Rosetta
Lutetia
Flyby

July 10,
2010

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SBAG 3: Pasadena, CA
August 3-4, 2010
Rosetta Mission

• ESA Cornerstone Mission with NASA participation
• Launched March, 2004 on Ariane 5
• Eleven instruments on orbiter; 10 instruments on lander.
• Flew by asteroid 2867 Steins on September 5, 2008.
• Flew by asteroid 21 Lutetia on July 10, 2010
• 3-year hibernation will begin in 2011 during aphelion passage. Not enough power to run spacecraft and radio transmitters.
21 Lutetia: Pre-Flyby Knowledge

- $a = 2.436$ AU, $e = 0.1629$, $i = 3.064^\circ$
- IRAS diameter = 96 km, albedo = 0.22
- $P = 8.1655$ hours
- Spectral type: M (Tholen), Xk (Bus), C (Barucci)
- Drummond et al. (2010, in press): $d = 124 \times 101 \times 93$ km
- Mass estimates from mutual events lead to density estimates: $3.5 \pm 1.1 \text{ g/cm}^3$, $4.3 \pm 0.8 \text{ g/cm}^3$
- Lamy et al. (2010): Thermal inertia = 30 (mks units) -- suggests thick dusty regolith
- Flyby: 3162 km CA, approach phase angle = 11°
Lutetia Approach Imaging – One Full Rotation
Closest approach
Close up of smooth crater: landslides and boulders
High phase departure view
Radio Science

- **Preliminary** density estimate: 2.5 – 2.9 g/cm$^3$
- **Uncertain** due to uncertainty in asteroid shape and volume

- Density is high for a C-type (carbonaceous) asteroid, though density of 2 Pallas is 2.6-3.1 g/cm$^3$
- Likely not dense enough for M-type (metal) asteroid unless porosity is very high, ~60-70%
- Possibility: W-class asteroid (Rivkin et al. 1995, 2000) with hydrated minerals on surface.
Future Reporting

• European Planetary Science Conference, Rome, September 2010
• Division for Planetary Sciences Meeting, Pasadena, October 2010
• Rosetta Lutetia Workshop, Granada, October 2010