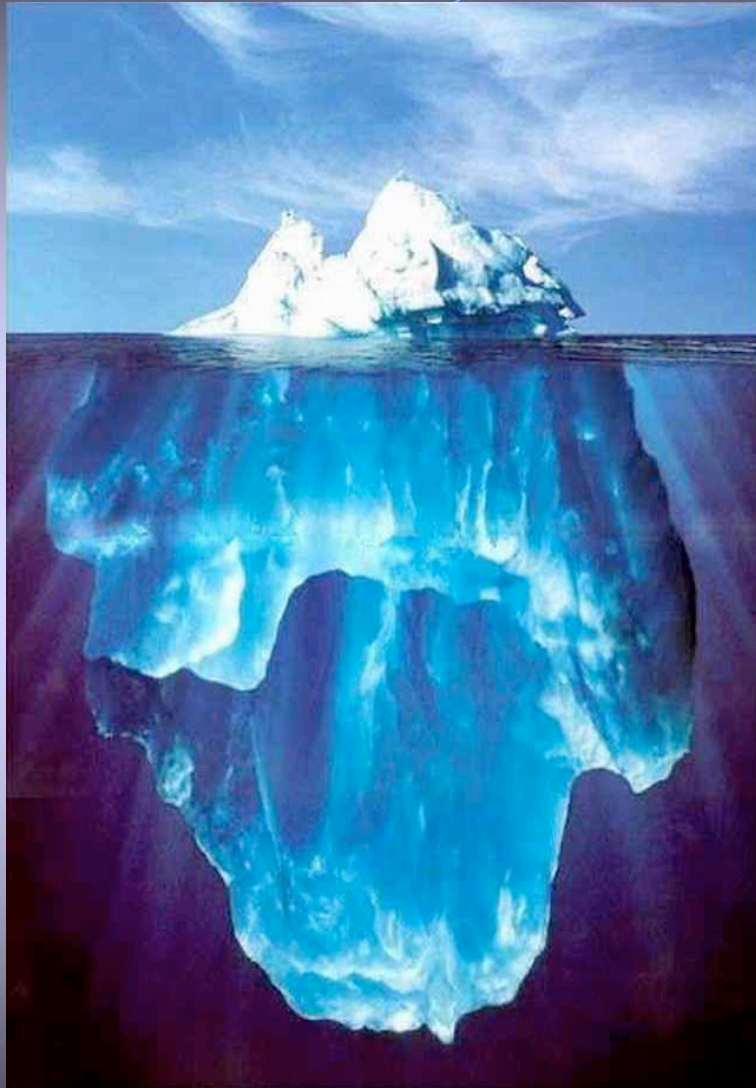


ANITA





# The Dark Matter problem



## Questions:

- Dark Matter or modified gravity?  
(or are we missing something?)
- If it exists, What is it?
- Is there a connection with physics beyond the Standard Model?

## Strategies

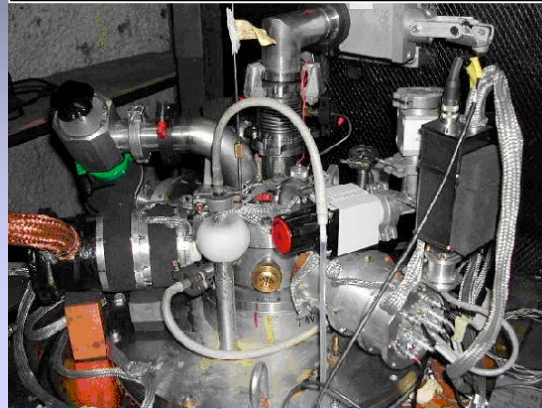
- Indirect detection with gamma-ray, neutrino and anti-particle experiments:  
*What are the best targets*  
*Are there smoking gun signatures?*
- Direct WIMP and Axion detection
- Accelerator Searches (LHC, ILC)

# Dark Matter detection experiments

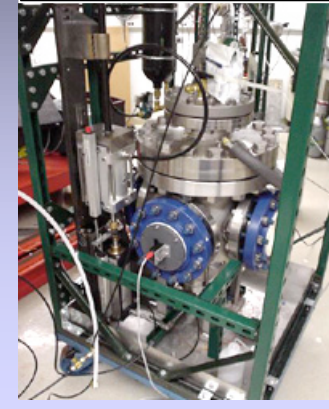
CDMS



Edelweiss



COUPP



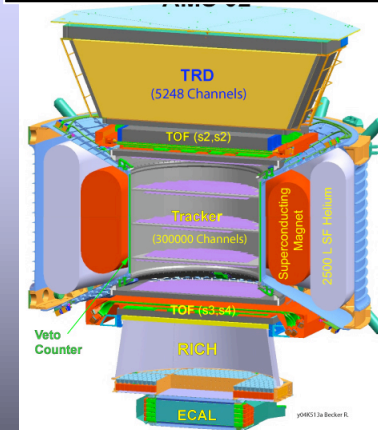
XENON



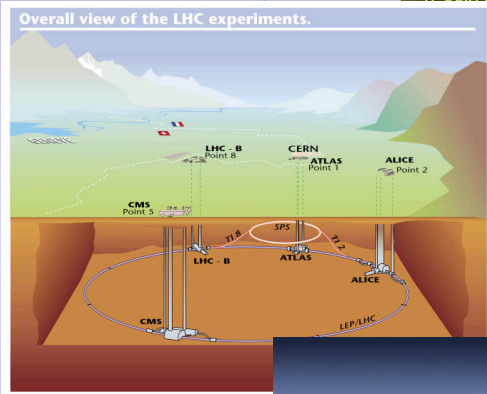
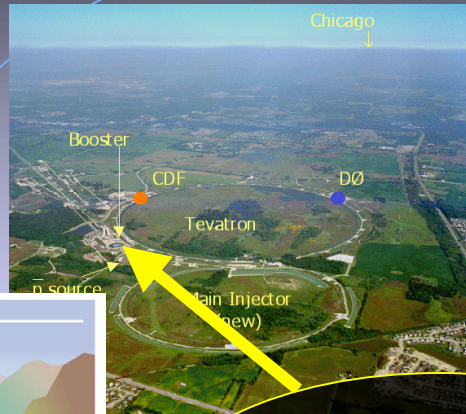
Axion Searches



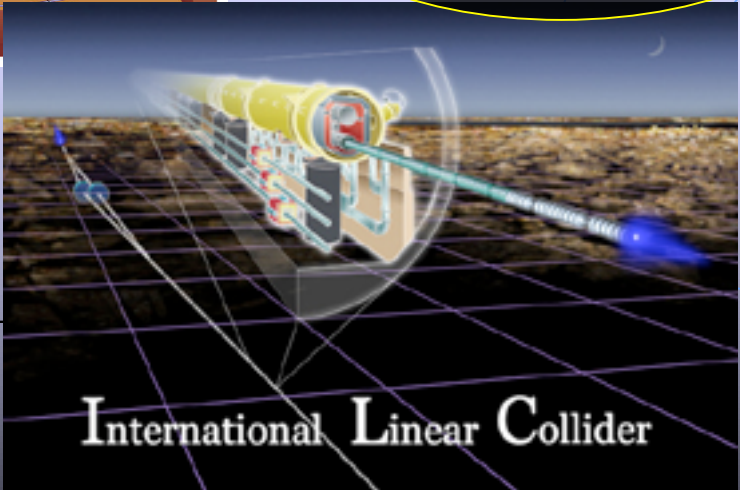
AMS, Pamela, GAPS



# (new?) Particle Physics at the TeV scale



You are HERE!



## Open Problems

- Hierarchy problem
- Quark/leptons, bosons/fermions
- Unification
- ...

## Physics Beyond the SM?

- Supersymmetry
- Extra dimensions
- String theory
- ...

## Experiments

- Accelerators:  
Tevatron, LHC, ILC?
- Astro-particle experiment,  
dark matter connection





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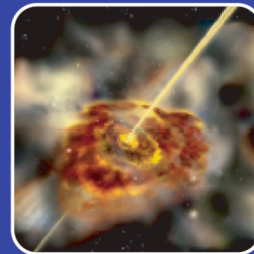


Image courtesy of NASA

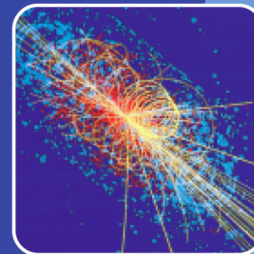


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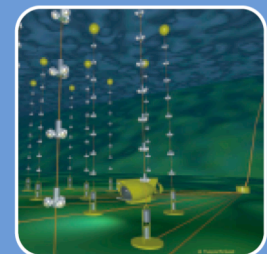


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