and further to the right lies an S-shaped formation in Vela-Puppis. Between Puppis and Ophiuchus lies the brightest and most dramatic part of the visual Milky Way. This part is also more whitish in color than the rest. Although the Milky Way in Sagittarius is on the whole the most luminous, the brightest spot of the Milky Way lies visually around η Carinae. The faintest part of the Milky Way lies in the "Backyard" region of Auriga. The dark matter appears to form a continuous belt whose length and breadth is broken in a few places. Beginning in the faintest region, Perseus, the dark strip is easily traced on the luminous blotches of Cassiopeia, Cygnus, Aquila, Ophiuchus, Sagittarius, Centaurus, Carina, Vela, Puppis, Canis Majoris, Orion, and Auriga. In other words, the dark girdle pierces the Milky Way in its midriff and thus divides the Milky Way in two almost equal parts. With the aid of this visual sketch of the Milky Way, one can draw a profile of the Milky Way as seen at a great distance from the sun.

The luminous areas of the Milky Way were quantitatively expressed in terms of the Large Magellanic Cloud, which I estimated to be -1.0 mag. visually. As the Milky Way was rolling up and as I was moving from place to place (Australia, Indonesia, India, Europe, and Massachusetts) the different luminous parts of the Milky Way were intercompared in estimation of brightness. Thus it was possible to express the brightness of the whole circuitous span of the Milky Way on a uniform scale. For example, the brightest region in the north (Carina) is -3.5 mag., that in the south (Sagittarius) is -3.2 mag., the brightest cloud in Cygnus is -1.0 mag., and the whole Milky Way is -5.5 mag.

*Harvard College Observatory,
Cambridge, Mass.*

Halliday, Ian. Auroral green line and collision effects in meteor wakes.

New observational material on meteor wakes has been obtained at Meanook and Newbrook, Alberta, Canada, during 1958. Five spectrograms showing the auroral green line have been secured. The line is observed between heights of 115 and 79 km. The cameras were occulted 12 times per second but there is no perceptible decay of the green line across the occulted portions of the trails. An upper limit of not more than 5 de-exciting collisions per second for the metastable oxygen atom is derived. The light curves indicate that in those cases where the line disappears

at relatively great heights the cause is a lack of some reagent, presumably atmospheric oxygen in atomic form, rather than an increased importance of de-exciting collisions. The persistence of the green line below 90 km is surprising, since, in addition to more than 10^4 collisions per second with atmospheric particles, collisions with ablated meteor atoms become frequent and might be expected to quench the forbidden line. The height to which the green line remains visible appears to be correlated with local geomagnetic activity. The line is observed down to lower heights at times of increased activity.

Two high-dispersion spectrograms of a bright Perseid were secured, one of which shows a strong wake spectrum. The magnesium plus iron feature near $\lambda 5176$ is resolved in the wake and confirms that iron is the main contributor to this wake feature. A combination of the two spectrograms shows that iron atoms released at the terminal flare coasted for 180 meters before the energy of re-exciting collisions dropped to an optimum for the lowest iron multiplets. The deceleration is reasonable for coasting atoms but not for solid particles.

*Dominion Observatory,
Ottawa, Canada*

Hawkins, G. S., Southworth, R. B. and Stienon, F. Recovery of the Andromedids.

The spectacular displays of the Andromedid meteors in 1872 and 1885 have never been repeated and they have often been listed as a "lost stream." Precise photographic measurement with the Harvard Super-Schmidt cameras over the period 1952-56 have disclosed 24 meteors that follow the orbit of Biela's comet and represent the remnants of the swarm. The individual orbits show evidence of perturbations caused by the earth and Jupiter. It is deduced that the orbit of the Andromedid swarm now passes 0.05 a.u. below the earth's orbit. The Andromedid meteors described here have been perturbed in the plane of the comet orbit, similar to the dispersion observed in the sunward tail of the comet Arend-Roland.

*Harvard College Observatory,
Cambridge, Mass.*

Henize, Karl G. A new planetary nebula NGC 6164-65 (Cederblad 135a, b).

Objective-prism photographs of NGC 6164-65 taken in the light of $H\alpha$ and $[NII]$ in the course of the Michigan-Mount Wilson $H\alpha$ Survey show a markedly symmetrical distribution of gas about

the central star HD 148937 (Harvard spectral class B0). The shape of the nebula is roughly that of a figure "8" with small knots in the nebulosity showing central symmetry. These details are confirmed on direct photographs obtained with the 48-inch Schmidt.

The apparent brightness ($6.89 m_{pg}$) of the central star is greater than that of any other planetary nucleus. Assuming the nucleus to be a main sequence B0 star, Cederblad derived a distance of 670 parsecs. If, as seems more likely, it is a subluminescent B or O star comparable to other planetary nuclei, its distance is reduced to about 150 parsecs.

The $370''$ angular diameter of the nebula is the fourth largest on record. At a distance of 670 parsecs this yields a linear diameter of 1.2 parsecs; while at 150 parsecs the derived linear diameter is 0.27 parsec.

This object is clearly a planetary nebula from a morphological viewpoint, but spectroscopic observations of the nebula and central star are required to determine whether or not it fits this description from an evolutionary point of view. Whatever the result, the object is of unusual interest and deserves further investigation.

*Smithsonian Astrophysical Observatory,
Cambridge, Mass.*

Hynek, J. A., Henize, Karl G. and Whipple, Fred L. Report on the precision optical tracking program for artificial earth-satellites.

The photographic tracking program for IGY artificial earth-satellites operated by the Smithsonian Astrophysical Observatory employs a network of 12 observing stations around the world which uses the 20-inch, $f/1$ Baker-Nunn Schmidt satellite tracking camera especially designed for satellite tracking purposes.

Since 5 July 1958, all 12 stations have been in operation and the optical performance of the Baker-Nunn cameras has fulfilled the original design specification which called for $20-25\mu$ diameter stellar images. Mechanical performance, which called for rapid cyclic operation at essentially satellite and stellar angular rates, and a photographic time presentation have likewise proved satisfactory.

Photography of all satellites aloft except the Vanguard 1958 β has been routine. 1958 α has, since 5 July 1958, been photographed at the rate of 2.05 transits per day, with multiple photographs obtained per transit. The $6''$ Vanguard

satellite has been successfully photographed at a distance of more than 900 miles.

The Army satellite, Explorer IV (1958 ϵ) has, after 27 July, been photographed at 0.81 transit per day. Rapid reduction of the Explorer photographs were made to provide minute-by-minute space positions for evaluation of the radiation counts made by the Geiger and scintillation counters carried by Explorer IV.

All satellite photographs are reduced roughly at the respective stations. Later, machine reduction is made at the tracking headquarters in Cambridge. Standard reduction techniques with both the Van Biesbroeck goniometer and the Mann two-screw measuring engine are used. These data will be published and will include: 1. α and δ and estimated p.e.; 2. position angle of satellite motion and estimated p.e.; 3. time (UT_2) and estimated p.e.

Using 117 measures of variable quality, the estimated probable errors are $5''.4$ in α and $4''.0$ in δ ; but using 13 images of best quality, the mean estimated probable errors of a single satellite position are $1''.1$ in α and $0''.5$ in δ .

The larger error in right ascension reflects the greater error in setting on satellite positions in the direction of satellite motion, which to date has been predominantly west to east.

*Smithsonian Astrophysical
and Harvard College Observatories,
Cambridge, Mass.*

Koch, Robert H. The eclipsing binary, XY Leonis.

Photoelectric light curves were obtained in both yellow and blue light over a four month period in 1956. Additional observations place the variable on the (U, B, V) system and indicate it to be composed of similar late dwarfs.

The period of light variation is not constant and does not vary in a simple manner. To describe the outside-eclipse variations a term in $\cos 3\theta$ is necessary in both colors. Various methods of rectifying the observations are attempted, and it is shown that the final results do not depend greatly on the particular method chosen. The rectified eclipses are photometrically shallow but geometrically deep, and determinate solutions for the elements of the system have been derived. The discrepancies between the solutions are discussed, and a tentative model for the system is proposed.

*University of Pennsylvania,
Philadelphia, Pa.*