

TAC Seminar
Monday, April 2, 2007
12:00 noon
544 Campbell Hall

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HOW TO ESCAPE FROM SATURN (AND OTHER PLACES)

Cassini has unveiled the Saturnian system in unprecedented detail, and in doing so has exposed gaping holes in theories we took for granted. This talk will focus on one of those mysteries and on the wider implications of its resolution.

The tool we have used since Voyager times to measure Saturn's rotation rate has tricked us: the planet's radio emission period has been varying by 10 minutes over the last 25 years, and it's simply not possible that the planet's interior could be doing the same. Direct magnetic measurements by Cassini reveal yet another period, which still cannot be the interior rotation rate. I will show that plasma escaping from the magnetosphere can explain all the above (without knowing the real rotation rate), and that the recently discovered Enceladus plume is likely to be the culprit. I will discuss the physics of plasma convection, and the requirement for a single 'tongue' of escaping plasma to explain the observations. New Cassini results continue to strengthen support for this model, and laboratory experiments back up our assumptions.

Previously, studies of plasma convection have focused on the more easily observable Io torus around Jupiter (where we know the planet's rotation rate exactly), but the details have been elusive. Our results at Saturn may shed light on the Jupiter system, and provide an explanation for the mysterious 'System IV' periods observed in the Io torus.