

ISDT Report: Fundamental Physics and Cosmology

2014 TMT Science Forum

Tucson, July 19 2014

ISDT membership

Ray Carlberg (Toronto) ● Tommaso Treu (UCLA) (chairs)

18 other members currently—room for more!

Bagla, Jasjeet

● Bradac, Marusa

Chattopadhyay, Surajit

● Dell'Antonio, Ian

Evslin, Jarah

Fassnacht, Christopher

● Lubin, Philip

Navarro, Julio

● Oguri, Masamune

Primack, Joel

Sami, M.

Sen, Anjan Ananda

Tytler, David

Wilson, Gillian

Xu, Renxin

Zhang, Xinmin

Zhao, Gongbo

Zhao, Hongsheng

IISER

UC Davis

Pailan College, IUCAA

Brown

IHEP

UCD

UC Santa Barbara

University of Victoria

University of Tokyo

UC Santa Cruz

Jamia Millia Islamia Central University

Jamia Millia Islamia Central University

UCSD

UC Riverside

Peking University

IHEP

NAOC

University of St. Andrews

● (at this forum)

The “big picture” ISDT:

- Dark Matter (near/far field)
- Dark Energy (lenses/tomography/SN)
- Beyond the Standard Model physics
- Extreme object Physics (NS and WD)

Science Case examples: DM

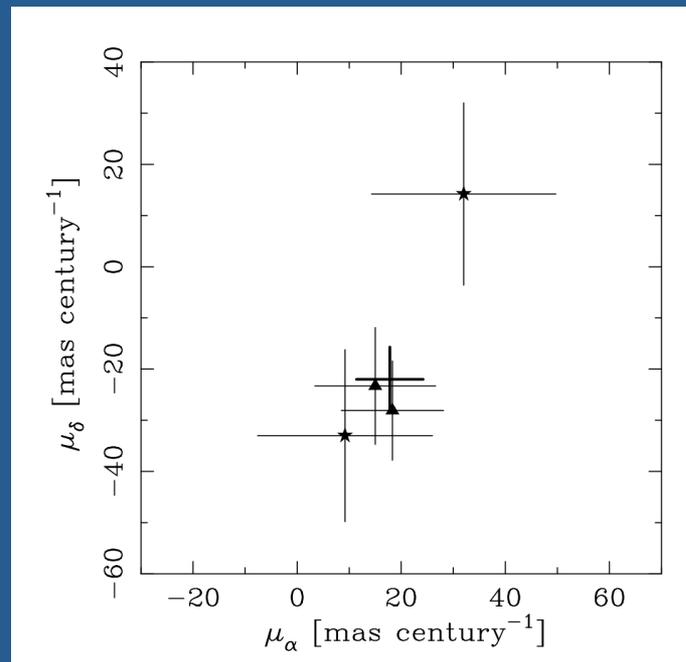
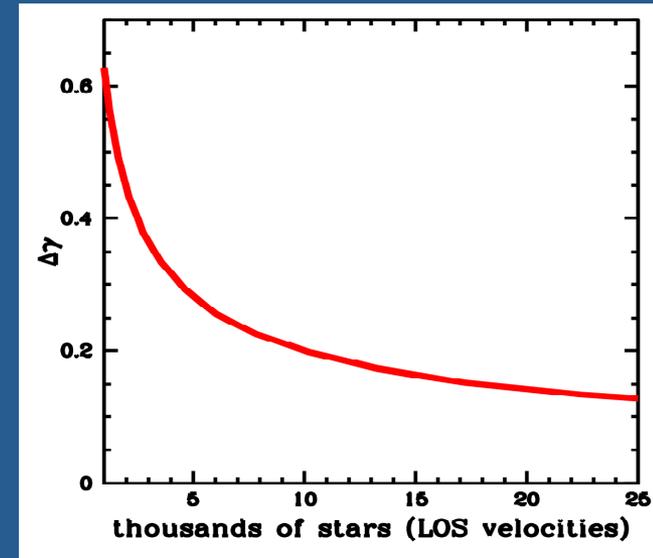
Credit: J. Bullock

DM in dwarf galaxies:

- Radial velocities (w/ MOBIE)

- Proper motions out to

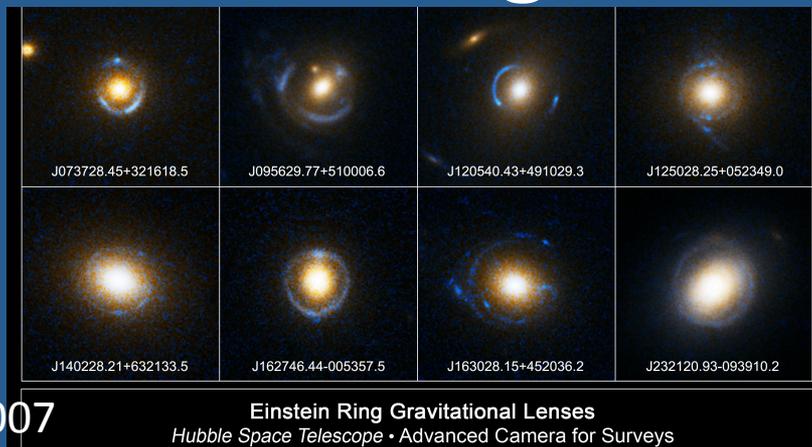
- ~ 100 kpc (w/IRIS)



Draco w/HST;
Pryor et al. 2014

DM properties from lensing

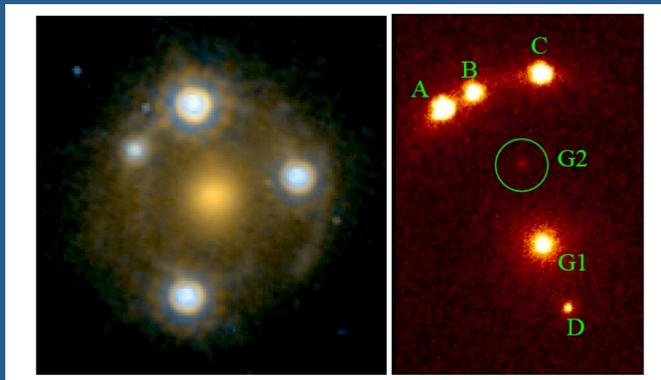
Galaxy-galaxy arcs:



Bolton et al. 2009

Anomalous Flux ratios

Keeton et al 2006, McKean et al 2007

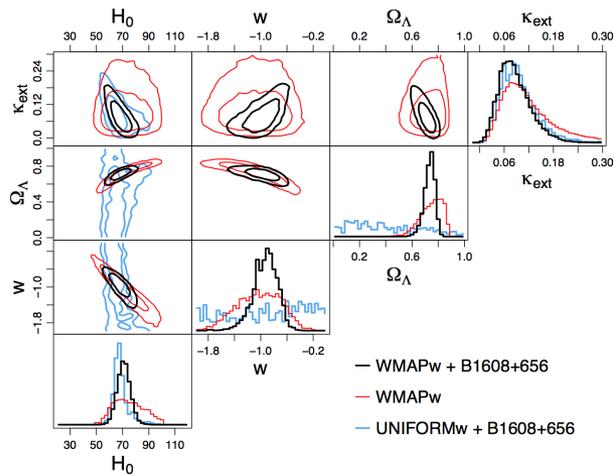


Dissociative Cluster Mergers:

Frontier field
image—thanks
to Jennifer Lotz

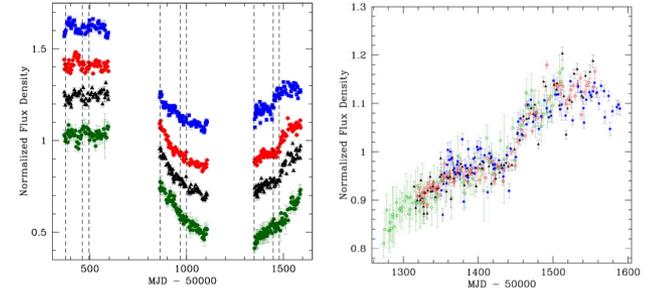
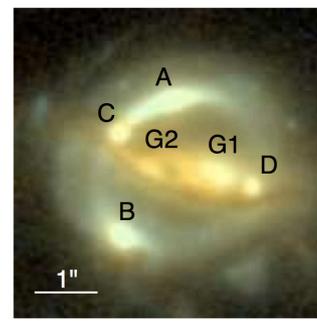
Dark Energy:

Time delay cosmography

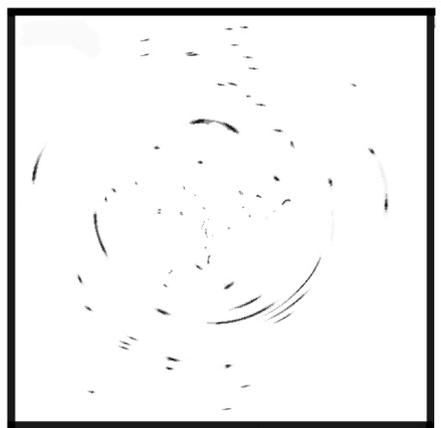


Suyu et al. 2009

B1608+656;
Fassnacht et al. 2002

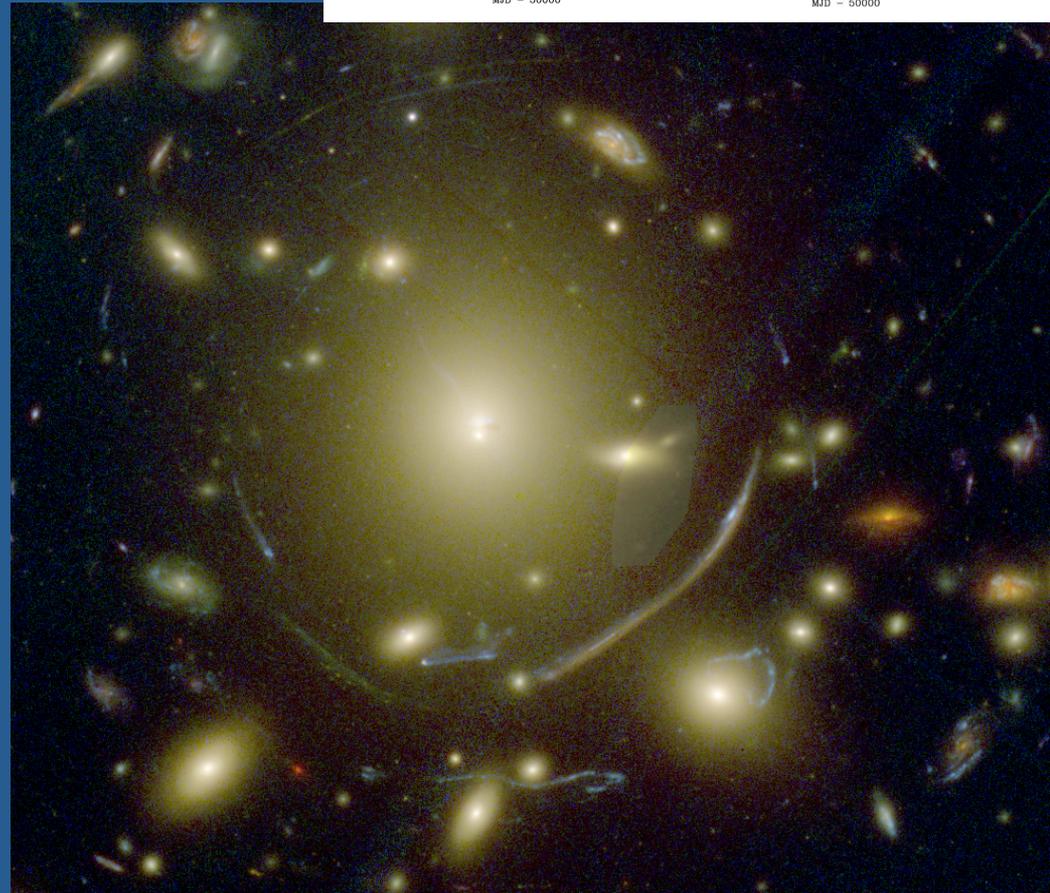


Sendra et al. 2013



Cluster lensing tomography

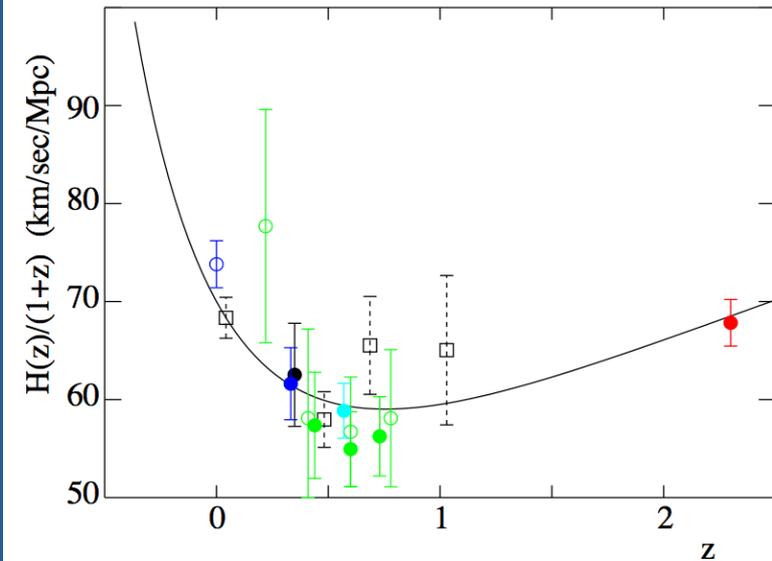
CLASH image; A383:
Coe et al. 2014



Dark Energy

BAO signal from
absorption line
systems of galaxies
with TMT-MOBIE

Busca et al. 2013



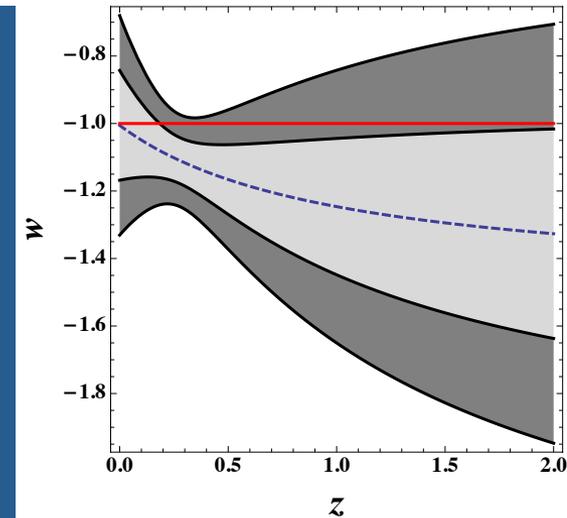
**Plus important role
combined with other
surveys:**

Calibration of cluster mass function

Redshifts for QSO lenses

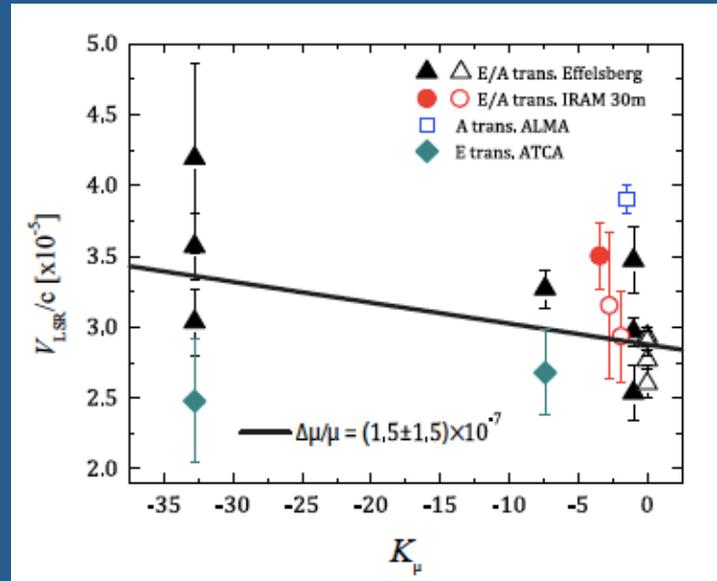
Deep redshift surveys

Current
state of
the art
(Hazra et
al. 2013)



BSM and extreme physics

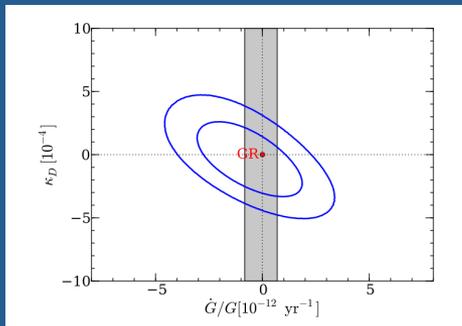
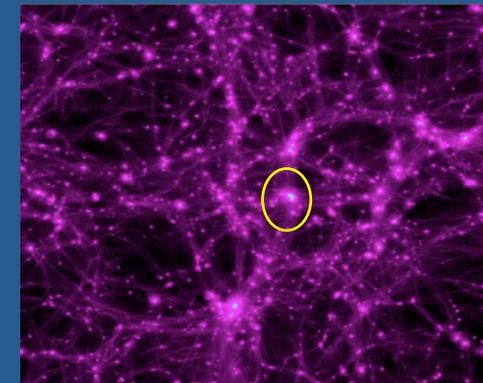
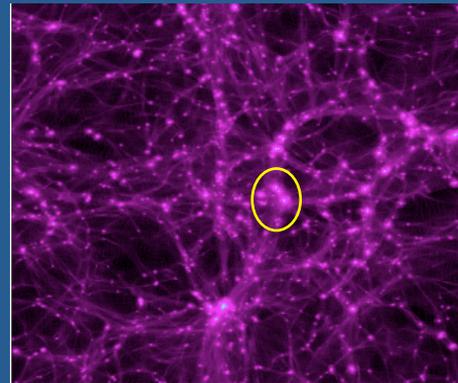
Bagdonaite et al. 2013



- m_e/m_p variation
- α variation

- Modifications to gravity

- WD-NS binaries

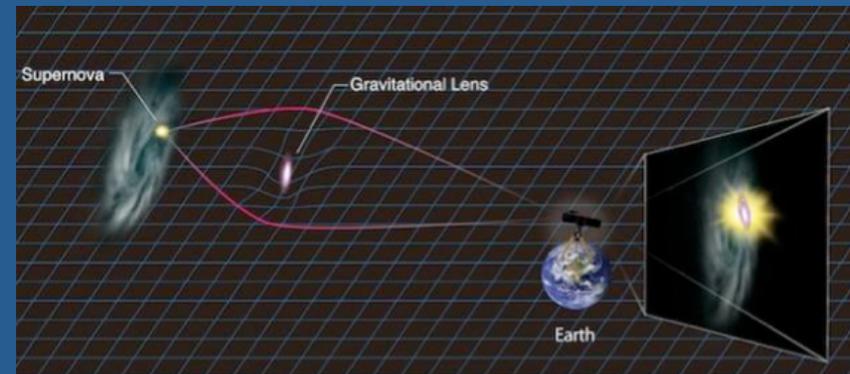


Freire et al. 2012

Fig 1. Snapshots at $z=0$ for N-body simulations of GR (left) and $f(R)$ gravity (right). This simulation uses 256^3 particles in a $B=64 \text{ Mpc}/h$ box. The Hu-Sawicki model (Hu & Sawicki 2007) is adopted for the $f(R)$ simulation [Zhao, Li & Koyama 2011a].

Breakout presentations

Masamune Oguri: Lensed SN with TMT



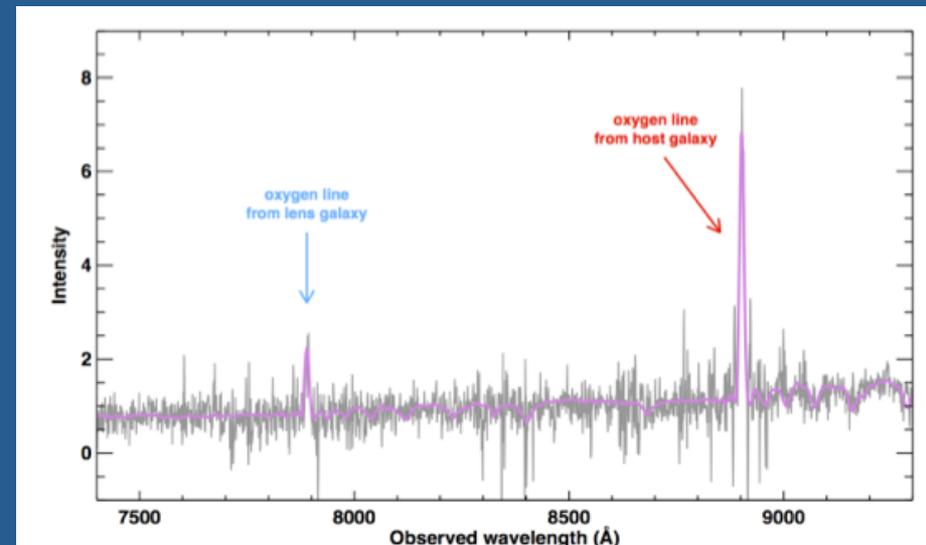
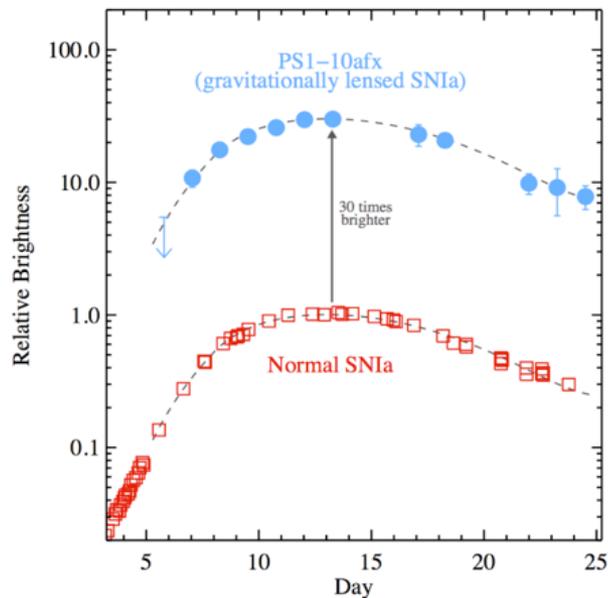
credit: Kavli IPMU

Rare, but >500 may be found by LSST.

Already found one?

PS1-10afx

Quimby et al. 2013



Quimby et al. 2014

Where we are headed...

Complete Editing of DESC

Develop key programs (joint with high-z group):

Lensing Clusters

Survey of time-delay Lenses

Proper motion survey of closest clusters

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