The nearby galaxies are particularly interesting because for distances less than ~5 Mpc, there are a few galaxies which are truly exceptional such as M82 = NGC 3034 and NGC 5128 = Centaurus A. Other galaxies show mild cases of activity which may represent normal but short stages of the evolution of galaxies. For example, M81 has a very compact, flat-spectrum central radio source of low absolute luminosity; in M31 the ionized gas shows non-rotational motions of small amplitudes. Another very informative case of activity in a galactic nucleus is provided by the Sc galaxy NGC 253 (fig. 1). The main signs of activity are (i) motions of the gas indicating that gas is escaping from the central region and (ii) extremely intense infrared radiation emitted by the nucleus. The results of recent spectrographic observations of NGC 253 (M.-H. Ulrich, 1978, in press) are briefly outlined below.

NGC 253 is at 3 Mpc and its heliocentric systemic velocity is 250 km s\(^{-1}\). Spectrograms of the central region of NGC 253 were obtained with the RC spectrograph of the 4 m telescope at Kitt Peak National Observatory, Arizona, USA. One of the spectrograms is shown in figure 2. On the original plate the dispersion is 54 Å/mm\(^{-1}\) and the scale perpendicular to the dispersion is 25 arcsec/mm\(^{-1}\). The set of spectrograms reveals departures from rotational motions in the south-east quadrant with apex at the nucleus. In particular on spectra taken along the minor axis, the velocity of the gas is definitely smaller than the systemic velocity indicating that gas is flowing out of the nucleus and towards us. The velocity field observed from measurements along the emission lines of the ionized gas is in excellent agreement with the velocity field mapped by interferometry of H I 21 cm observed in absorption in front of the continuum source (S. Gott WHITE, 1976, Ap. J. 204, 699). No velocity larger than the systemic velocity is observed in the atomic gas, ionized or neutral. In contrast, the molecular lines of H\(_2\)CO and OH show both higher and smaller velocities than the systemic velocity. This suggests a model for the gas in the nuclear region where the gas in its densest form, i.e. molecular gas, is expanding but is still in the region emitting the radio continuum whereas the atomic gas is outside the continuum source. In this model, the part of the atomic gas flowing out of the nucleus and away from us is behind the continuum source and therefore cannot be seen in H\(_2\)CO absorption, nor can it be seen in the optical emission lines because of the absorption by dust in the equatorial plane.

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It would be particularly interesting to conduct a spectrophotometric study of the ionized gas flowing out of the nucleus. Relative line intensities can provide the reddening—which is probably small since the gas is outside the equatorial plane—and the density of the gas. This information combined with a measure of the absolute intensity of one of the lines would allow to calculate the mass of the ionized gas escaping the nucleus. The temperature cannot be determined because \([\text{O III}]\) 4363 is very weak; however, the mass of the emitting gas is only a slow function of the effective temperature \(T_e\). Such an investigation is planned for the autumn of 1978 using the IDS scanner of the ESO 3.6 m telescope.

In an exploratory step towards such an investigation, the absolute intensity of \(H\alpha\) in the nucleus of NGC 253 has been estimated by comparison with M82 for which absolute spectrophotometry exists. Using this estimate, the rate of mass loss from the nucleus of NGC 253 is approximately \(10^{-3} \, M_{\odot}/\text{year}\). It can be shown that 1,000 O6 stars in the central region can provide the ionizing flux necessary to keep this outflowing gas ionized and also provide the mechanical energy to accelerate it above the velocity of escape. The presence of this large number of young stars is consistent with the infrared luminosity observed by G. Rieke and F. Low (Ap. J. 202, 197, 1975) between 2 and 30 \(\mu\)m. It can also be argued that the present rate of star formation cannot last for the entire life of the galaxy; otherwise the nucleus would lose most of its mass and it is tentatively concluded that there is now an outburst of star formation. Clearly, this very informative galaxy deserves further study which should enable one to reach definitive conclusions regarding the above important points.