THE NATURE OF COMETS: BIG SURPRISES. Tom Van Flandern, Meta Research (tomvf@metaresearch.org)

Overview: New findings from the *Stardust* and *Deep Impact* missions and from the outburst of Comet Holmes indicate that comets apparently have no surface ices, yet do have high-formation-temperature minerals and thick dust regoliths. These findings were a surprise to the standard dirty snowball model for comets, but were as expected by the satellite model for comets, a corollary of the exploded planet hypothesis (EPH). The latter model has now successfully predicted asteroid-comet similarities [1], asteroid and comet satellites [2-9], salt water [10], meteor storms associated with comets [11-13], and explosion signatures in asteroid and comet orbital elements [14-15], among many other features [16]. Most of these predictions were published years in advance of discovery when they were still considered to have negligible plausibility. While the dirty snowball model requires continual repair, EPH and its satellite model for comets have proved invaluable for understanding small solar system bodies.

Details: The *Stardust* mission to Comet Wild 2 brought back samples showing the comet's chemical composition. Noteworthy were high-formation-temperature minerals (magnesium, calcium, aluminum, titanium) found in the comet's coma, along with materials such as olivine normally associated with volcanism. [17-18] Implied formation temperatures are above 1100°C, and grain compositions are a good match to inner-solar-system asteroids.

In October 2007, Comet Holmes underwent a major outburst of unprecedented magnitude. The cause and energy source powering such outbursts remains unknown to mainstream astronomers. But in the satellite model for comets, disturbances of the outer coma by the Sun's gravity can redirect quite large orbiting debris fragments toward the nucleus. A head-on impact can eject millions of tons of surface dust that had fallen onto the nucleus from the coma.

Yet another comet surprise had occurred in July 2005, when a probe from the *Deep Impact* spacecraft smashed into Comet Tempel 1. Surface colors and reflectivity indicated no evidence for surface snow or ice. Craters and other surface relief and the bright impact flash suggested a hard surface, and visual appearance was indistinguishable from asteroids. [19]

The 200-year-old EPH correctly and exactly predicted all these comet features, or at worst explained them without need of any model change or unanticipated add-on hypotheses. The EPH implies that asteroids are in reality fragments of planets or moons that have exploded at a few specific times in solar system history, and today's comets are almost all from the explosion of a moon-sized parent body 3.2 million years ago.

Comets have retained more volatiles than asteroids because of their greater distance from the Sun. This explosion-type origin implies the "satellite model" for comets. The coma does not originate by ejection of gas and dust from the comet nucleus, but rather is a semi-permanent debris cloud from the original parent-body explosion gravitationally attached to the nucleus. [1] The coma might have far more mass than the nucleus, and is a continuing source of dust falling onto the nucleus.

Anyone can judge the quality of a model by the success of its predictions, especially the most improbable ones; by the absence of failed predictions; and by the insight or understanding of nature that it provides. Continual model repair is a sure sign of a failed theory. There is no scientifically legitimate reason for ignoring a viable model with a lengthy record of improbable prediction successes.

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