The galactic nucleus has been mapped at 10 microns with a resolution of a few arc seconds. Four discrete sources were resolved superimposed on an extended background.

We have scanned the center of our galaxy at a wavelength of 10 microns with a beam 5.5 arc-sec in diameter. The scans have been combined to produce the map shown in Figure 1. At 10 kpc, commonly assumed to be the distance to this region, 5.5 arcsec corresponds to 0.3 pc.

These observations were taken during the day on February 15, 1971, with the sixty-one-inch telescope at the Catalina Observatory. Because of the imprecision in the drive of the telescope, the scans could not be located accurately in declination; the telescope also drifted slowly in right ascension. These problems were overcome by comparing the scans with some made earlier by one of us (FJL) and D. E. Kleinmann with the Steward Observatory 90-inch telescope. Minor distortions may persist in the map. All of the features described below stand out clearly above the noise, which has a peak-to-peak value of about $6 \times 10^{-17} \text{ W/m}^2 \text{ Hz ster}$.

Four sources can be distinguished and are numbered in Figure 1. An additional broad zone of emission can be seen extending to the north. Sources 2 and 4 are partially resolved and have diameters of about 0.5 pc. There are indications on the individual scans that Source 2 would break up into two or three sources at higher resolution. Source 1 is unresolved and must be less than 0.2 pc in diameter. Source 3 may also be unresolved with our beam, although the ratio of signal to noise is inadequate to permit a strong statement.
for this map has a peak-to-peak value of about 1.8 \times 10^{-15} W/m^2 Hz ster; at this level, Sources 2 and 3 were not detected. Source 1 stands out prominently. It lies near the center of an extended source that has a radius of about 20 arcsec.

Two field stars are plotted in Figure 1 and labeled A and B. Additional scans at 10 microns enabled us to locate our map relative to field star A. The coordinates of this star were measured from a Palomar Sky Atlas plate, allowing us to determine the absolute position of the 10-micron sources to within about 2 arcsec. (A finding chart for the galactic center has been published by Spinrad, et al., (1971) (their Fig. 1). Star A is 2.5 mm south and 2.0 mm east of the indicated position of the galactic center on this chart and star B is 1.5 mm north and 1.0 mm west. It should be noted that the position of the 10-micron sources differs somewhat from the one indicated on the published finding chart.)

From our map, we estimate the total flux from the galactic center to be $480 \pm 50 \times 10^{-26} W/m^2 Hz$ at 10 microns. The 22-micron map indicates that the flux at this wavelength is $2300 \pm 250 \times 10^{-26} W/m^2 Hz$, of which about 60% or $1400 \pm 150 \times 10^{-26} W/m^2 Hz$ would fall within a field of view 25 arcsec in diameter. These results are in reasonably good agreement with earlier measurements made with a 25 arcsec field of view of $550 \pm 60 \times 10^{-26} W/m^2 Hz$ at 10 microns, and $1700 \pm 200 \times 10^{-26} W/m^2 Hz$ at 22 microns (Low, Kleinmann, Forbes and Aumann, 1969).

Maps of the galactic center at 2.2 microns have already been published (Becklin and Neugebauer, 1968). At this wavelength the detected flux arises almost entirely from unresolved stars. Except for the "point-like" source, the brightest features at 2.2 microns would produce a flux of $0.2 \times 10^{-26} W/m^2 Hz$ in a field of view the size of ours. At 10 microns, the flux from these stars should be an order of magnitude lower. Our peak-to-peak noise is about $3.5 \times 10^{-26} W/m^2 Hz$; thus, the general stellar background detected at 2.2 microns makes virtually no contribution to the 10-micron map. Becklin and Neugebauer (1969) have published the results of a scan across the galactic center at 10 microns. Their scan appears to have passed near the center of Source 2.

The 10-micron sources fall within the region of maximum intensity of the extended 2.2-micron source, which is centered (Becklin and Neugebauer, 1968) at $\alpha (1950) = 17^h 42^m 30^s \pm 1^s$ and $\delta (1950) = -28^\circ 59.4^\prime 0.1$ Their position also agrees with that of the radio source Sgr A (Maxwell
and Taylor 1968), $\alpha$ (1950) = 17h 42m 30s $\pm$ 1s and $\delta$ (1950) = $-28^\circ 59' 14''$ $\pm$ 15''.

Despite the consistency of these positions, significant ambiguities remain if one looks closely at the data. Our 22-micron map suggests that source 1 lies at the galactic center. On the other hand, a scan across the maximum of the 2.2-micron extended source, published by Becklin and Neugebauer (1969), places the greatest density of stars near Source 2. The 2.2-micron "point-like" object can be identified with Source 3; if it is, the 2.2-micron scan must be shifted in a direction which improves the correspondence with Source 2. The existence of Source 2 indicates that objects considerably cooler than normal stars lie very near the maximum 2.2-micron intensity. The contribution of these objects to the 2.2-micron flux is not known, leaving the position of the point of maximum stellar density uncertain.

Resolution of 6 arcsec at radio frequencies (Downes, private communication) reveals that Sgr A consists of two objects, one to the east and one to the west of our position for the infrared sources. The published position reflects the contribution of both sources.

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REFERENCES


Downes, D. 1971, private communication.


