

Opening Remark

RESCEU & JSPS core-to-core
program DENET Summer School
Dark energy in the universe
August 30-September 1, 2010



Yasushi Suto

Department of Physics & RESCEU The University of Tokyo

International Research Network for Dark Energy (JSPS, core-to-core program 2007-2012)

DENET

Princeton U.
Dept. of
Astrophys. Sci.
coordinator
Edwin Turner

Institut
d'Astrophysique
de Paris
coordinator
Jerome Martin

Univ. of Tokyo
Res. Center for the
Early Universe
coordinator
Yasushi Suto

CMB
Gravitational lens
Baryon oscillation

Modified gravity
Extra-dimension
backreaction

Tohoku
Univ.

NAOJ

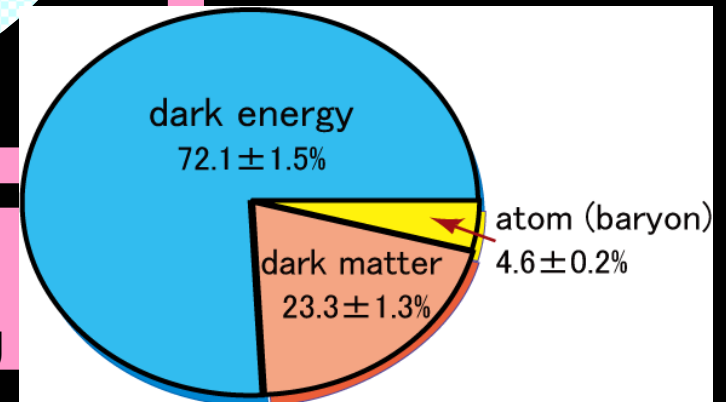
Hiroshima
Univ.

Kyoto
Univ.

Nagoya
Univ.

Edinburgh U.
Royal Obs.
coordinator
John Peacock

Theoretical model
Baryon oscillation
Weak lens mapping



RESCEU & JSPS core-to-core program DENET

Summer School @ Gora, Hakone

Dark energy in the universe Sept. 1-4, 2007

Three invited lecturers (2007)

■ Nemanja Kaloper (UC Davis)

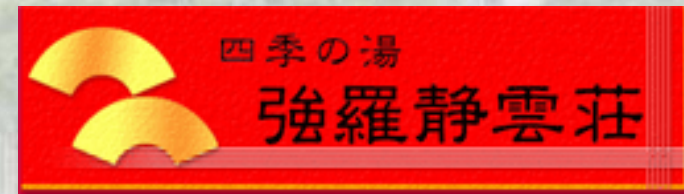
- Cosmological Constant and Other Dark Energies
- Challenging the Cosmological Constant
- Charting a Landscape of Modified Gravity

■ David Parkinson (Univ. of Sussex)

- The effect of dark energy on large-scale structure
- Large-scale structure as a probe of dark energy
- Recent BAO observations and plans for the future

■ Mamoru Doi (IoA, Univ. of Tokyo)

- Supernova observations for dark energy



2007 summer school



Decrypting the Universe

Large Surveys for Cosmology

Invited Speakers

D. Spergel
S. Cole
E. Copeland
M. Doi
A. Helmi
O. Lahav
R. Maartens
Y. Mellier
S. Miyazaki
A. Murphy
M. Takada
T. Yamada

24th-26th October 2007
Edinburgh, Scotland

Joint Royal Observatory Edinburgh / JSPS
Core-to-Core Program Workshop

www.roe.ac.uk/roe/workshop/2007

**Royal
Observatory
Edinburgh
Scotland**

Local Organising Committee

A. Heavens
R. Ivison
A. Nicol
P. Norberg (Chair)
P. Simon
F. Simpson
A. Taylor



Science & Technology Facilities Council
UK Astronomy Technology Centre





COSMOLOGY NEAR & FAR: SCIENCE WITH WF/Deep

May 19-21, 2008 @Marriot, Kona, Hawaii



Astronomy
Australia
Ltd.



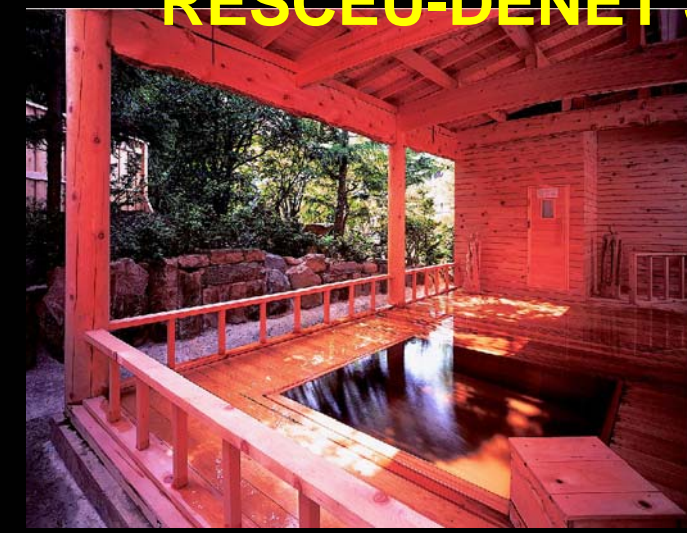
Science & Technology
Facilities Council





Aug. 31-Sept. 2, 2008

RESCEU-DENET Summer School @Asamushi, Aomori



Three invited lecturers (2008)

- **Kazuya Koyama** (Univ. of Portsmouth)
 - *Modified gravity as an alternative to dark energy*
- **Alan Heavens** (Univ. of Edinburgh)
 - *Probing dark energy with weak lensing*
- **Andrei Frolov** (Simon Fraser Univ.)
 - *Dark energy models in $f(R)$ gravity*

RESCEU & JSPS core-to-core program DENET Summer School @ Okinawa

Dark energy in the universe
August 31-September 2, 2009



Three invited lecturers (2009)

- **Alexei Starobinsky** (Landau Institute)
 - Reconstruction of dark energy properties from observational data
 - Overview of dark energy models
- **Michael Seiffert** (JPL)
 - Cosmology with galaxy surveys
- **Will Percival** (Univ. of Portsmouth)
 - Dark Energy and Observational Methods
 - Measuring Galaxy Clustering and Making Predictions
 - Current Galaxy Clustering Measurements and Cosmological Constraints

DENET and Princeton joint conference:
*Science Opportunities
with Wide-Field Imaging and
Spectroscopy of the Distant Universe*
November 9-11, 2009@Princeton Univ.

<http://www.astro.princeton.edu/astroevents/widefieldsurveys/program.php>

28 Japanese participants supported by DENET



RESCEU & JSPS core-to-core program

DENET Summer School at Kochi

Dark energy in the universe

August 30-September 1, 2010



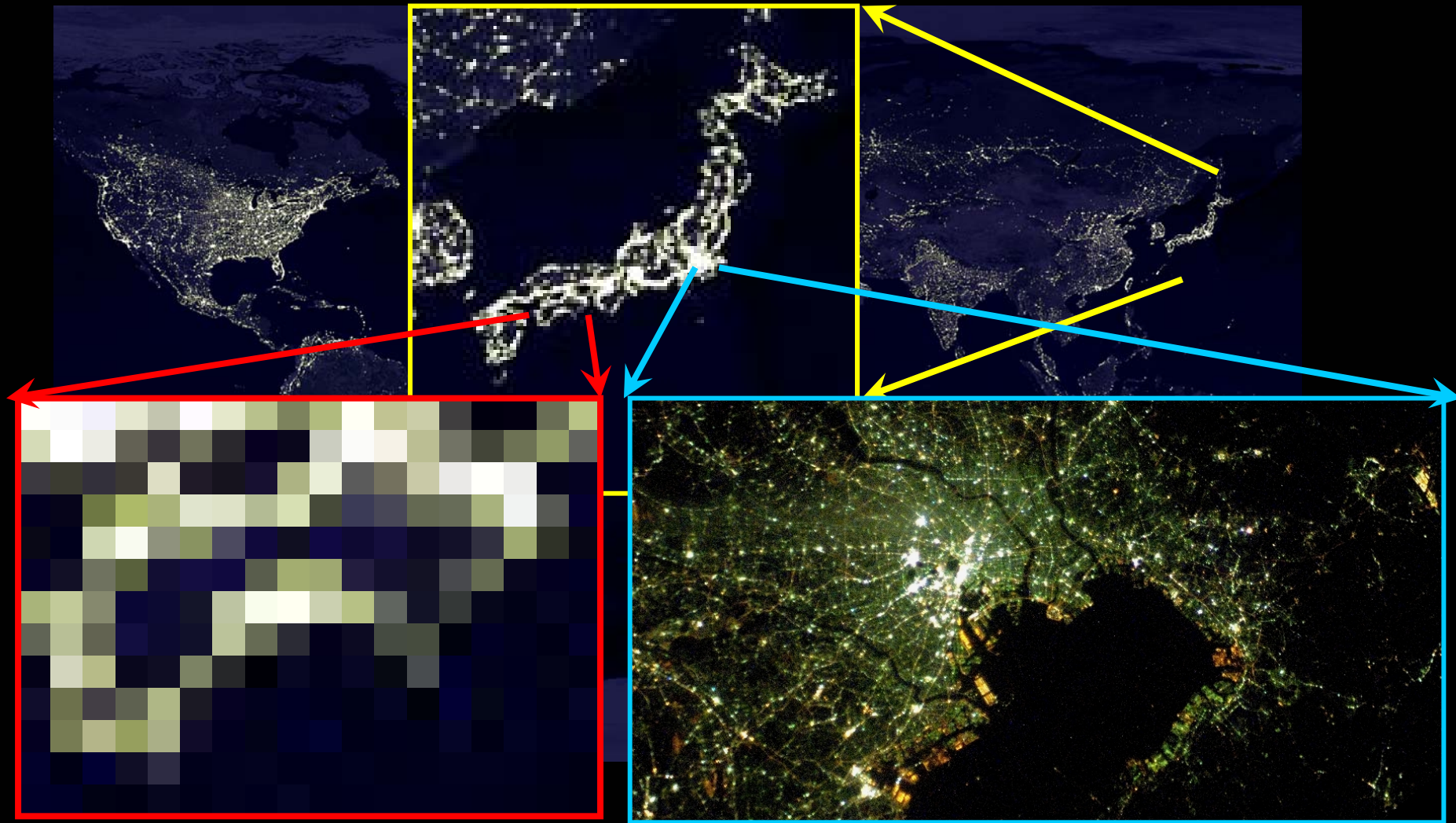
お手つないで
野道を行けば
みんな可愛い
小鳥になつて
唄をうたえば
靴が鳴る
靴が鳴る
靴が鳴る

花をつんでは
お頭にさせば
みんな可愛い
うさぎになつて
はねて踊れば
靴が鳴る
靴が鳴る
靴が鳴る

靴が鳴る
清水かつら 作詞
弘田龍太郎 作曲
1920

おてーま つないで のみちをーゆけーば みんな かあーい こどりーにー
なつて うたをうたえーば くつがなる はれたみせーらにーくつがなる

Where is Tokyo ? Where is Kochi ?



Marc Imhoff of NASA GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC

Three invited lecturers (2010)

- **Dragan Huterer** (University of Michigan)
 - *Accelerating Universe: Observations and Phenomenology*
 - Discovery of dark energy
 - Descriptions of dark energy
 - Cosmological analysis: likelihood methods
- **Jerome Martin** (Institut d'Astrophysique de Paris)
 - *Particle Physics Models of Dark Energy*
 - The accelerating Universe & the cosmological constant
 - Quintessence & high energy physics
 - Other models of dark energy
- **Massimo Meneghetti** (Universita di Bologna)
 - *Lensing by massive structures in the Universe*
 - An introduction on gravitational lensing
 - Unveiling the structure of galaxy clusters using lensing
 - Cosmology with lensing clusters

Astro2010: US decadal survey (August 13, 2010)

■ **Large-scale space programs**

- Wide field infrared survey telescope (WFIRST)
- Explorer program augmentation
- Laser interferometer space antenna (LISA)
- International X-ray observatory (IXO)

■ **Large-scale ground-based programs**

- Large synoptic survey telescope (LSST)
- Mid-scale innovations program
- Giant segmented mirror telescope
- Atmospheric Cerenkov telescope array

Galaxy survey project: SuMIRe

Subaru *M*easurement of *I*maging and *R*edshift of the universe

- **PI: Hitoshi Murayama** (director of IPMU, U. of Tokyo)
 - Japanese Institutes in charge: IPMU, The University of Tokyo, NAOJ +
- **Imaging survey with HSC** (Hyper-Suprime Cam)
 - Japan + Princeton + ASIAA (Taiwan)
- **Spectroscopic survey with PFS** (Prime Focus Spectrograph)
 - Japan + Various international collaboration scheme is under discussion

DENET-Caltech conference:
The Observational Pursuit of Dark
Energy after Astro2010
October 7-9, 2010@Cahill Center for
Astronomy and Astrophysics, Caltech



California Institute of Technology

Conclusion

*Welcome to Kochi and
enjoy the summer school*