# PRINCE on Subaru

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# PRINCE

## Subaru PRime Focus INtegral Cosmic FiEld Unit

# 主焦点 IFU

# Subaru

# <u>Olehile</u>

## W. M. Keck Observatory



http://www.keckobservatory.org/media/maunakea-summit/

# Very Large Telescope



https://ja.wikipedia.org/wiki/超大型望遠鏡VLT

## **Gemini Observatory**





https://en.wikipedia.org/wiki/Hawaiian\_Islands#/media/File:2003-3d-hawaiian-islands-usgs-i2809.jpg

#### https://ja.wikipedia.org/wiki/北アメリカ







https://ja.wikipedia.org/wiki/南アメリカ

# Why one Subaru ?

### Subaru Observatory in 2025







# Subaru II @ Chile Prime Focus only (*F* < 2) PRINCE only





### Subaru II Site



https://www.eso.org/public/teles-instr/elt/

## Subaru II @ Chile

### monolithic or mosaic mirror? 8m or larger ? small but tough dome etc

### How to reduce its cost ?

# PRINCE

### e.g., FoV = 1 sq degree Fiber diameter = 2 arcsec φ 1800 x 1800 = 3.24 x 10<sup>6</sup> fibers 3240 dispersers 3240 CCDs

# PRINCE

For simplicity, imagine the followings

Fiber = 1000 x 1000 = 10<sup>6</sup> fibers

**Detector = 2000 with 2kx2k pixels** 

### $\lambda/\Delta\lambda = 2000$ Spectrograph = 2000

If one spectrograph costs 0.1 billion JPY we need 200 billion JPY for only spectrograph .....

# Many action items

**Needs micro lens array ?** Which type of detectors ? (CCD, CMOS, or ...) **High-performance**, low-cost spectrograph?

• • • • •

# Necessity is the mother of invention 必要は発明の母

# Something will happen 何とかなるさ

## **PRINCE Survey**

### 5 hours / pointing 1000 sq degree field $\rightarrow$ 1000 pointings 5000 hrs $\rightarrow$ 3 years for the 1st cool





# **Science with PRINCE**

#### [ex] Probing the origin of the most distant DLA @ z = 6.4 Ogura et al. (Subaru S20A with FOCAS IFU)



# If we have PRINCE



# **Science with PRINCE**

- **Unbiased** Deep Spectroscopic Survey
  - Targets -
  - galaxies active galactic nuclei intergalactic medium any

# **Science with PRINCE**

**Unbiased** Deep Spectroscopic Survey

Explore coevolution among galaxies, SMBHs, & IGM

**Explore cosmic reionization history** 

Time domain astronomy ToO is welcome

# Synergy with



https://en.wikipedia.org/wiki/Large Synoptic Survey Telescope



https://www.eso.org/public/teles-instr/elt/



LSST

E-ELT

https://www.gmto.org/overview/







https://alma-telescope.jp/gallerytag/aos#mt-20\_1 ALMA (submm, mm)

# PRINCE

### How much ?

### I don't know...

# But try less than 170 billion JPY ?????

# Subaru II

### How much ?

### I don't know...

### But try less than 30 billion JPY

# PRINCE + Subaru II

### Try less than 200 billion JPY

comparable to the initial cost of HST but much cheeper than that of JWST (1000 billion JPY)

# What shall we see using PRINCE on Subaru II ?

250 Mpc/h

#### **The Millennium Simulation (VIRGO)**

https://wwwmpa.mpa-garching.mpg.de/galform/virgo/

1 Gpc/h

# Herewego!

#### The Millennium Simulation (VIRGO)

https://wwwmpa.mpa-garching.mpg.de/galform/virgo/

# PRINCE

# on Subaru

# <u>o</u>chile

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