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NOTE

A POSSIBLE SUPERNOVA REMNANT IN THE ASSOCIATION SCORPIUS I

The nebulosity north-east of the emission nebula IC 4628 (MORGAN *et al.*, 1953, figures 2 and 3) is an object with a remarkable structure. It is located near the Sco I association member HDE 322 417, a B0-type star with $V = 10.3$ and $A_v = 3.3$ (HOUCK, 1956), and like IC 4628 it is probably related to this association. In IC 4628 BLAAUW (1961) has recognized supernova shells possibly ejected from NGC 6231, the nucleus of Sco I situated $1^\circ.5$ to the south. Though the neighbouring members of Sco I are possible sources of excitation, we think that the structure of the nebulosity considered suggests it to be rather the result of an explosive event too.

The object considered is shown in plate 1, centred at $\alpha = 16^h55^m.5$, $\delta = -40^\circ08'$ (1950). A fan extends to a distance of about $8'$ north-west from this centre and an arc is situated at about $4'$ south-east from it. Conspicuous bright spikes are pointing to this arc. We assume the object to belong to Sco I at a distance of 1800 pc (BOK *et al.*, 1966), so that $8'$ and $4'$ correspond with projected dimensions of about 4 and 2 pc.

The idea of an explosion is supported by the proximity of the radio source CTB 35 ($\alpha = 16^h55^m.6$, $\delta = -40^\circ13'$) with a diameter of $0^\circ.6$ and a flux density of $134 \times 10^{-26} \text{ W} \cdot \text{m}^{-2} \cdot (\text{c/s})^{-1}$ at 960 Mc/s (WILSON, 1963). It has been catalogued by HOWARD and MARAN (1965), together with two other sources, under No. 490. If indeed we are dealing here with one source, this is a non-thermal one with a spectral index of about -0.76 in the 960–3200 Mc/s range.

Further evidence comes from ancient Chinese records mentioning the appearance in A.D. 1203 of a guest star as bright as Saturn in the tail of Scorpius. According to XI ZE-ZONG and BO SHU-REN (1965) this may have been a supernova at $\alpha = 17^h$, $\delta = -40^\circ$. Their identification of this supernova with CTB 37, however, seems less likely than an identification with CTB 35, because the position of the former source ($\alpha = 17^h12^m.8$, $\delta = -38^\circ03'$) is less in accordance with the quoted

position of the supernova. Their tentative identification with the H II region Sharpless 51 ($\alpha = 18^h37^m.9$, $\delta = -16^\circ36'$) is out of the question. Adopting for the supernova of 1203 a distance of 1800 pc, $V = 0.5$ and $A_v = 3.3$, we obtain an absolute magnitude at discovery of -14.1 , which is not unreasonable for a type II supernova.

If we identify the object under consideration with the remnant of the supernova of 1203, its present form and dimensions may be explained as follows. Suppose that M solar masses exploded isotropically and that only the sweeping up of interstellar material has to be considered. We may then apply the law of conservation of momentum for an independently outward moving element of a shell. Taking for example the initial velocity of expansion to be 6000 km/sec, the density, expressed in atoms per cm^3 , has to be $\sim 6M$ in the medium surrounding the arc and $\sim 0.1M$ in front of the fan. The arc would then have swept up ~ 5 times its original mass and its velocity would have decreased by about a factor of 6. The corresponding figures for the fan would be ~ 0.6 and 1.6. Hence a type II supernova ejecting several solar masses gives reasonable values.

We think that the proposed origin of the nebulosity north-east of IC 4628 makes it worth considering this object in more detail.

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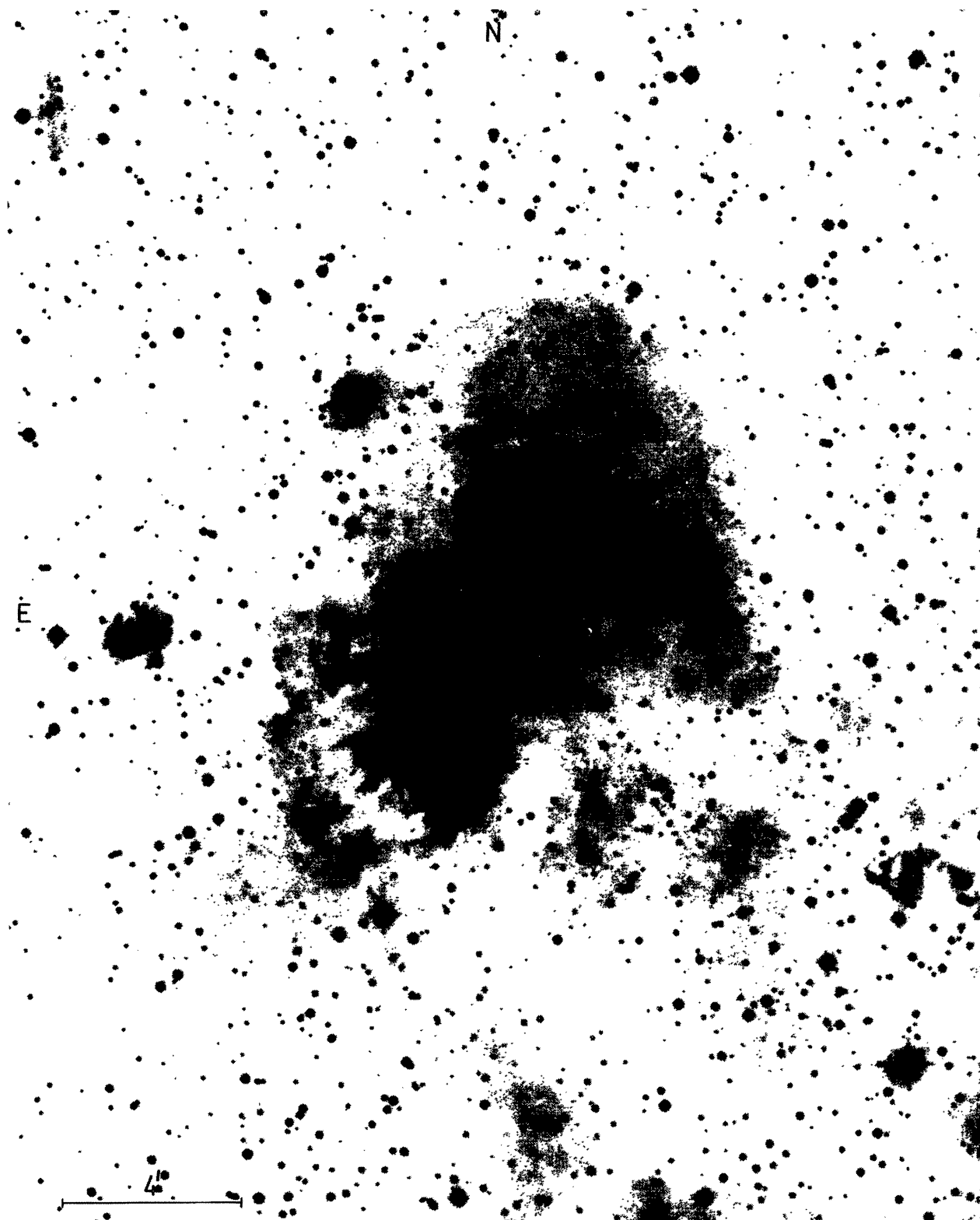


Plate 1. The suspected supernova remnant in Sco I. The plate has been copied from a print of a red 48-inch Schmidt plate in the Whiteoak Atlas (California Institute of Technology). The position of HDE 322 417 is indicated. The scale is shown in the lower left-hand corner.