

Feb 20th, 2006

P340: Homework Assignment No. 2

DUE DATE: Monday, 27th FEB. 2004

Please note that late assignments will not be marked

(1) Solar System: The picture we have of the solar system evolved considerably over the period between the time of the Ancients and that of Kepler. In roughly 500 words, compare and contrast the views of the solar system structure due to Aristotle, Ptolemy, Copernicus, and Kepler, noting in particular how the movements of the planets were explained in these different views. You can use the course notes and slides, and also the very extensive information on the web, to get any details you need.

(2) Retrograde motion: Describe what is meant by the *retrograde* motion of a planet in the sky, and *why* it is that we see this retrograde motion. You should use pictures to help explain these ideas.

(3) Telescopic images: Francis Bacon believed in something that has been called "Immaculate Perception", viz., that "all depends on keeping the eye steadily fixed upon the facts of nature and so receiving their images simply as they are." Such 'theory-free' observation is considered by some to be the foundation of scientific work- although Bacon himself was careful to note the role of human reasoning and the human perceptive apparatus in observations.

Now it is always open to someone to say (as did some cardinals in Rome, when faced by Galileo's magic 'light tube'), that the telescope is nothing but a trick, and that there is no reason to believe what one apparently sees through it. What arguments would you use to convince them that you really are seeing what you think you are seeing through the telescope?

(4) Newton's Laws: Here we look at some simple questions about Newton's Laws.

(i) Give a concise explanation of what each of Newton's 3 laws of dynamics say. You should pay careful attention to explaining how the various quantities like distance, time, acceleration, mass, and force are to be defined, in the real world. If it helps to give examples then by all means do so.

(ii) Then explain what is Newton's law of Gravitation between masses. In order to give a proper definition of all the quantities involved in his 3 laws you may also have to refer to the law of gravitation.

(iii) Finally- explain how you would *test* Newton's 3 laws (ie., give evidence to show that they are true). Note that one way of doing this is to imagine how you might show they are *false*, ie., devise a method of falsifying one or more of them. You will probably find it helpful to imagine some specific simple experiment (or experiments) which would somehow test one or more of the laws. You do not need to know anything sophisticated about physics to answer this question - it is enough to understand what the laws themselves mean.