

Topic A

"The Visible Sky"

Part 6. The Planets

(Web Version: 01-16-01)

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Planetary Motions

Two Categories:

- Inferior — Mercury & Venus
- Superior — All others except Earth (Mars, Jupiter, Saturn, Uranus, Neptune & Pluto)

Note: Earth *not* inferior or superior

Why? Earth *not* on sky!

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Planetary Motions

Like Sun & Moon but . . .

- Rates different
- Tracks on sky more complex
- Wandering motions sometimes westward!
- Associated brightness changes

Explaining planetary motions challenged human thought for over 2,000 years!

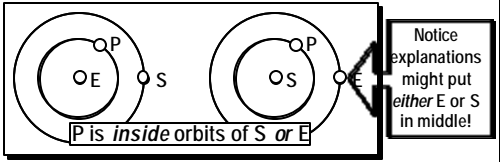
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The Inferior Planets

Inferior — *lower, beneath or inside of*

Explanations of motions put planet either *inside*

Sun's Orbit or Earth's Orbit



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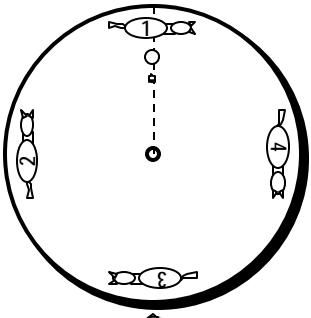
Inferior Planet Summary

See Study Guide (Table 2)

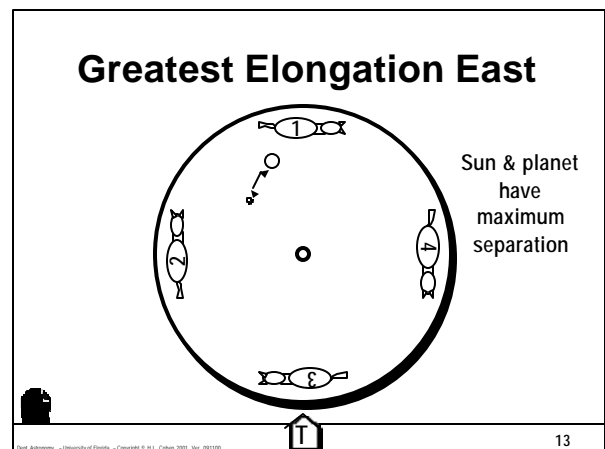
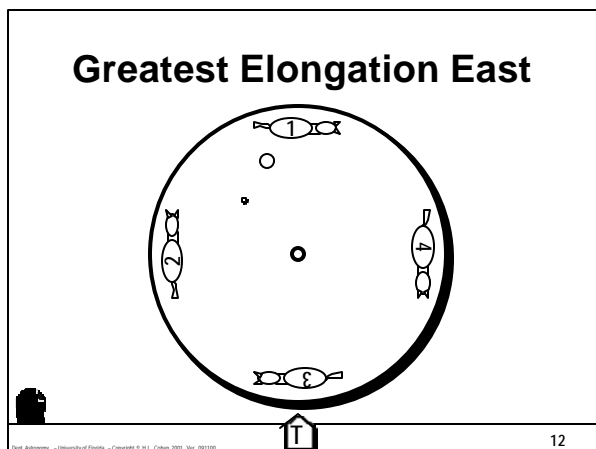
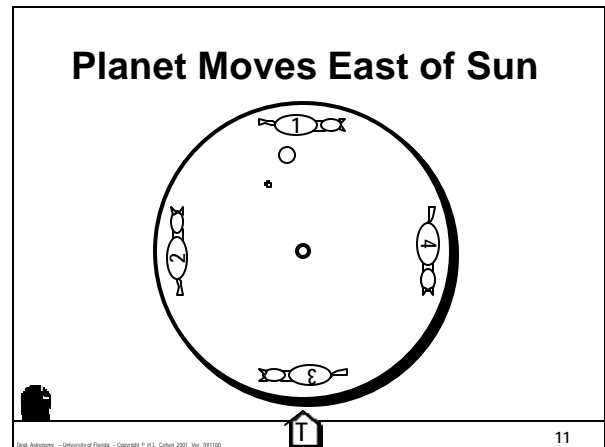
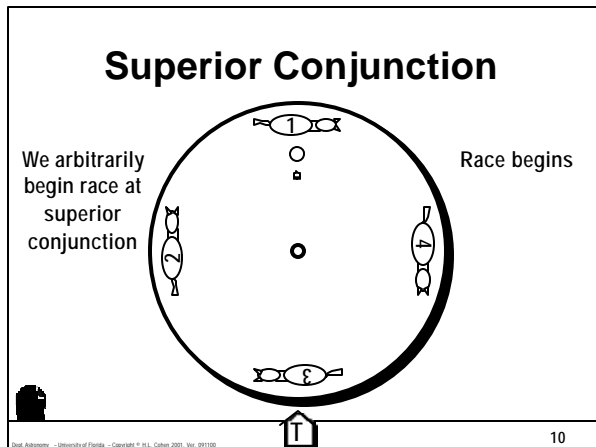
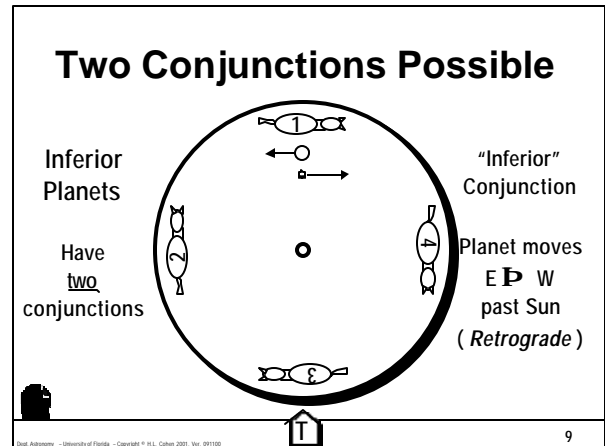
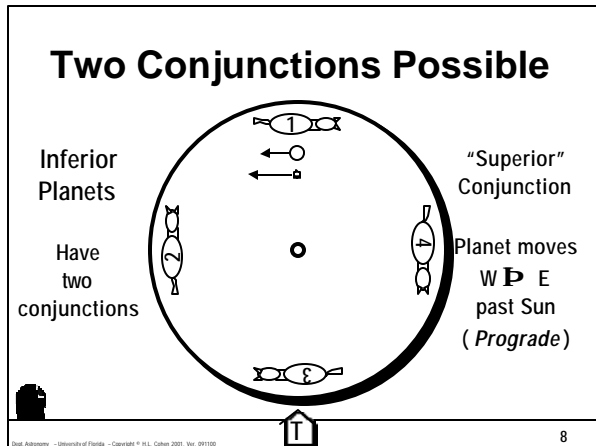
| | |
|-----------------------|--|
| • Alternate Names | None |
| • Objects | Mercury & Venus |
| • Direction | West to East (<i>prograde</i>) but sometimes East to West (<i>retrograde</i>)! |
| • Average Rate | <i>More than 1°/day</i> |
| • Greatest Elongation | 18 – 28° (Mercury) ← 46 – 47° (Venus) ← |

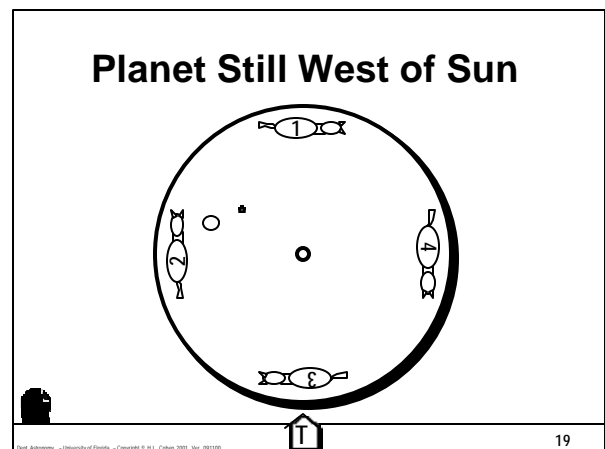
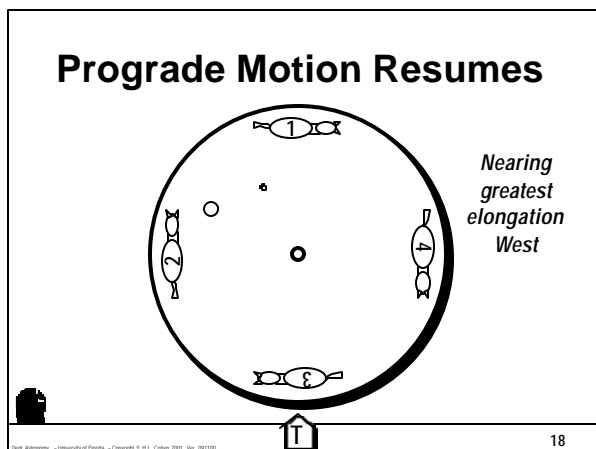
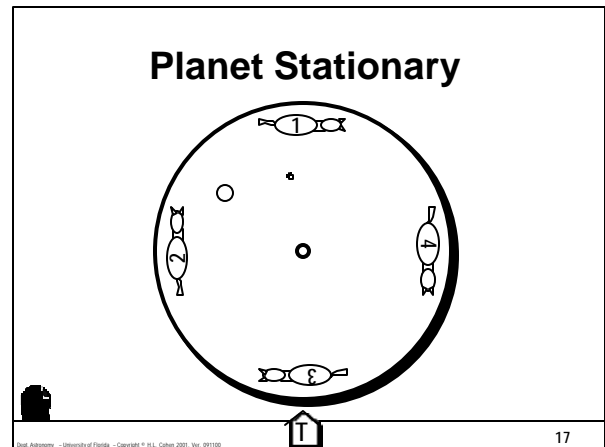
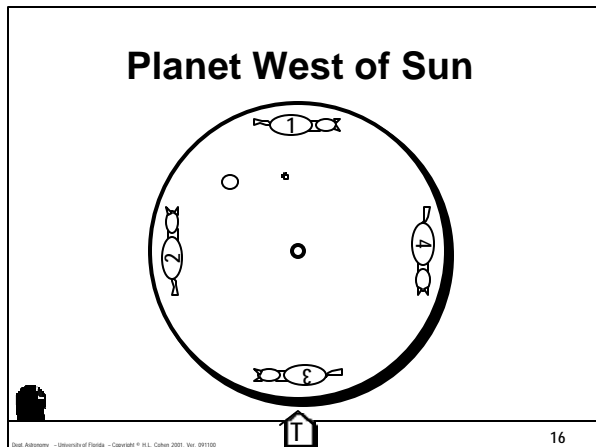
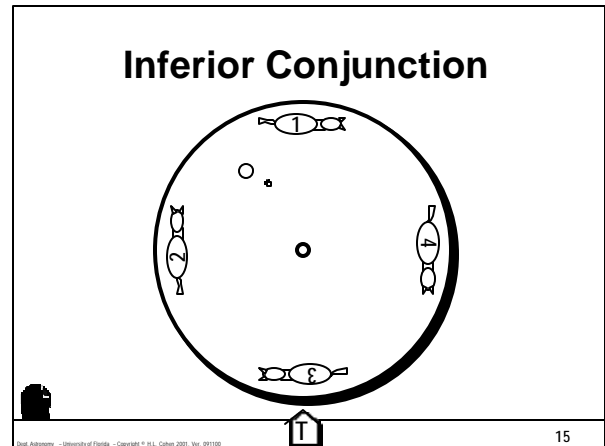
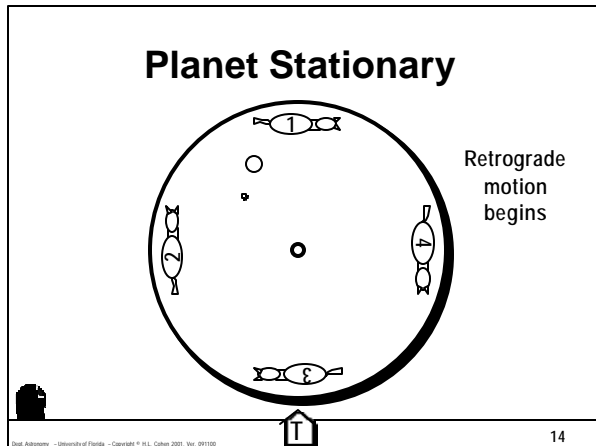
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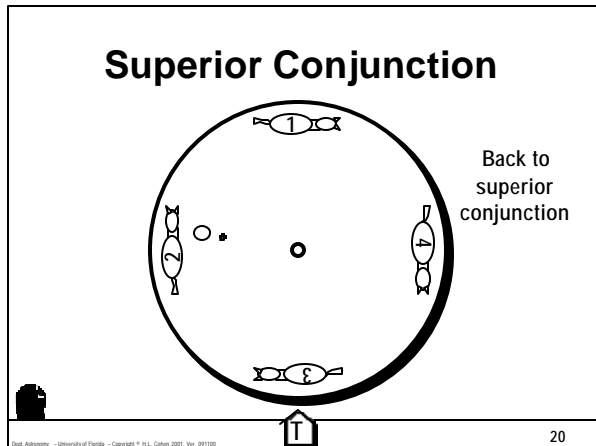
Inferior Planet



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Behavior of Inferior Planets

- Like bicyclist and pedestrian traveling together
- Problem — Bicyclist has trouble moving as slow as pedestrian
- "How do they stay together?"

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Solution

- Bicyclist "loops" pedestrian as pedestrian walks
- Hence — Both "stay together"

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Consequence: Evening "Star"

Evening Dusk
(Assume time near sunset)

Venus always near Sun in sky

46° (maximum)

East Horizon Facing South West Horizon

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Consequence: Morning "Star"

Morning Dawn
(Assume time near sunrise)

46° (maximum)

Likewise when west of Sun

East Horizon Facing South West Horizon

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Same for Mercury

Evening Dusk
(Assume time near sunset)

Inferior Planets always near Sun in sky

18 - 28° (maximum)

East Horizon Facing South West Horizon

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No Opposition/Quadrature

So can see conjunction only with crescent moons

East Horizon Facing South West Horizon

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The Superior Planets

Superior — *higher, above or outside of*

Explanations of motions put planet either *outside*

Sun's Orbit or Earth's Orbit

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Superior Planet Summary

See Study Guide (Table 2)

- Alternate Names None
- Objects All but Mercury & Venus
- Direction West to East (*prograde*)
but sometimes **East to West (*retrograde**)**
*retrograde motion just before to just after opposition
- Average Rate **Less than 1°/day**
- Greatest Elongation 180° (opposition: *brightest*)

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Conjunction

Race begins

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Planet West of Sun

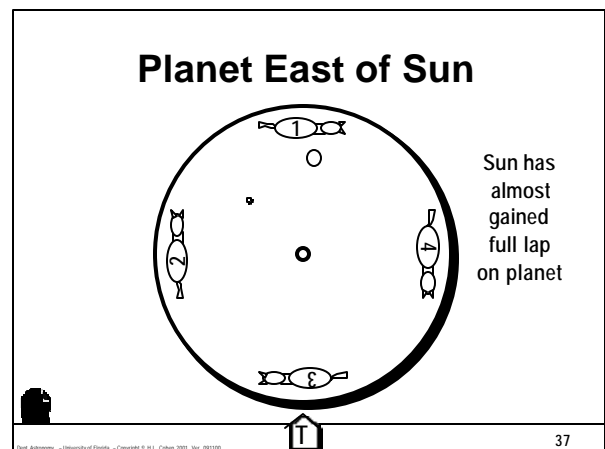
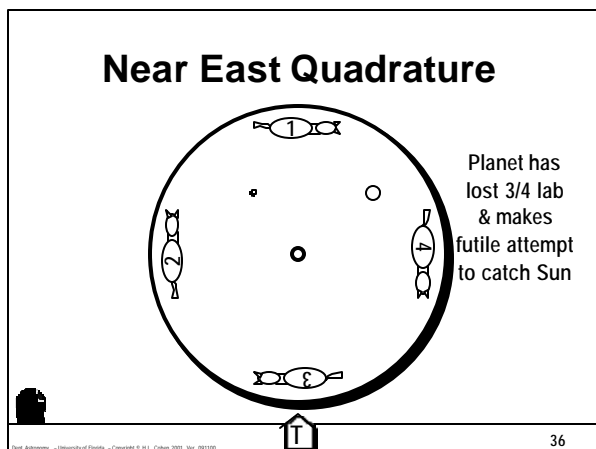
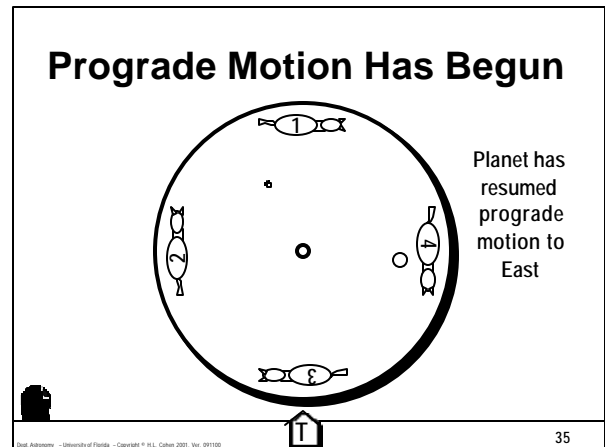
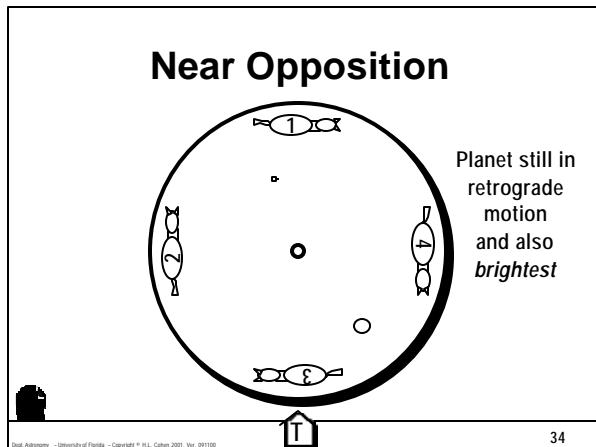
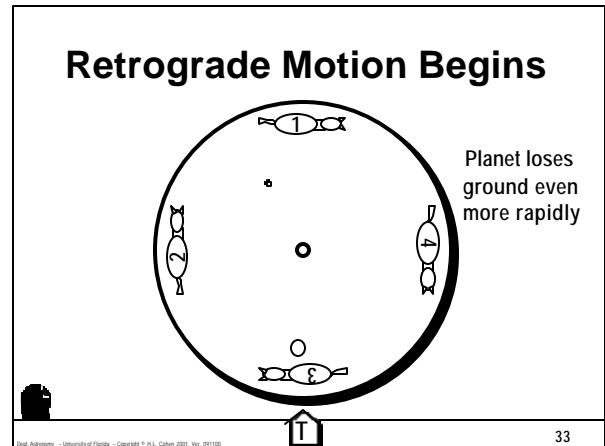
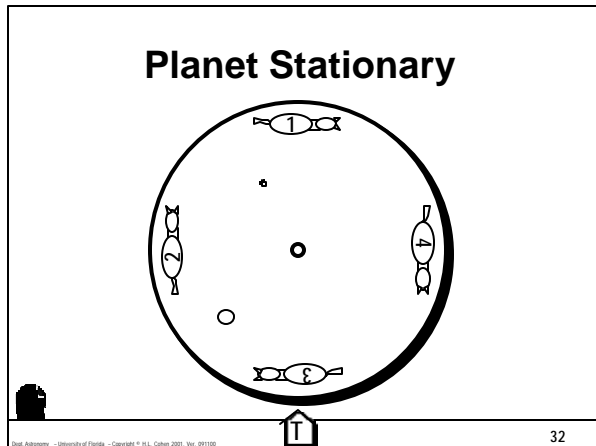
Planet falls behind

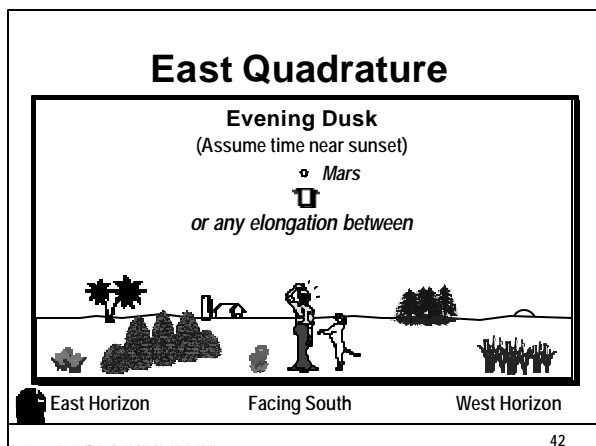
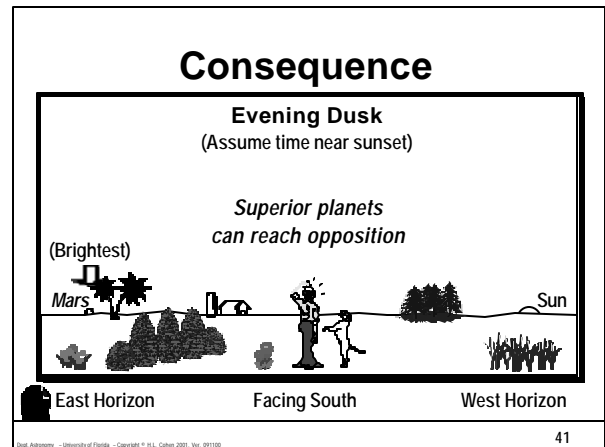
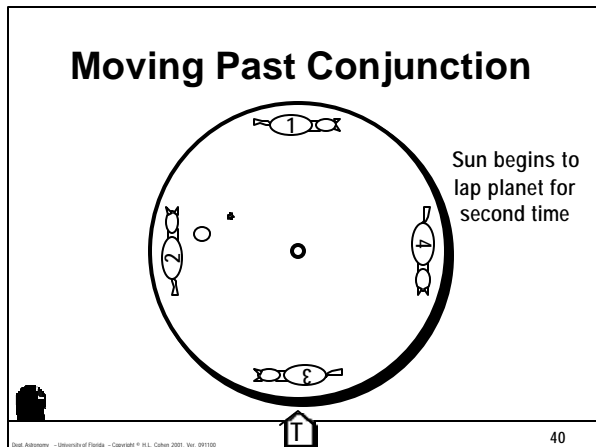
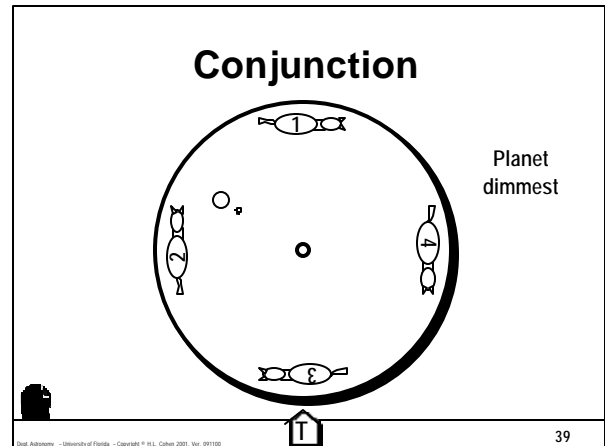
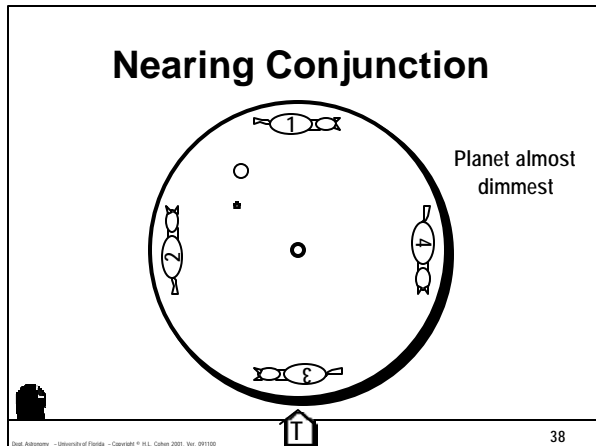
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Nearing West Quadrature

Planet has lost almost 1/4 lap

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Planetary Animations

- Produced with a planetarium sky program
- *TheSky™ for Windows* (Software Bisque)

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