MARS TO LOSE A MOON, GAIN A RING

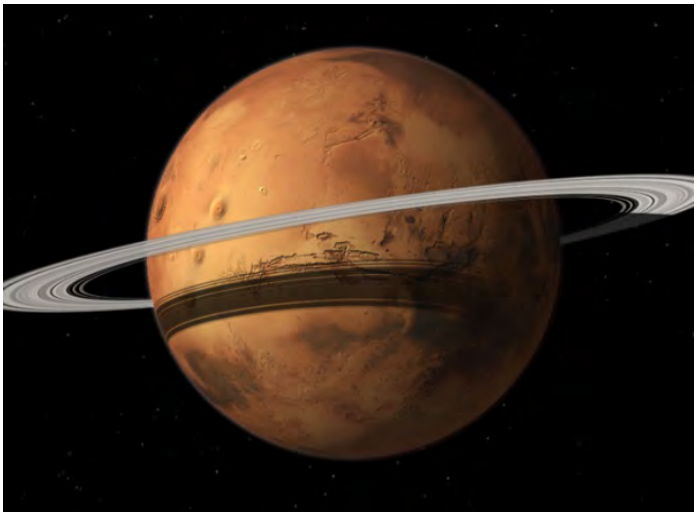

Image of how Mars might look by Tushar Mittal

Mars' large moon Phobos is slowly drifting closer toward the planet. But rather than smash into the surface of Mars, Phobos will most likely be torn to shreds by the planet's gravity and the pieces strewn about Mars in a ring, like the rings encircling Saturn, Jupiter, Uranus and Neptune.

In about 20-40 million years Phobos will be close enough to the planet so that the differential gravity on the highly fractured moon gets powerful enough to actually pull the moon apart. Dismembering it will be analogous to pulling apart a granola bar, scattering crumbs and chunks everywhere.

Though inevitable, the demise of Phobos is not deemed imminent. It will probably happen in the next 40 million years, leaving rings around the planet that will persist for anywhere from one million to 100 million years.

In a paper appearing online in Nature Geoscience on November 23, 2015, researchers estimate the cohesiveness of Phobos and conclude that it is insufficient to resist the tidal forces that will pull it apart when it gets closer to Mars.

Phobos is a lumpy, fractured moon that will be torn apart by Mars' gravity when it gets too close to the planet

Just as earth's moon pulls on our planet in different directions, raising tides in the oceans, for example, so too Mars tugs differently on different parts of Phobos. The resulting rubble from Phobos – rocks of various sizes and a lot of dust – would continue to orbit Mars and quickly distribute themselves around the planet in a ring.

Largest chunks would eventually spiral into the planet and collide at a grazing angle to produce egg-shaped craters, the majority of the debris would circle the planet for millions of years until these pieces, too, drop onto the planet in 'moon' showers, like meteor showers. Mars' other moon, Deimos, would remain.

Researchers, postdoctoral fellow **Benjamin Black** and graduate student **Tushar Mittal**, both in University of California, Berkeley's Department of Earth and Planetary Science, were drawn to the question of what might happen to Phobos because its fate is expected to be so different from that of most other moons in our solar system.

While our Moon is moving away from earth at a few centimetres per year, Phobos is moving toward Mars at a few centimetres per year, so it is almost inevitable that it will either crash into Mars or break apart. One of the motivations for studying Phobos was as a test case to develop ideas of what processes a moon might undergo as it moves inward toward a planet. Only one other moon in the solar system, Neptune's largest moon, Triton, is known to be moving closer to its planet. **Studying such moons is relevant to conditions in our early solar system, when it's likely there were many more moons around the planets that have since disintegrated into rings – the suspected origins of the rings of the outer planets**. Some studies estimate that during planet formation, 20-30 percent of planets acquire moons moving inward and destined for destruction, though they would have long since disappeared. Some of Mars' several thousand elliptical craters may even have been formed by remnants of such moonlets crashing to the surface at a grazing angle.

The Stickney crater at one end of Phobos was created by an impact that could have torn Phobos apart if the moon were less fractured and porous.

It is not clear whether the rings would be visible from earth, since dust does not reflect much sunlight, whereas ice in the rings of the outer planets makes them easily visible. Standing on the surface of Mars a few tens of millions of years from now, it would be pretty spectacular to watch.

AK, from EarthSky Notes