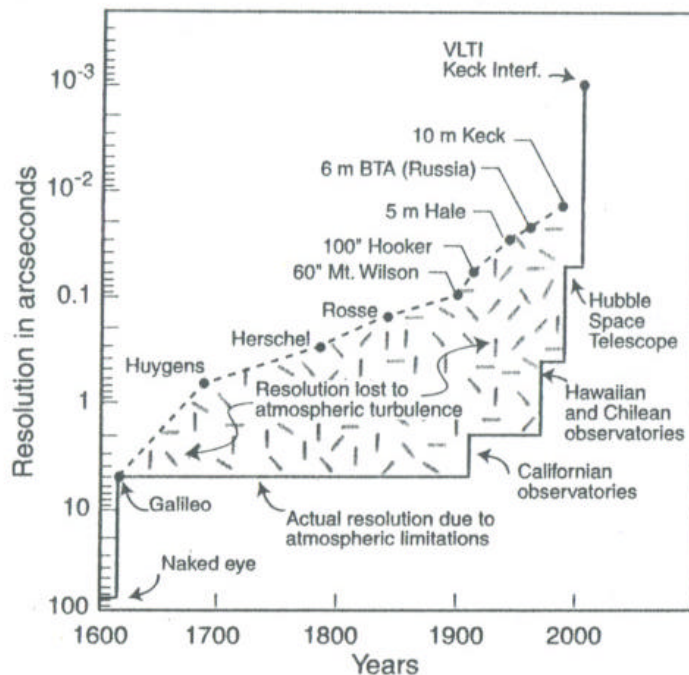


Observation exam #1 28/11/2007

- 1- What are the 3 forms taken by the principal carrier of information in Astronomy? Describe briefly the main characteristics of each and discuss advantages and disadvantages. What is the main condition to be able to retrieve information of these carriers?
- 2- Give one important example of a phenomenon affecting information while it propagates into space. What would be the consequence of not taking this phenomenon into account? In what case the nature of space itself would be important (for EMR this question was the first to be solved by Michelson-Morley experiment).
- 3- What is the importance of the **Chicxulub Crater** in Yucatán? What makes the meteorite **ALH 84001** so special?
- 4- What is the solar neutrino problem and how was it solved?
- 5- What is the difference in flux of two stars with difference in magnitude $\Delta m = 10$? (Show the way to calculate that). What is a Jansky? What is the difference between apparent and absolute magnitude? What is reduced brightness? What is AB magnitude? How do you get the luminosity from the flux of an object?
- 6- What kind of analysis (explain) can be done on flux received from an object (5 types)?
- 7- Explain what the graphic below is showing.

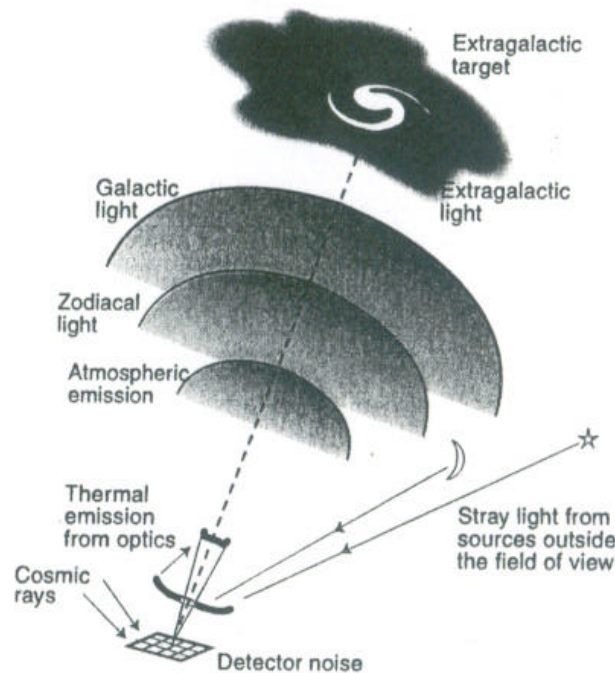


- 8- What are the main effects (explain) of atmosphere on observation (4 effects)?
- 9- What is the importance of the inversion layer?
- 10- What are the three measurements used to characterize the seeing (explain: maybe a graphic would help)? Based on your explanation, discuss the quality of the sites listed below: units are $[\epsilon_0] = \text{arsec}$, $[\theta_0] = \text{arsec}$, $[\tau_0] = \text{millisecond}$. Assuming q_0 was measured at 8 km above ground, compare r_0 at dome C and SPM.

Table 1 Comparison of observatory site conditions

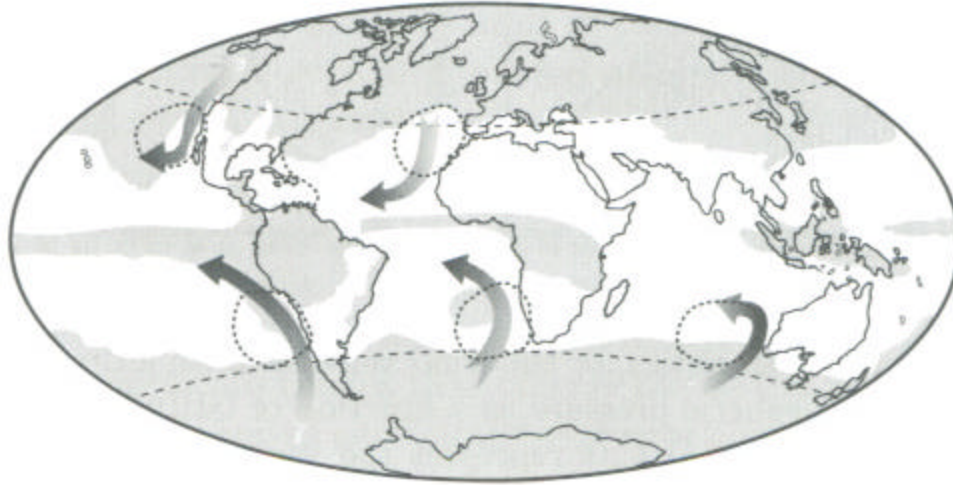
Site	ϵ_0	θ_0	τ_0
Dome C	0.27	5.7	7.9
South Pole	1.8	3.2	1.6
Mauna Kea	0.5–0.7	1.9	2.7
San Pedro Martir	0.59	1.6	6.5
Cerro Paranal	0.80	2.6	3.3
La Palma	0.76	1.3	6.6

- 11- The graphic below show the different sources of background noise. Explain their origin and the way to limit their effects.



- 12- Compare the advantages and disadvantages of observation from ground with those of observation from space. What is the main conclusion of this comparison?

13- Based on the map below, locate the best sites of observation on the ground and explain why they are the best.



14- Based on the map below, locate the best sites of observation on the ground and explain why they are the best.

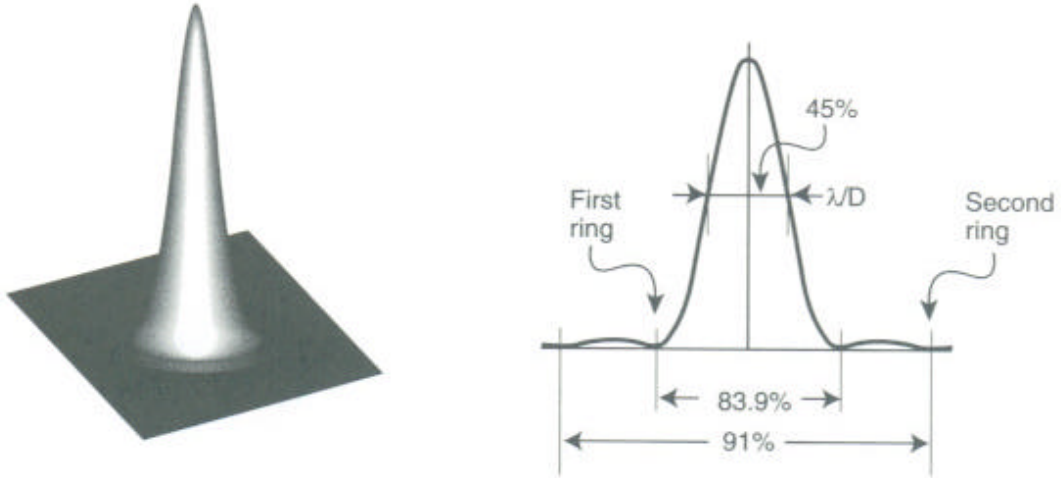
15- Would the Moon be a good place to install telescopes? What is the best place in the solar system to put a telescope (explain why)?

16- The US NSF (National Science Foundation) graded the James Web Telescope project as a high priority project. Can you explain why?

17- Give definitions and explain the following terms:

- a. Gregorian telescope
- b. Cassegrain telescope
- c. Focal ratio
- d. Plate scale
- e. Field of view
- f. Vignetting
- g. Aberrations: spherical, coma, astigmatism, field curvature and distortion
- h. Zernike polynomial

18- What is this figure illustrating (explain)? Does this correspond to the definition of a diffraction limited telescope according to Rayleigh?

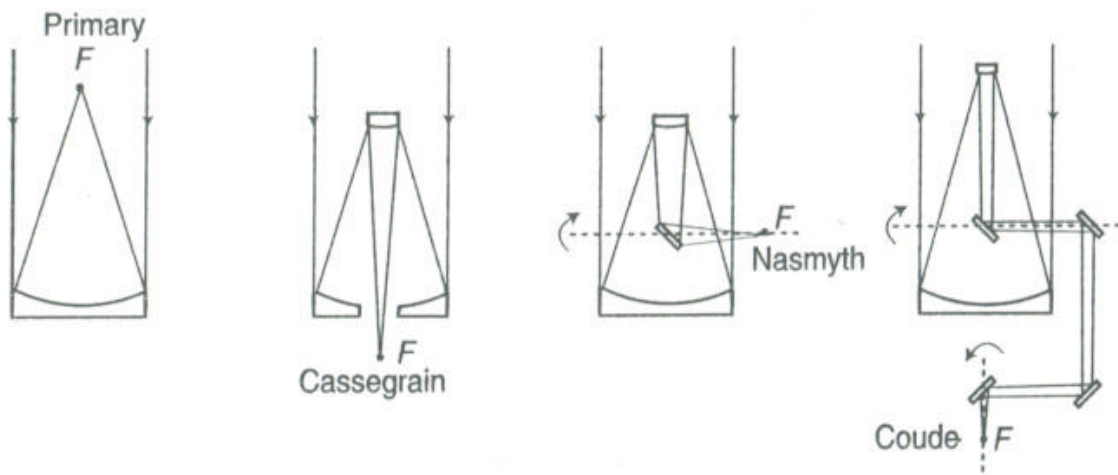


19- What is the difference between an equatorial and alt-azimuth telescope. What are advantages and disadvantages?

20- What is an off-axis telescope and what advantage this telescope presents?

21- What are the advantages and limitations of a fixed-altitude and fixed-primary-mirror mount?

22- Compare in terms of advantages and disadvantages the uses of the different foci possible on a telescope. What is a fast telescope?

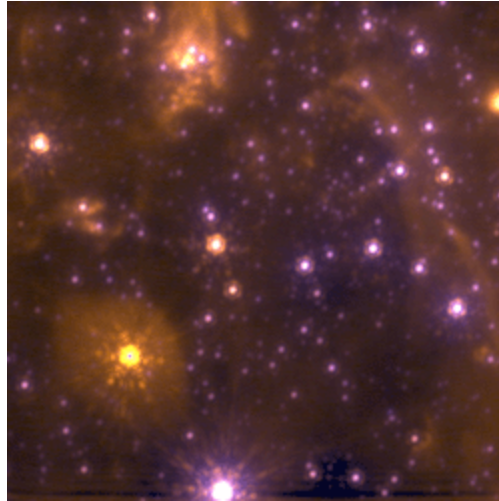


- 23- According to Nyquist's theorem, the optimal f -ratio is independent of the diameter of the telescope. Following this rule, we obtain the table below for optimal f -ratio. What does this implies for the telescope in La Luz: 57 cm diameter telescope used at $f/7.5$ or $f/13.5$ with CCD having $9\ \mu\text{m}$ pixels? What is the effect of the bad seeing (2 arcsec) in La Luz on this?

Table 4.5. Typical f -ratios for critically sampled detectors

Wavelength (μm)	0.5	2	2	10
Pixel size (μm)	7	18	28	28
Optimal f -ratio	28	18	28	5.6

- 24- This is an image taken by the Keck telescope. What do you deduce based on this image?



- 25- What are the considerations to take into account when preparing for an observing run? What is the important difference for a time request in imaging, spectroscopy or infrared?