high temperature, and meteoritic particles that may have survived weathering.

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Kerr, F. J. A Magellanic effect on the galaxy.

The shape of the galactic disk has been studied, by means of 21-cm hydrogen-line observations, using the Leiden rotational model (van de Hulst *et al.* 1954) to deduce distances. The whole of the galactic plane, except for a small 45° sector, centered on longitude 90°, can be seen from Sydney. The results of this study were reported to a Radio Astronomy Symposium in Sydney in September last (Kerr 1956).

A sweep across the galactic plane at a given longitude and frequency gives the vertical position of the galactic "plane" at a particular distance. A relief map of the galaxy can be built up in this way. When drawn with reference to the conventional galactic plane, the main effect is the well-known downward slope, approximately towards the center.

This slope has been found from observations over the nuclear region, leading to a solution for the "principal plane," that is, the equatorial plane of the most massive part of the galaxy. Allowing for this slope, the central part becomes substantially flat, but the outer regions show a twist—downwards (southwards) on the side towards the Magellanic Clouds, which are below the plane, and upwards on the opposite side. At a distance of 12 kpc from the galactic center, for example, the maximum deviation from the principal plane is 350 to 400 pc, which is about 1½ times the thickness of the gas layer.

A phenomenon of this type suggests a gravitational tide, but the effect is quantitatively much too large for a simple gravitational explanation. There may be an analogy with cases reported by Zwicky and others, in which there appear to be unexpectedly large interactions between galaxies.

Kerr, F. J. 1956, *Proc. Radio Astr. Symposium*, Sydney, Sept. 4-5 (in press).

van de Hulst, H. C., Muller, C. A. and Oort J. 1954, *B. A. N.* 12, 117.

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Kraft, Robert P. $H\alpha$ doubling in the spectra of three long-period classical Cepheids.

The observational material for this discussion was obtained at the Mount Wilson Observatory

while the author held a National Science Foundation Fellowship. $H\alpha$ is found to exhibit double absorption cores in the spectra of the three long-period classical Cepheids TT Aql, X Cyg and WZ Sgr, with periods 13.8, 16.4 and 21.8 days respectively. The phenomenon is transitory in TT Aql and X Cyg, lasting from about phase 0^p.75 at least to 0^p.85 from maximum light in both stars; an isolated plate of WZ Sgr at phase 0^p.79 also shows the splitting. The three stars belong to Eggen's (1951) A and B groups.

Coudé spectrograms of the $H\alpha$ region with dispersion 20 Å/mm were obtained for TT Aql from 0^p.57 to 0^p.85 and for X Cyg from 0^p.45 to 0^p.87. In both stars the following developments take place:

1. At phases when the splitting is absent, $H\alpha$ lies shortward of the velocity of the metallic lines.
2. When the splitting is present, the violet component is at most 25 km/sec shortward of the metallic line velocity.
3. The longward components of $H\alpha$ first appear very close to the time of minimum light and are displaced longward of the metallic lines by about 35 km/sec. These cores do not develop from any longward-displaced wing of the violet component, but rather appear to be completely independent. Gradually increasing in strength, they reach an intensity equal to that of the shortward components by about phase 0^p.80 to 0^p.85.

The doubling of $H\alpha$ confirms the discovery of doubling in the low-excitation metallic lines of X Cyg found earlier (Kraft 1956). The phenomenon does not, however, appear to develop along lines parallel to those in the spectrum of the Population II Cepheid W Vir (Sanford 1952; Abt 1954).

Suppose that the gas contributing to these longward-displaced cores in the classical Cepheids is distributed in a spherically symmetrical, though not necessarily smooth, way. In X Cyg, the mass of this gas is about 0.1 gm in a column of 1 cm² cross-section. The observations then suggest that this material, the earlier history of which cannot be followed, appears suddenly at a time when it is falling into the star with a velocity of at least 60 km/sec with respect to the γ axis. The outstanding problem would consequently seem to be this: where does this material come from?