Hence, it is probable that the $[Fe II]$ lines, which presumably are produced by collisional excitation, originate in a cloud of low density gas at rest relative to the star, whereas the hydrogen lines are produced in a shell of higher density rotating about the star. This phenomenon is perhaps not too dissimilar to that found for the much cooler and less luminous T Tauri type stars located in nebulosity.

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Whipple, Fred L. On tests of the icy conglomerate model for comets.

It has been shown previously that the icy conglomerate model for comets explains the anomalous accelerations of certain comets and also possible reductions in the effective attraction by the sun. These effects depend upon a moderate loss of matter, $\Delta M/M$ per period. This loss measures the loss of radius, $\Delta R/R$, while the solar radiation determines the maximum loss of radius by vaporization if one assumes 100 per cent efficiency in the radiation transfer. By this means an upper limit of radius for seven comets has been determined. Numerical values in km are: Encke 4, Pons-Winnecke 82, Biela 1.7, d'Arrest 1.4, Brooks 1.2, Wolf I 19 and 1905 III 0.2. The smaller values are probably the most significant and are generally greater than the expected values derived from the reflected light at great solar distances. The heat transfer efficiency can be estimated from these deviations and is probably about 0.1 for Encke and nearly unity for 1905 III.

The model predicts a large excess of unobserved hydrides, H_2O , NH_3 and CH_4 molecules, as compared to the observed CO^+ , C_2 and CN . For Halley's comet, using Wurm's calculations for the rate of loss of CO^+ and C_2 and using the total loss of ices calculated from solar radiation for a nucleus of radius 10 km, the relative abundances of CO^+ and C_2 to the combined hydrides are 10^{-5} and 10^{-3} respectively. These abundances are roughly consistent with certain of ter Haar's calculations for molecules formed from interstellar atoms. Calculations show that the predicted excess of hydrides will produce no appreciable Rayleigh scattering in comets, and also little electron scattering should all atoms become singly ionized by photo-ionization. Little visible radiation from the hydrides of C , N and O would be expected, but thorough observations of cometary

spectra in the infra-red are needed, as well as laboratory and theoretical studies.

The comet model requires that a large cometary nucleus eject visual or photographic meteoroids with greater velocities than a small nucleus at the same perihelion distance, velocity proportional to the square root of the radius. Hence, the meteor streams from the greater comets should generally be more dispersed and more uniform from year to year than streams from lesser comets with comparable orbits. Confirming examples of streams from greater comets are the Perseids and the Orionids and η Aquarids, if the latter streams arise from Halley's Comet; the Leonids and Bielids represent debris from dying comets. Qualitatively, the model predicts well for the meteor streams from known comets. Quantitative studies are under way.

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Wood, Frank Bradshaw. Period changes of eclipsing variable stars.

1. This paper investigates the stability of systems whose periods fluctuate irregularly. To a first approximation, the limits of stability can be determined by computing the Jacobian surface containing the double point appearing when the ovals around the stellar centers meet. This is a surface of zero relative velocity; if the system is stable, all parts of each star lie within this surface. The shortest equatorial radius of the less massive star, b_f , reaches this surface first. The application of this test consists of determining b_f and the mass-ratio for stars exhibiting irregular period changes, and, by comparison with the stability criteria, determining whether such systems are near stability limits. Care must be taken especially in determination of b_f . The light curve yields the average photometric ellipticity of both components; we want the geometric ellipticity of the less massive. This may be computed from the elements of the system if the observations are good and the solution is reasonably determinate.

The 546 stars in Pierce's Finding List were investigated. Eighteen well-observed cases show irregular period fluctuations. Seventeen of these are near the stability limits; the eighteenth is abnormal both photometrically and spectrographically.

This evidence is supported by stars showing constant periods over long intervals; in every case where strong solutions are available, stability of the system is indicated.