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FILAMENTARY STRUCTURE IN NGC 5253

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A photograph of the galaxy NGC 5253 in the light of [O III] λ5007 is reproduced. Ionized gas with extensive filamentary structure is associated with the galaxy. Emphasis is placed upon the resemblance between this galaxy and the peculiar galaxies Messier 82, NGC 3077, and NGC 1569 which appear in each case to be in a similar environment close to a large spiral galaxy.

Key words: galaxies—peculiar galaxy—filamentary structure

This paper draws attention to an extensive filamentary structure in the gas associated with the galaxy NGC 5253. Some of the features have been noticed previously (Hodge 1966; Sersic, Carranza, and Pastoriza 1972), but, as far as I am aware, they have never been shown as clearly as in the accompanying picture, Figure 1.

The photograph was taken with the Carnegie image-tube camera mounted on the Yale 1-m telescope at Cerro Tololo Inter-American Observatory and with an exposure of 3.5 hours. An interference filter was used to isolate light from the [O III] λ5007 line to give emphasis to the distribution of the light from ionized gas over that from the stellar component which contributes most of the total light of the system. The heliocentric velocity of NGC 5253 was measured to be +383 km s^{-1} by Welch and Wallerstein (1969) and so a slightly red-shifted filter was used which was originally employed for Magellanic Cloud work. This filter passed light in a band centered on 5012 Å with a full-width at half-maximum transmission of 16 Å.

The [O III] radiation in the central part of the galaxy is very strong and completely saturates this part of the image in Figure 1. The strength is sufficient to produce an artificial circular ring resulting from internal reflections within the image tube. This is just visible in Figure 1 outside the galaxy image near the border of the photograph. The other features recorded are almost certainly real. Many of them are seen in a second photograph which was taken with a shorter exposure but with the galaxy in a slightly different part of the field. The brightest filament at position angle 120° is roughly aligned with the minor axis of the galaxy. It was noted by Hodge (1966) and by Sersic et al. (1972) although they were unable to detect its peculiar fork-like structure. Fainter filaments extend further out to a distance of 1'.4 from the center of the galaxy. These show no preferred orientation with respect to the main body. In view of the known aggregates of blue stars in this object (van den Bergh 1980), it seems probable that the ionization is due to stellar uv radiation but spectroscopic observation is necessary to confirm this. Without velocity data, we have no information about the motion of the filaments and thus cannot discriminate at present between possibilities such as gas falling into the galaxy or gas being swept out by stellar winds or supernovae associated with aggregates of hot, blue stars.

Others have pointed out (e.g., Hodge 1966; Sersic et al. 1972; Sandage and Brucato 1979; van den Bergh 1972, 1980) that NGC 5253 has much in common with the better known peculiar galaxy Messier 82. The [O III] photograph, Figure 1, strengthens this resemblence. Reference to a photo taken by Arp and published by Barbieri, Bertola, and di Tullio (1974), shows that there is an even stronger likeness to another member of the Messier 81 group of galaxies, NGC 3077. All three galaxies have clusters of hot, early-type stars in their central regions implying that star formation is presently going on. All three lie close in space to well-developed gas-rich spiral galaxies (Messier 83 and Messier 81). Another example is the dwarf galaxy NGC 1569 whose similar filamentary structure has been shown beautifully in a photograph taken by Hodge (1974). This galaxy is 5°.4 from the large, low-latitude spiral IC 342.

Rather than considering such galaxies as being in a *post-eruptive* state, it seems preferable to relate to the discussion of Messier 82 by Solinger, Morrison, and Markert (1977) who believe that most of the unusual features of that galaxy can be explained by the infall of interstellar dust and gas, part of which is later compressed and formed into stars. These galaxies do not resemble more-massive and more-energetic giant radio galaxies of which NGC 5128 is an example at a comparable distance (Graham 1979; Graham and Price 1981). While accretion of matter may initiate the observed phenomena in each case, the presence or absence of a massive, compact nucleus, such as that contained in NGC 5128, is likely to make a profound difference to the subsequent chain of events.

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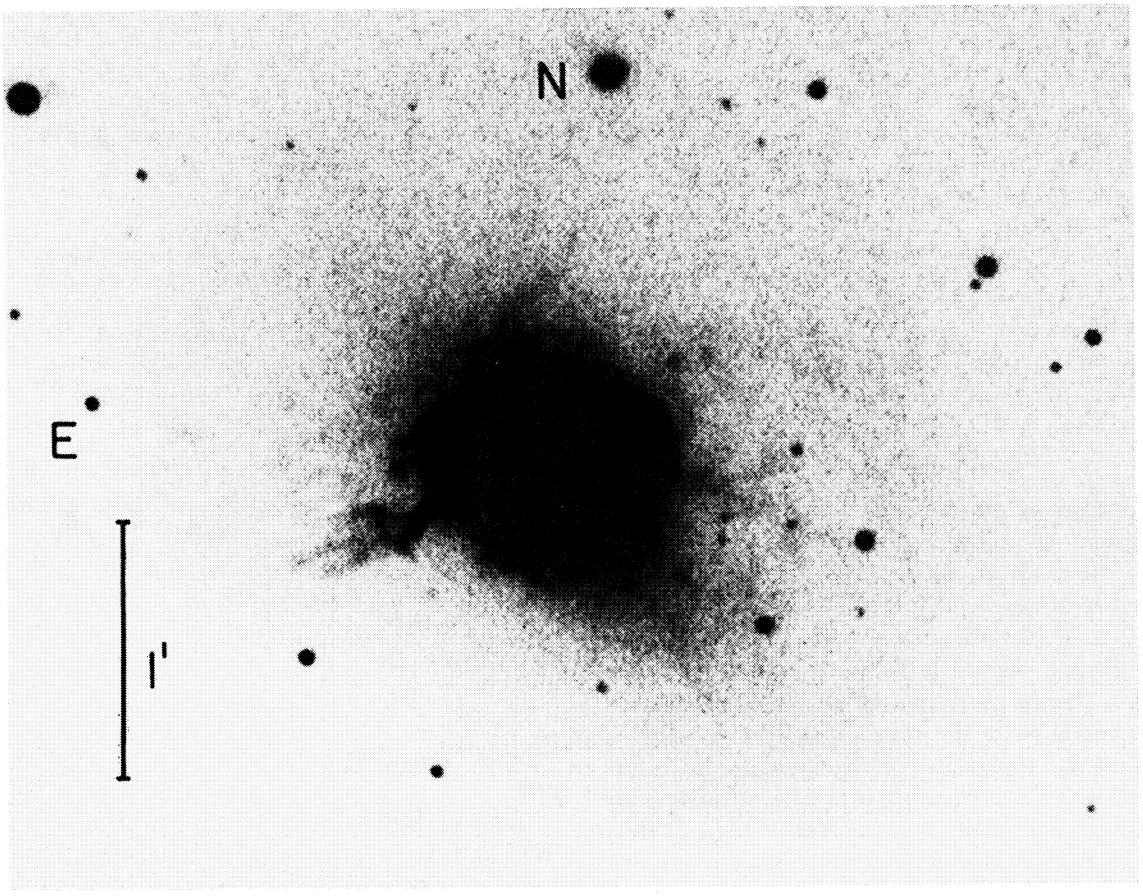

FIG. 1—NGC 5253 photographed in the light of [O III] λ5007.

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