right (western) side of the Horsehead is remarkable, and derives from the powerful influence of σ Orionis, which is far outside the right edge of the photo. What gives the Horsehead its name is mainly a luminous feature which forms the "jaw". Deep CCD images obtained with the Danish 1.5 m telescope at La Silla have revealed that the "jaw" is really a large flow-region, where matter is blown away from a newborn star in a highly collimated flow. Radio observations at millimetre wavelengths have in recent years revealed several regions of outflowing material around young stars, often aligned in two oppositely directed jets. A few optically visible jets have also been found, and the one in the Horsehead is a particularly fine example. The young star responsible for this activity can be seen in Fig. 1 at the base of the jet as an optically very faint star. P. Bouchet, ESO, has made near-infrared photometry of this star with the 3.6 m telescope at La Silla, and found it to be much brighter in the infrared than in visible light. The study of such violent phenomena in young stars is very new, and so far no consensus has been reached on the driving processes. However, there is some observational and theoretical evidence that a star recently born in the centre of a slowly rotating disk of molecular material may undergo eruptions when material from the disk accretes onto the star. During these violent flare-ups material may be driven away from the star and guided into oppositely directed jets by the surrounding disk. There could therefore, at least in principle, be a counter-jet in the Horsehead, burrowing into its denser regions, and thus not visible.

Another young star has been born in the Horsehead, in its upper right-hand (north-western) corner. Here a small nebulosity is visible, and CCD images have revealed a faint star half embedded at the bottom of a nebulous cavity. This star has also been observed in the infrared by P. Bouchet, who found it to be a bright infrared source. A few other regions in the Horsehead could also be due to newborn stars; one is a large indented cavity in the northern edge, another is around some structured reflection nebulosity in the southern part.

The Horsehead is thus a newborn Bok globule actively forming stars (probably of low mass), and it appears likely that this activity was triggered by the same processes which are presently excavating it from its parental cloud. Further optical and infrared data supplemented with millimetre observations are now being collected to study how widespread star formation is in this region.

NGC 5367: Demise of a Globule

A globule which has been excavated from a large dark cloud may sometimes be given only a short lease of life. This is so because the OB stars which liberate the globule may also contribute to its destruction. Firstly, the ultraviolet radiation bathing a globule makes a very hostile environment. Secondly, if star formation is triggered in the globule, winds and radiation from the young stars can make significant erosion. And thirdly, if one of the luminous OB stars in the neighbourhood is among the rare, very massive stars, it will after a rather brief evolution become a supernova, and any globules in the region will be run over by a blast wave.

NGC 5367 is a tiny cluster of nebulous stars embedded in the head of the very large cometary globule CG 12. This globule appears to have suffered from all the above-mentioned destructive forces, and may not live for very long. Fig. 2 is an enlargement, also specially processed by C. Madsen, ESO, from a deep ESO Schmidt plate taken by H.-E. Schuster. The globule itself is embedded in the dense bright rims in the front of the cometary object. The tail is about 10 pc long, and shows much structure, partly along the flow direction and partly around obstructions in the flow.

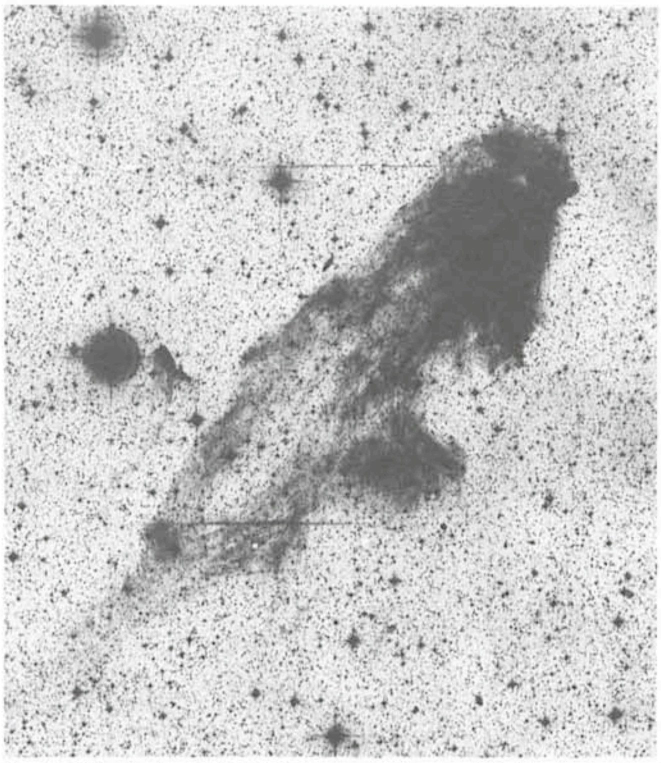

Fig. 2: *This photo of NGC 5367 was made by subjecting a standard ESO Schmidt plate (ERS 325) to diffuse light amplification.*

The stars in the globule have been studied by several authors, and lately optical and infrared photometry, IDS spectra and CCD images have been obtained at La Silla, and supplemented with IUE spectra. At least 6 stars are associated with the globule. Most prominent is the close visual binary Herschel 4636, consisting of two late B stars, one with and one without Hα emission. Three other late B and early A stars are associated with the globule, and an infrared source is embedded in the globule.

It is evident that some outside force has influenced the globule and caused the extraordinary tail structure. There are no obvious OB stars in the direction opposite the tail, but previous investigators found that there is an H I loop, towards the centre of which the globule is pointing. It appears that a very massive star has exploded as a supernova, and a shock wave has passed over the globule. The combined effects of first a luminous OB star, then a supernova explosion, and now a handful of embedded stars will most probably in the end lead to the destruction of the original globule.

The full details of the results mentioned here will appear in articles in *Astronomy and Astrophysics.*

List of Preprints Published at ESO Scientific Group

June – August 1984

327. M.-H. Demoulin-Ulrich, H.R. Butcher and A. Boksenberg: Extended Gaseous Emission in Normal Elliptical Galaxies. *Astronomical Journal.* June 1984.
328. G. Gavazzi, M. Tarenghi, W. Jaffe, H. Butcher and A. Boksenberg: Radio and Optical Investigation of UGC 6697 in Abell 1367. *Astronomy and Astrophysics.* June 1984.

329. P.A. Shaver: Clustering at High Redshifts. To appear in "Inner Space/Outer Space", proceedings of a conference held at Fermilab, 2–5 May 1984 (University of Chicago Press. June 1984).
330. M.-P. Véron-Cetty: Study of a Complete Sample of Galaxies. I. UBV Aperture Photometry. *Astronomy and Astrophysics Suppl.* June 1984.
331. B. Reipurth and P. Bouchet: Star Formation in Bok Globules and Low-Mass Clouds. II. A Collimated Flow in the Horsehead. *Astronomy and Astrophysics*, Letters. July 1984.
332. B. Barbanis: The Stochastic Behaviour of a Galactic Model Dynamical System. *Celestial Mechanics.* July 1984.
333. L. Maraschi et al.: Coordinated UV and Optical Observations of the AM-Her Object E 1405–451 in High and Low State. *Astrophysical Journal.* July 1984.
334. E.A. Valentijn and A.F.M. Moorwood: The Stellar Content of the A 496 cD Galaxy. *Astronomy and Astrophysics.* July 1984.
335. A.C. Danks and J. Materne: The Galaxy Group Klemola 25. *Astronomy and Astrophysics.* July 1984.
336. S.R. Federman, A.C. Danks and D.L. Lambert: The CN Radical in Diffuse Interstellar Clouds. *Astrophysical Journal.* July 1984.
337. S. D'Odorico, R.G. Gratton and D. Ponz: A High Dispersion Analysis of a Giant Star in 47 Tucanae. *Astronomy and Astrophysics.* August 1984.
338. F. Matteucci and A. Tornambé: Carbon Deflagrating Supernovae and the Chemical History of the Solar Neighbourhood. *Astronomy and Astrophysics.* August 1984.
339. C. Barbieri, S. Cristiani, S. Omizzolo and G. Romano: The Variable Extragalactic Object 3C 446. *Astronomy and Astrophysics.* August 1984.

Rotation Axes of Gas and Stars in Elliptical Galaxies

D. Bettoni, Padova Astronomical Observatory, Italy

Recent studies (1, 2) of the distribution and kinematics of gas in elliptical galaxies have revealed that in most cases there is no correlation between the position angle of the major axis of the gas and that of the stellar isophotes. In addition, a decoupling is present in the kinematical axes of these components, in that the kinematical major axes of gas and stars do not coincide.

But until now a comparative study of gaseous and stellar dynamics has been made for only very few of these systems; in the past only the stellar or only the gaseous dynamics have been studied in detail. In order to extend this study to a wider sample of objects, it is necessary to have simultaneously the kinematical properties of both gas and stars.

For this purpose we started observations in March and in May 1983 and in March 1984 with the image tube + B & C spectrograph attached to the 1.52 m and 3.6 m ESO telescopes with dispersion of 29 and 39 Å/mm, in order to obtain a complete velocity field for 6 elliptical galaxies, listed in Table 1.

TABLE 1

NGC	Type	M_{B_T}	P.A. kin. maj. axis Stars	Gas	σ_o (Km sec^{-1})	V_m/σ_o
2325	E4	− 21.01	6° (maj. ax.)	–	181 ± 12	0.31
2974	E4	− 21.01	45° (maj. ax.)	45° (maj. ax.)	221 ± 30	0.83
3962	E1	− 20.91	0° (maj. ax.)	90° (min. ax.)	240 ± 50	0.27
5077	E3 +	− 21.05	7°? (maj. ax.)	97° (min. ax.)	307 ± 50	0.095
5846	EO +	− 21.22	4°?	90°	244 ± 26	0.25
5898	EO	− 20.54	150°	150°	174 ± 40	0.3

The spectra were digitized with the ESO PDS microdensitometer with an aperture of 12.5 $\mu \times 50\ \mu$. All the spectra were calibrated in intensity and wavelength using the IHAP system of Garching. All the calibrated spectra were finally analysed with the Fourier Quotient Method of the Padova Observatory computer centre in the spectral range $\lambda\lambda$ 3900–4500 Å. This method allowed us to obtain simultaneously the radial velocity V_r, the velocity dispersion σ and the line strength γ for each position angle (P.A.) observed. The emission lines were measured with the ESO Grant machine and the data were reduced at the Padova Observatory computer centre. An additional measurement of redshift and FWHM of emission lines has been performed by using a non interactive batch IHAP programme, the result being in good agreement with the Grant measurements.

In Table 1 we list the galaxies observed, their morphological characteristics (3) and the distances, obtained from the redshift, assuming H_o = 50 km sec^{-1} Mpc^{-1}. We report also the dynamical behaviour, i.e. the position angle of maximum rotation, for stars and gas, estimated by means of cosinusoidal interpolation of the central velocity gradients versus P.A., and the value of V_m/σ_o observed for the central regions. The error in the P.A. of the line of nodes obtained by this procedure is about 10°. All the galaxies follow with little scatter the $L \propto \sigma^4$ (4) and the log (V_m/σ_o)vs M_B (5) relations for elliptical galaxies.

Despite these common morphological and kinematical properties, the galaxies considered show many differences concerning the internal dynamics of gas and stars. All but one case show that gas and stars have different rotation axes, which in most cases are nearly perpendicular.

NGC 2974 is the only galaxy in which gas and stars share the same velocity trend along all the position angles observed. In Fig. 1a, b are shown the rotation curves along the major and minor axis respectively. The gas seems to be in a disk with the line of nodes coincident with the major axis of the stellar component, in agreement with previous observations (2). The same behaviour is exhibited by the stars. The representative point of NGC 2974 in the V_m/σ_o-ε diagram falls exactly on the line of oblate isotropic rotation, a fact which, together with the previously cited gas and stars spin axes alignment, implies that this galaxy is very similar to a fast spinning disk of stars.

NGC 5077, on the other hand, is a system where the stars do not show appreciable rotation, while the gas, more extended along the apparent minor axis of the galaxy, shows along this axis a well defined rotation curve (Fig. 2a, b). This behaviour resembles the visible configuration observed in NGC 5128, where the dust lane represents a disk rapidly rotating with the spin axis aligned with the major axis of the stellar body (6).

This interpretation is confirmed by the low value of V_m/σ_o for the stars which places this bright galaxy (M = −21.1) among the low rotators and well down the predicted line of prolate figures. These two properties suggest that this galaxy repre-