

### 3 What techniques are used to produce spectra of many objects simultaneously?

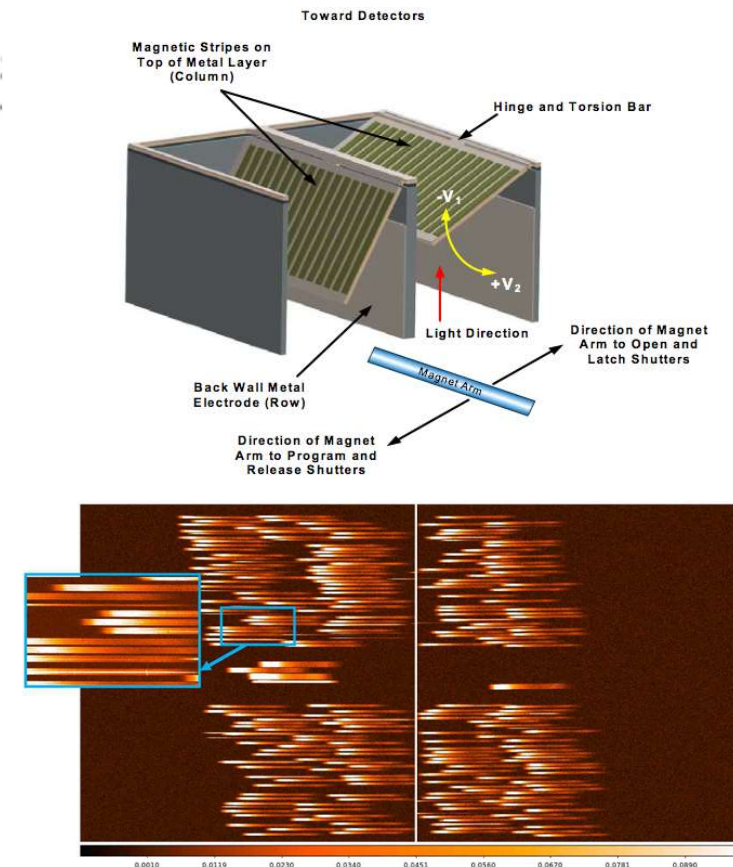
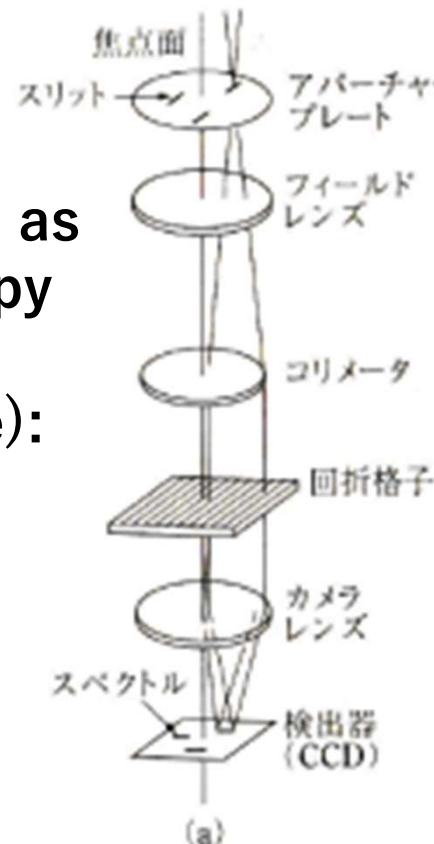
Discuss the advantages of multi-object spectroscopy over conventional spectroscopy.

#### ① Multi-slit spectroscopy

- Multiple slits on aperture plate
- Structure of instruments is same as that for conventional spectroscopy
- FoV: depends on spectrograph
- Number of objects (per exposure):  
<~100

Instruments:

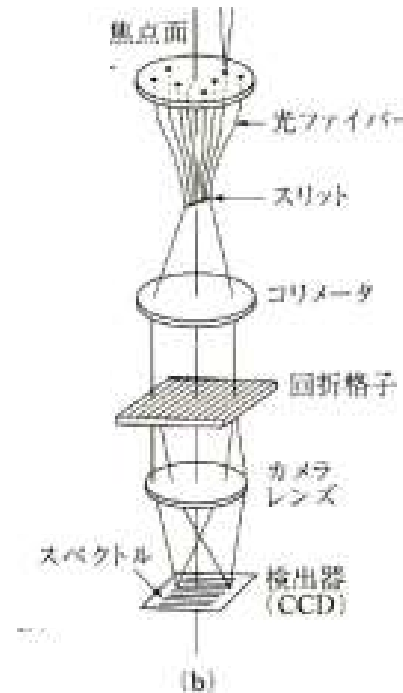
FOCAS(Subaru), VIMOS(VLT),  
DEIMOS(Keck), NIRSpec(JWST)



## ② Fiber spectrometers

- Light is led to spectrometer's slit by optical fiber
- Efficiency and accuracy: affected by fibers
- FoV: depends on telescope (larger than multi-slit)
- Number of objects (per exposure):  $< \sim 1000$

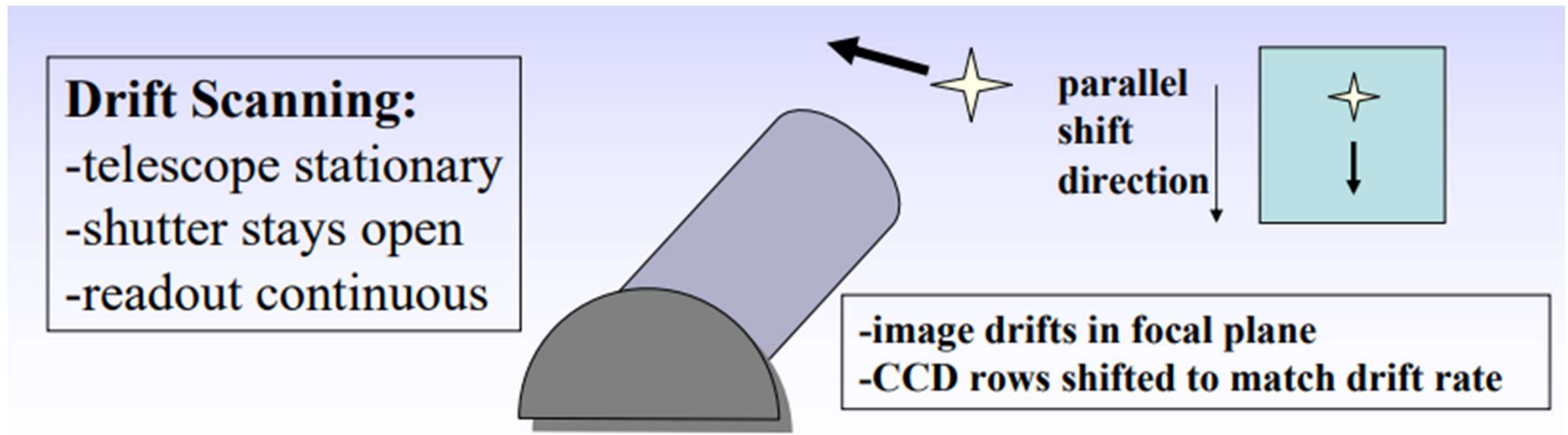
Instruments:  
SDSS, FMOS(Subaru)



9 Explain the technique of drift-scanning and compare it with Time Delay and Integration.

**Drift scanning:**

- Carry Charge on CCD synchronize with object image (telescope stationary)
- Improved image quality (high S/N ratio)
- Used for Wide area survey



## **Time Delay and Integration:**

- **Mode of reading out a CCD camera**
- **(another name of Drift scanning?)**

**(following: Chat GPT's answer)**

- **Used for observing fast objects or surface of the planets**
- **Integrate counts with object's motion**

<https://www.cambridge.org/core/books/abs/astrometry-for-astrophysics/using-ccds-in-the-timedelay-integration-mode/EDDB5B1195EFE0DC63540BC70F8E4D01>  
<https://academic.oup.com/pasj/article/66/6/115/1576669>