The interstellar gas in the central part of the galaxy

Oort, J.H.; Rougoor, G.W.

other. The relative semi-amplitude of the satellite oscillations increases with increasing perigee height, ranging from about 10 per cent for the Soviet satellites to about 35 per cent for 1958 $\beta 2$.

Another solar effect, which can be detected in 1957 $\beta 1$, 1958 $\beta 2$, and 1958 $\delta 1$ is a dependence of the orbital acceleration on the geocentric angular distance between the perigee and the subsolar point. This "diurnal" effect is not limited to the time when the perigee crosses over from night into daylight, or vice-versa, but seems to be rather a smooth function of the perigee position relative to the sun.

Smithsonian Astrophysical Observatory, Cambridge, Mass.

McLAUGHLIN, DEAN B. **Absorption-like features in a supernova spectrum.**

The spectrum of the supernova of 1954 in NGC 4214 was studied on Lick spectrograms taken June 24 to August 19 and Mount Wilson-Palomar plates of June 6. In the blue-violet its appearance departed appreciably from that of the usual supernova spectrum of type I. Instead of the typical pattern of broad, diffuse emissions dominated by a band about λ4600, it appeared like a continuum with a few deep and several shallow absorption-like minima. Two of the strongest "absorption lines," when provisionally interpreted as λλ 4026, 4472 *He*I, give velocities near −5000 km/sec. The fainter "absorptions" are nearly all assignable to *He*I, *C*II, *O*II and *N*II with similar velocity. Deep, very broad minima near λλ 4900 and 3800 are not fully explained; otherwise the pattern of "absorption" resembles that of HD 124448 (Popper, D. M., *Pub. A. S. P.*, **58**, 370, 1946), a B-type spectrum lacking hydrogen lines. After July 8 the "absorption lines" faded. By August 19 the spectrum was that of a normal supernova of type I.

From June 6 to July 8 the supposed B-type spectrum shifted longward, the mean velocity changing from −5700 to −4700 km/sec. This suggests the hypothesis that the well-known longward shift of the blue emission bands may be due in part to decreasing shortward displacement of overlying hazy absorptions. This view encounters some difficulties. Thus, no sharpening of blue emission features accompanies the shift, and no progressive shifts occur in the red. The discrepancy between the high "absorption velocities" and the much lower expansion rate of the Crab nebula or of [*O*I] in the late stages of SN IC 4182 appears excessive. Finally, the long persistence of a shifting but unchanging pattern of absorption lines is difficult to explain in terms of any model involving high-speed ejection.

The author is grateful to N. U. Mayall and R. Minkowski for the use of spectrograms, and for helpful discussions. However, this does not imply agreement with the author's interpretations.

The University of Michigan Observatory, Ann Arbor, Mich.

OORT, J. H. AND ROUGOOR, G. W. **The interstellar gas in the central part of the galaxy.**

The high-velocity wings of the 21-cm line profiles in directions near that of the galactic center (Kwee *et al.* 1954) have been studied intensively in the past few years. Following are some features of the motion and distribution of neutral hydrogen in the central region of the Galaxy following from the observations.

1) A spiral or circular arm visible from $l = 305°$ to $l = 334°$ and possibly extending to greater longitude, at $R \approx 3$ kpc, which has a radial motion of about 50 km/sec directed away from the center; at the same time it takes part in the galactic rotation with a velocity of about 200 km/sec. The arm is seen against the continuous radiation of the source Sagittarius A (Van Woerden *et al.* 1957). It is by far the most regular of all the arms that have so far been observed in the Galaxy. Its temperature is about 100°K, the random motions average 5 km/sec in one coordinate, and the half-density thickness in the z-direction is 130 pc.

2) A spiral arm on the far side of the center, broken up into bits with radial motions between 75 and 150 km/sec, probably also situated between $R = 2$ and 3 kpc.

3) A rather empty region between $R = 0.5$ and 1.5 or 2 kpc.

4) A concentration within 500 pc from the center, with no radial motion and a rotational velocity of the order of 200 km/sec. Similar high rotational velocities close to the center have been observed optically in some elliptical nebulae and in M81.

It seems likely that the expansion is caused by magnetic fields (Oort and Rougoor 1958). The total amount of gas moving out of the region of 3 kpc radius is roughly 1.5 solar masses per year. At this rate the central disk would be emptied in a few tens of millions of years. It seems probable that replenishment comes from condensation of