FAULKES TELESCOPE

Galaxies

Brief Exercises for the JPEG Viewer

Author: Richard Beare

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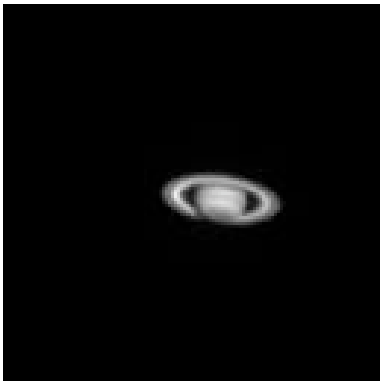
Measuring Jupiter

Jupiter

image width 2.45 arcmin

distance 4.59 AU

1. Click the Get new image button and import this image of Jupiter.
2. Enter the name Jupiter, the image image width and the distance of Jupiter from the telescope into the JPEG Viewer, making sure that you choose the correct units.
3. Now measure the diameter of Jupiter as follows:
   a. click the green solid line shape button on the toolbar
   b. drag the green line that appears on the image across the image until one end is on the left hand edge of Jupiter
   c. drag the handle at the other end of the line until it is directly opposite the other end (i.e. the line is a diameter)
   d. make any adjustments you need to in order to get the line in exactly the right position
   e. finally click the Measure button
   f. read off the angular diameter of Jupiter in arcminutes and also its actual diameter in km
4. The procedure you have just used is the same for all four shapes (solid line, dotted line, rectangle/square and ellipse/circle). Use the ellipse/circle shape to find the diameter of Jupiter. HINT: If you hold down the shift key while resizing the ellipse/circle shape it will stay as a circle.
5. Compare the sizes of the Earth, Saturn and the Sun using the Show comparison object button. *Hint: You can drag a comparison object across the image.*



Saturn and its rings

image width 2.3 arcmin

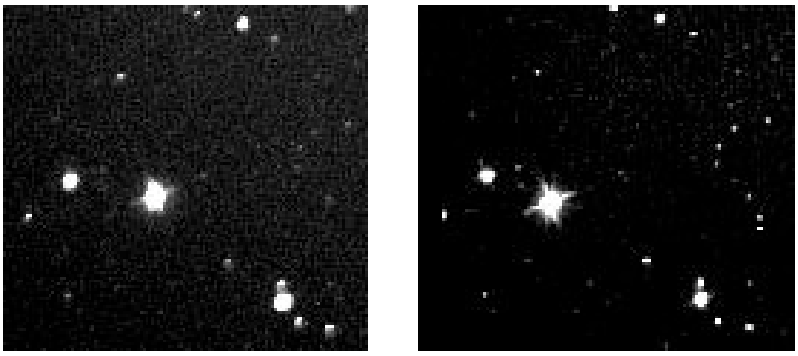
distance 8.45 AU

6. Measure the diameter of the outermost visible ring of Saturn (the A ring) by using an ellipse.

Hint: You will need to drag the handles on the ellipse to give approximately the right shape, and then rotate it. To rotate it, make sure that the shape is still selected, click the Rotate button and then drag the handles.

When you are satisfied with the fit, click the Measure button. The ring diameter will be given by the long axis of the ellipse. The angle of tilt will be given by the 'viewing angle' of the ellipse (i.e. a viewing angle of 90 degrees is edge on and zero degrees would be face on).

A Moving Asteroid



Two images containing the asteroid Vesta

image width 4.6 arcmin

distance unknown

7. Blink the two images and identify the asteroid. Instructions for doing this are as follows:

   a. Use the Get new image button to import the first image and the Get second image button to import the second one.

   b. Click the Blink button repeatedly and look for the object in the image which moves.

Please Note: The object you have identified is the asteroid Vesta. In general, however, you need at least three images to make a positive identification of an asteroid.

spiral galaxy M99

image width
4.6 arcmin

distance
44.7 Mly

lenticular galaxy M60 (top left)

and **spiral galaxy NGC4647** (bottom right)

image width
4.6 arcmin

distance 44.7 Mly

edge-on spiral galaxy NGC 4565

image width
4.6 arcmin

distance
86.4 Mly

Sombrero Galaxy (M104)

image width
4.6 arcmin

distance
43.0 Mly

8. A typical spiral galaxy like M99 contains one hundred thousand million stars like our own Sun, some smaller, some larger and some similar in size to our Sun. Given that number of stars, you would expect galaxies to be pretty big!

    i. Measure the diameter of M99 in thousands of light years (kly).

[How big is a light year? 1 kly = 9.46 x 1012 km - just under ten million million km!]

    j. Measure the diameter of the bright central bulge. Roughly how much smaller is the bulge than the whole visible galaxy in the case of M99?

11. The three other images above show four more galaxies that you can measure if you have time.

Two longer versions of this worksheet are also available, one containing more objects to measure and one which is intended to give a sense of sizes and distances in the universe.