

After studying all three targets to be imaged by the Cassini spacecraft, it seems evident to me that the target that could yield the most interesting science results is target number two, Saturn's F ring.

The F ring is a very faint structure, between 30 and 500 kilometers wide, confined radially by two shepherd moons - Prometheus and Pandora. Consisting of one core ring and a spiral strand around it, the F ring is not only the most active of Saturn's rings, but also possibly one of the most dynamic places in the Solar System, as it can change in a matter of hours. The key factor accounting for its bizarre activity is the influence of the potato-shaped moon Prometheus.

As Prometheus moves close to the ring, a stream of ring particles is pulled gravitationally towards the moon, opening long-lasting channels in the ring. Due to Prometheus's gravitational pull, the F ring's material coalesces, creating large snowballs that then punch through the ring, leaving glittering trails behind them. Taking a closer look at the channels, ripples and snowballs created by Prometheus would for one thing make a great opportunity of photographing these extraordinary objects, and on another it could reveal a lot about the moon itself, as the perturbations of Prometheus are imprinted on the F ring.

What surprised the scientists looking at Cassini's photos most, is the fact that the whole ring seems to be twice as bright now as it was in 1980, when the Voyager spacecraft photographed it. It has been proved that the disparity isn't an illusion caused by different camera calibration in the two spacecraft or the color of the ring, so it seems that the F ring has really increased its brightness over the last 30 years.

One of the reasons might be the distance separating Prometheus and the F ring, that changes (from 200 to 800 km!) due to the moons eccentric orbit and was much bigger during Voyager's flybys. The other hypothesis, though, says that the increase in brightness is probably the result of a change in the distribution of the ring's dust. The F ring is in a 'boundary' region, before where Saturn's tidal forces are so strong that they prevent objects from growing through accretion, while farther out everything accretes and forms moons. Thus some clumps inside the ring might have dispersed, spreading more material out and making the whole F ring brighter. The only way to check it is to take more photos of the ring.

Cassini's studies of the F ring could also help us understand the activity that occurs when planetary systems evolve out of dusty disks that are similar to the disk we see around Saturn, which would reveal a lot about the history of the Solar System.

In closing, I believe that due to its strange beauty and the interactions between the ring, Prometheus and Pandora, that have been difficult to disentangle, the F ring would make a great object for Cassini's observations.