| SIERRA COLLEGE OBSERVATIONAL ASTRONOMY LABORATORY EXERCISE |
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| NUMBER **III.H.** TITLE: Comets |
| DATE-      **PRINT NAME/S AND INITIAL BELOW:**      **GROUP** <br><br> DAY- <br><br> LOCATION |

**OBJECTIVE:**

To study the aspects of different comets which were visible from Earth. Use TheSKY to examine aspects of comet orbital elements.

**PROCEDURE:**

**Step 1**

Use TheSky program and the images of the comets to determine the following information about each comet in Table 1.

| Comet | Date | RA<br>h  m | Dec.<br>deg | Magnitude | Distance to<br>Earth (*D*) | Constellation |
|---|---|---|---|---|---|---|
| Halley | 4/2/86 | | | | | |
| Hyakutake | 3/23/96 | | | | | |
| Hale-Bopp | 3/29/97 | | | | | |

**Step 2**

Estimate the angular length of the comet and tail ($\theta$) in degrees and use the distance to the comet (*D*) found in Table 1 in the formula below to **determine the size of the comet (*S*) in AU's.**

**Note that the images are 10 degrees high and 15 degrees wide.**

$$S = \frac{\theta}{57.3°} \times D$$

| Comet | Image Scale | Measured length of tail | Angular Length ($\theta$) | Size  (S) in AUs |
|---|---|---|---|---|
| Halley | | | | |
| Hyakutake | | | | |
| Hale-Bopp | | | | |

**Step 3**

Open the comet Orbital Element dialogue box and record the orbital elements and RA/Dec for Halley's comet. Adjust each parameter (increase the value slightly and decrease it slightly) and recompute the comet position. Determine how each parameter affects the comet's orbit (what is the change in RA and Dec). List your results below:

e=                                    L=
q=                                    w=
i=

RA=                Dec=

| Parameter | Increase value | | Decrease value | |
|---|---|---|---|---|
| *e* | *RA=* | *Dec=* | *RA=* | *Dec=* |
| *q* | *RA=* | *Dec=* | *RA=* | *Dec=* |
| *i* | *RA=* | *Dec=* | *RA=* | *Dec=* |
| *L* | *RA=* | *Dec=* | *RA=* | *Dec=* |
| *w* | *RA=* | *Dec=* | *RA=* | *Dec=* |

**Step 4**

Determine the size of the comet Shoemaker-Levy 9, the comet that broke apart!
Use the 5 images and complete the table below. Use the size formula (S) found in
Step 2.

**All images are 2 arc minutes wide (i.e. 1/30<sup>th</sup> of a degree wide).**

**Determine Image Scale = _____**

| Date | Distance from Earth (D) | Measured length of chain of comets | Estimated angular length ($\theta$) | Size (S) |
|------|------|------|------|------|
| 3/27/93 | 4.5 AU | | | |
| 4/15/93 | 4.6 AU | | | |
| 5/21/93 | 4.9 AU | | | |
| 6/12/93 | 5.2 AU | | | |
| 7/17/93 | 5.3 AU | | | |

**Step 5**

Determine the size of the LARGEST impact site for the "great crash" from the
images provided (Show Work!).

**Determine Image Scale = _____**

**Note: Jupiter's diameter is 142,800 km and the Earth's diameter is 12,756 km.**

Impact Site Size = ---------------------

**Questions:**

List and describe the major parts of a comet.

What are the types of orbital periods of comets?

Would you say comets are large or small celestial objects? Why?

How does the size of the SL-9 impact on Jupiter compare to the Earth?

What would have happened if SL-9 hit Earth?

**Write Conclusions in Bluebook.**