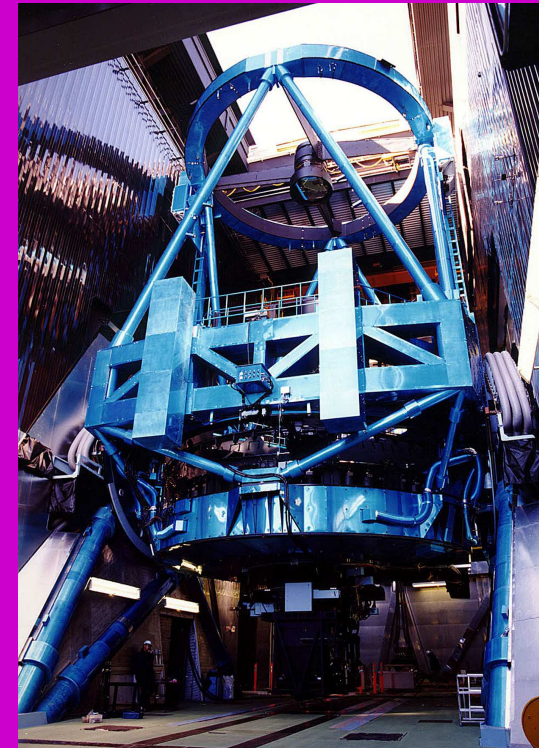




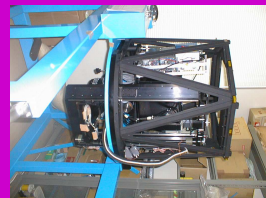
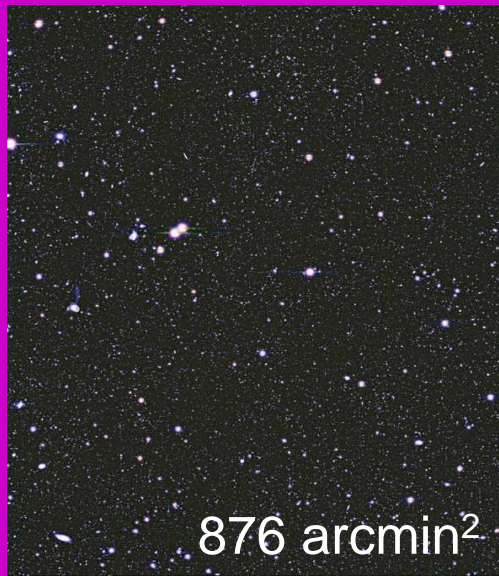
# *Lyman $\alpha$ emitting galaxy at redshift $z = 7$ and its implications for cosmic reionization*

Kazuaki Ota<sup>1</sup>, Masanori Iye<sup>2</sup>, Nobunari Kashikawa<sup>2</sup>

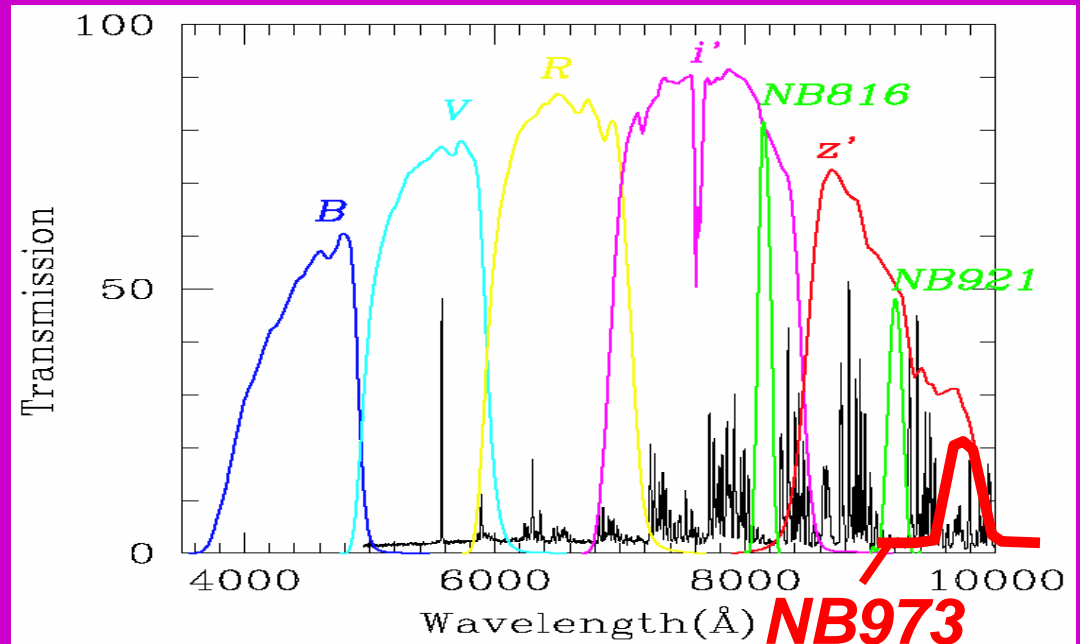
University of Tokyo<sup>1</sup>, National Astronomical Observatory of Japan<sup>2</sup>



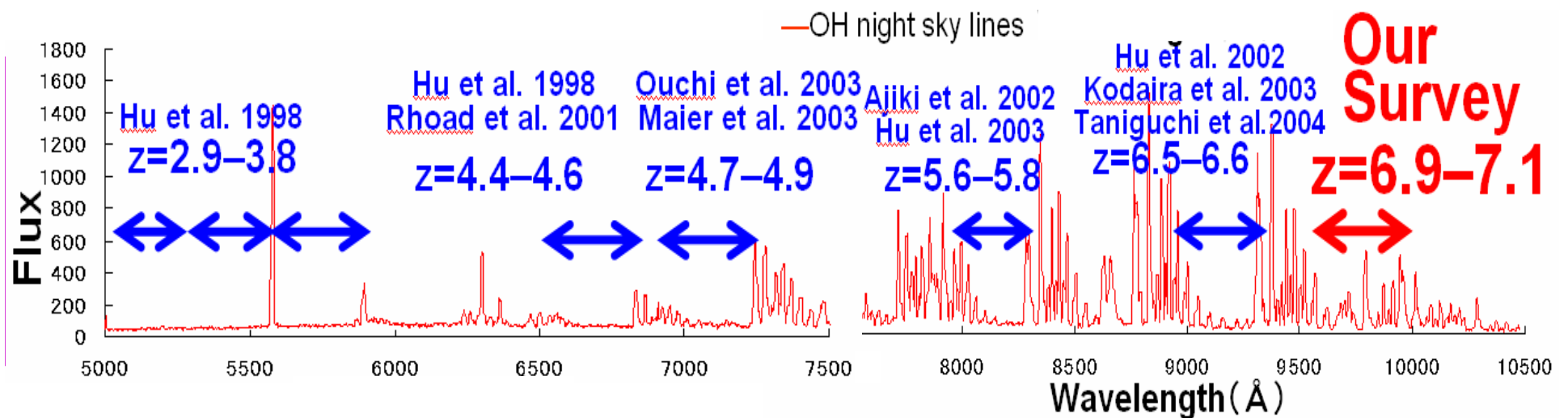
# Imaging Observation



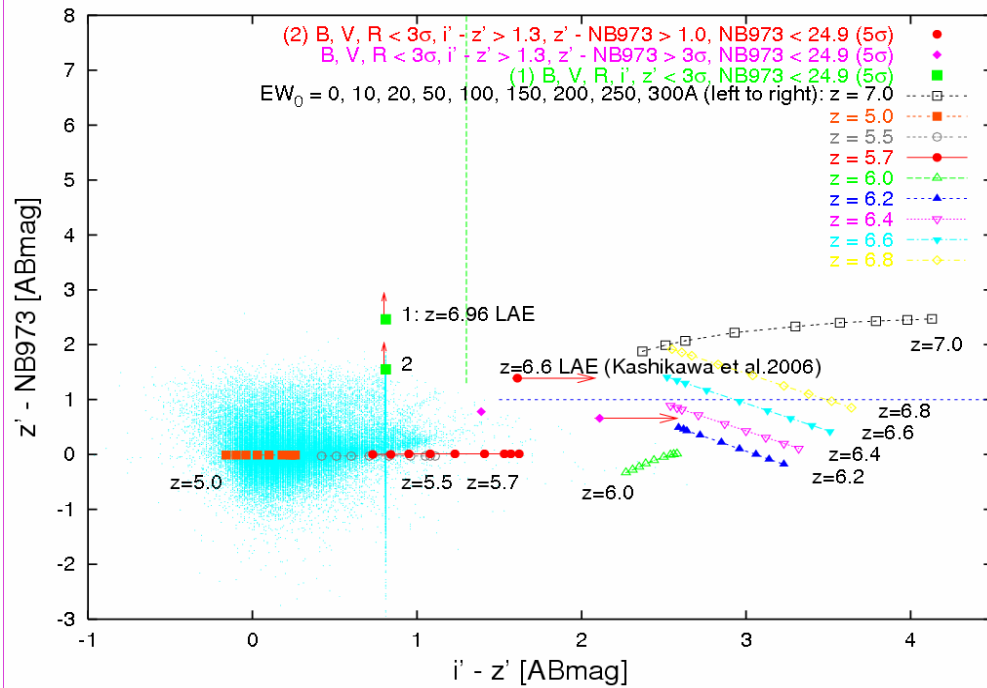
Subaru Deep Field  
Suprime-Cam / Subaru Telescope



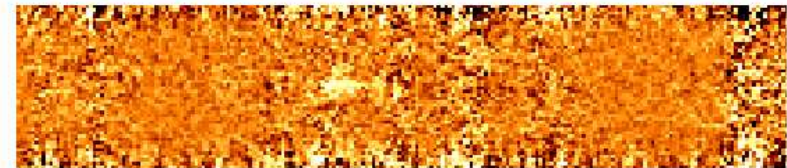
Our narrowband filter



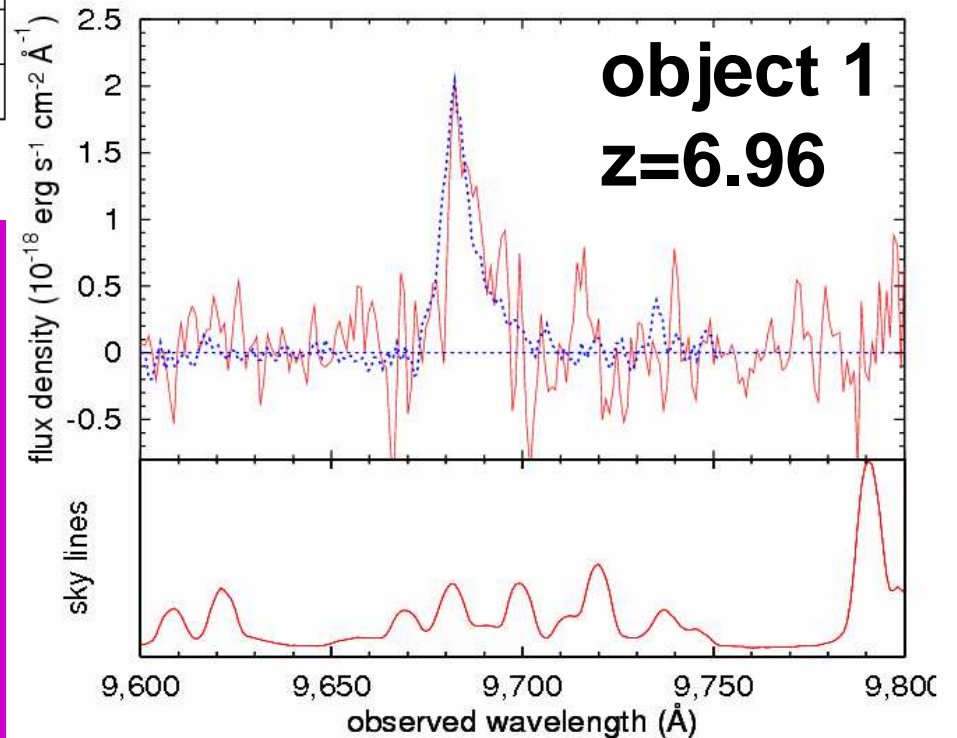
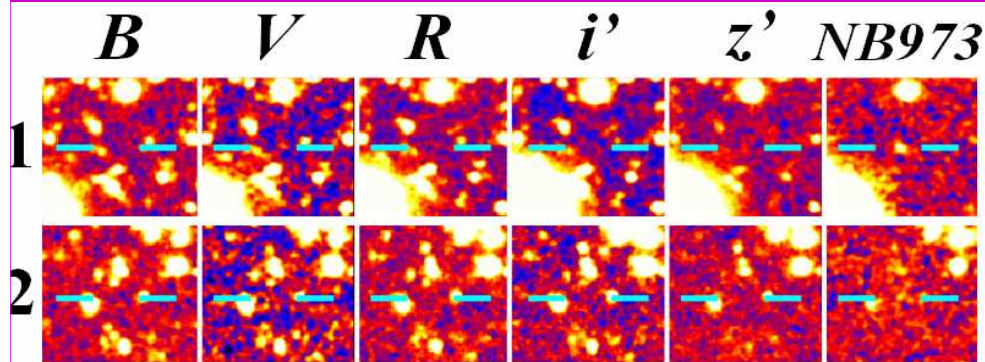
# Candidate Selection & Spectroscopy



- (1)  $B, V, R, i', z' < 3\sigma$ , for  $z=7.0$  LAE candidates: object 1 and 2,  
 (2)  $B, V, R < 3\sigma, i' - z' > 1.3, z' - \text{NB973} > 1.0$   
 $z=6.4-7.0$  LAE candidate: object 3.



Colors:  $z=5-7$  model galaxies &  $z=7$  LAE candidates

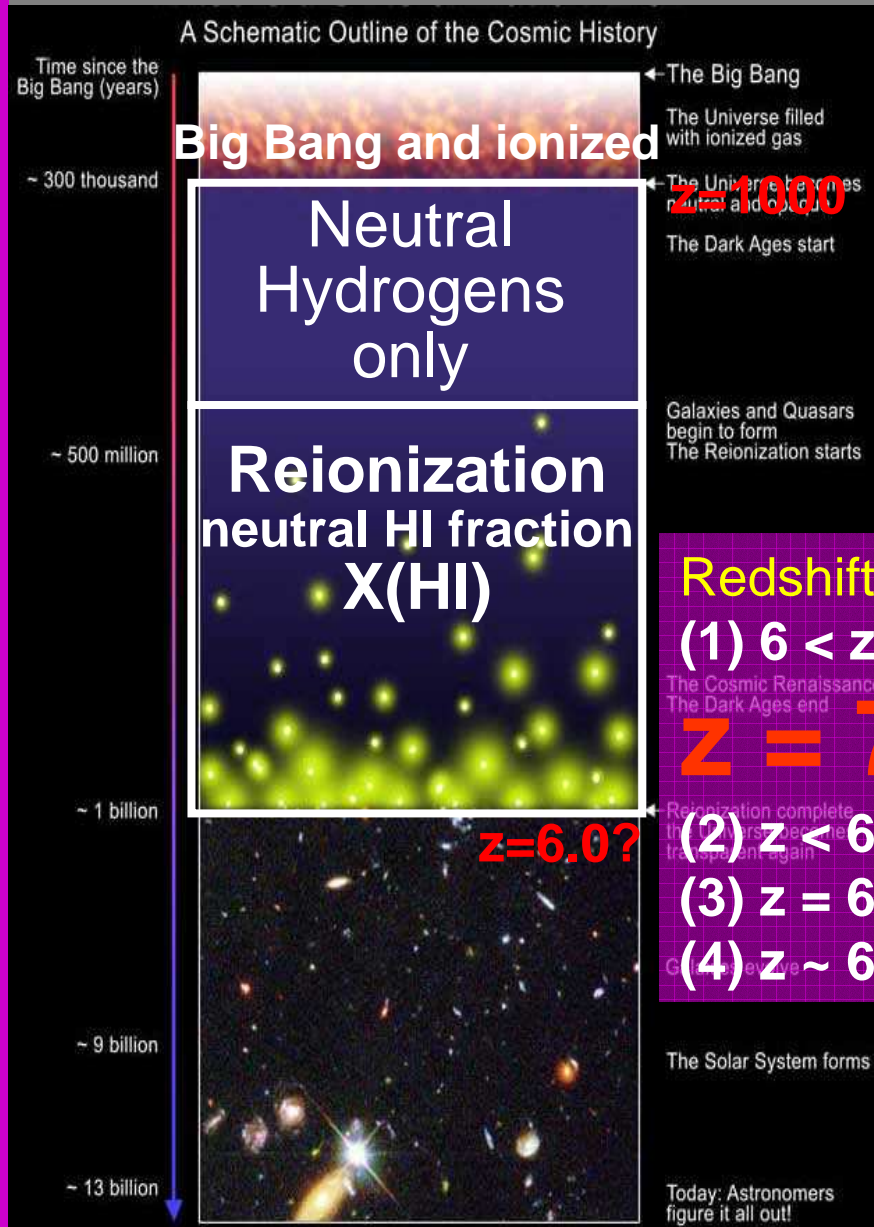


Images of  $z=7.0$  LAE candidates

Spectrum of  $z=6.96$  LAE

# Epoch of the Reionization

History of the Universe (credit: Djorgovsky)



- (1) **WMAP**: CMB polarization obs.
- (2) **High-z Ly  $\alpha$  emitting galaxies**
- (3) **Ly  $\alpha$  absorption of  $\gamma$ -ray bursts**
- (4)  **$z \sim 6$  SDSS quasars' GP troughs**

Redshifts  $z$  & neutral hydrogen fractions  $x(\text{HI})$

(1)  $6 < z < 14$  WMAP (Page et al. 2006)

**$z = 7.0$   $x(\text{HI}) < 0.63 - 0.83$**

(2)  $z < 6.6$   $x(\text{HI}) < 0.45$  (Kashikawa et al. 2006)

(3)  $z = 6.3$   $x(\text{HI}) < 0.17$  (Totani et al. 2006)

(4)  $z \sim 6.0$   $x(\text{HI}) < 0.01$  (Becker et al. 2001)