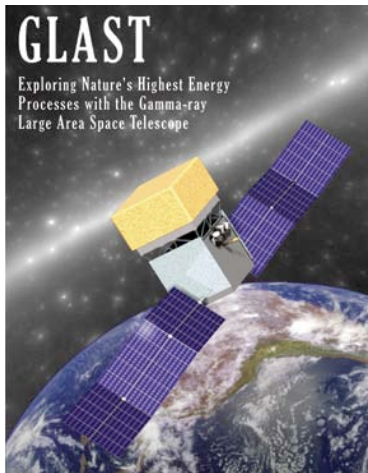


# UCSC Physics /Santa Cruz Institute for Particle Physics (SCIPP)

## Astrophysics and Cosmology



### High Energy Astrophysics – Experiment

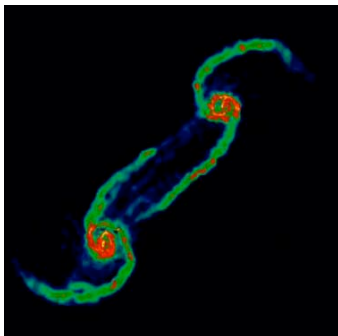
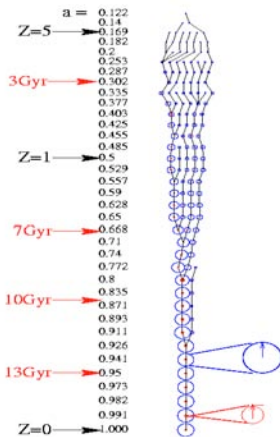
- Ground-based  $\gamma$ -ray detectors: Milagro, STACEE, VERITAS
- GLAST
- High energy X-ray experiments: RHESSI, etc.

### High Energy Astrophysics – Theory

- Probing galaxy formation via  $\gamma_{\text{blazar}} \gamma_{\text{starlight}} \rightarrow e^+ e^-$
- WIMP dark matter annihilation

### Cosmology and Galaxy Formation – Theory

- Nature of dark matter: centers of galaxies and clusters
- Structure formation: origin and evolution of galaxies
- String theory and cosmology



### People (partial list)

Bill Atwood, Don Coyne, David Dorfan, Robert Johnson, Hartmut Sadrozinski, David Smith, David A. Williams, Anthony Aguirre, Tom Banks, Michael Dine, Howard Haber, Joel Primack

# UCSC Physics /Santa Cruz Institute for Particle Physics (SCIPP)

## Theoretical Astrophysics and Observational Cosmology

### Faculty:

Anthony Aguirre, George Blumenthal, Avishai Dekel, & Joel Primack  
(support from NASA and NSF, supercomputing support from DOE)

### Current Post-Doc:

Jennifer Lotz (support from Hubble Space Telescope, NASA)

### Current Graduate Students:

Brandon Allgood<sup>P</sup>, TJ Cox<sup>P\*</sup>, Patrik Jonsson<sup>\*A</sup>, Michael Kuhlen<sup>A</sup>  
(<sup>P</sup>Physics, <sup>A</sup>Astronomy, \*PhD expected 2004)

### Recent Graduate Students:

Rachel Somerville (supervisor: Primack, PhD 1997; currently tenure track at Space Telescope Science Institute), Michael Gross (Primack, PhD 1997; NASA/Ames staff), James Bullock (Primack, PhD 1999; currently Hubble Fellow at Harvard), Ari Maller (Primack, PhD 1999; currently postdoc U Mass), Risa Wechsler (Primack, PhD 2001; currently Hubble Fellow at U Chicago)

## High Energy Astrophysics – Theory

- Probing galaxy formation via  
 $\gamma_{\text{blazar}} \gamma_{\text{starlight}} \rightarrow e^+ e^-$

First calculations based on semi-analytic models of galaxy formation:  
Primack et al. 1999, 2001

- WIMP annihilation in galactic center  
Gnedin & Primack 2003



## Cosmology and Galaxy Formation – Theory

- **Basic papers on Cold Dark Matter theory**  
Pagels & Primack 1982; Blumenthal, Faber, Primack, & Rees 1984; Blumenthal, Faber, Flores, & Primack 1986 (adiabatic contraction); Primack, Seckel, & Sadoulet 1988 (searching for CDM); Lahav, Lilje, Primack, & Rees 1991 (effects of  $\Lambda$ ); Klypin, Primack, & Holtzman 1996 ( $\Lambda$ CDM)
- **Nature of dark matter**  
Flores & Primack 1994 (possible problem at centers of galaxies and clusters); Klypin, Kravtsov, Bullock, & Primack 2001 (high-resolution simulations)
- **Structure formation**  
Bullock thesis papers 2001 (density and angular momentum structure of  $\Lambda$ CDM halos), Wechsler thesis papers 2002 (halo structural merger trees, angular momentum acquisition via mergers), Maller thesis papers 1997- (gravitational lensing, damped Lyman  $\alpha$  systems), Cox/Jonsson theses papers 2004- (galaxy collisions)
- **Origin and evolution of galaxies**  
Somerville thesis papers 1999, 2001 (first semi-analytic models including full effects of galaxy mergers, account for nearby and high-redshift galaxies, extragalactic background light), Lotz et al. 2003 (new statistics)
- **Problems with MOND alternative to dark matter**  
Aguirre et al. 2001
- **Critique of anthropic cosmology**  
Aguirre 2001
- **Earliest stages of cosmic inflation**  
Aguirre & Gratton 2002, 2003
- **Metals in the intergalactic medium**  
Aguirre, Schaye, & Theuns 2002



# Galaxy merger videos

thesis research by TJ Cox (supervisor: Primack)

