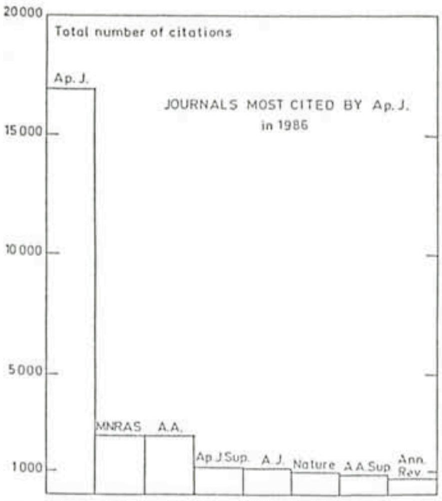

Figure 4: *Total number of citations by* ApJ. *of papers from different astronomy journals.*

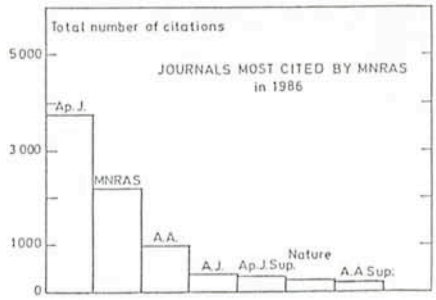

Figure 5: *Idem for* MNRAS.

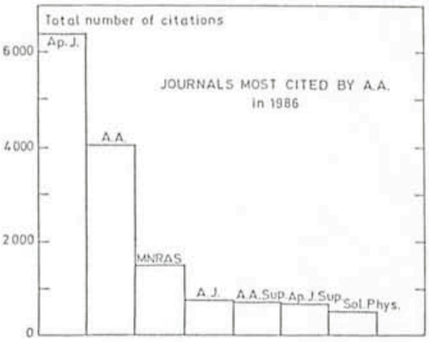

Figure 6: *Idem for* AA.

much higher. In 1987 36% were rejected. This is somewhat less than 5–10 years ago when about 50% of the articles were rejected. Some of the rejected "Letters" are eventually published as normal articles in the Main Journal. In 1987 this number was about 10%.

It appears that, with the exception of *AA* Letters, astronomy journals have a higher acceptance rate than physics journals. Although recent figures are not available, Batchelor (1981, *J. Fluid. Mech.* **106,** p. 1) finds a rejection rate of between 14% and 33% for ⅔ of 44 leading physics journals. It is not clear why the rejection rate is lower in astronomy.

6. Influence of the Journal

The scientific quality of the journals is difficult to define and compare. The one factor which can be compared is the number of citations which is compiled and published, by the Science Citation Index. Complete figures are now available for 1986. In particular we compare the "impact factor", which is defined as the ratio of the total citations (to a particular journal) to the total number of citable items in that journal.

Figure 3 gives the impact factor for the various journals since 1980. As can be seen, the *ApJ* has a higher impact factor than the other journals, which are closely ranked. This may be interpreted as a higher scientific quality of the *ApJ* but a careful examination indicates that another interpretation is possible. This can be seen in Figures 4 to 6 which show the total number of citations to *ApJ, MNRAS* and *AA* separately. It is obvious from these figures that there is a tendency in all the journals to cite themselves more often than might be expected from the total number of articles published, a kind of "astronomical provincialism". This appears to be especially bad in the *ApJ.* Some of this may be understood because different fields (or sub-fields) are more prominent in one journal or the other. This cannot be the complete answer, however, because then the various diagrams, after correction for the total number of articles published in each journal, should be symmetric.

It seems clear that *ApJ* authors are influenced much more by what is published in *ApJ* than in the other journals. Especially *AA* and *AJ* have comparatively little influence. It is impossible to determine how much of this is due to a lower scientific quality of the latter journals and how much is due to "provincialism" in the former.

On the Nature of the Bars of SB0 Galaxies: First Results

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1. Introduction

Bars are a common feature of disk galaxies: approximately 60 to 70 per cent of all galaxies between Hubble types S0 to Sc, including the SAB's, are barred. Their structure and evolution represents one of the most puzzling problems in galactic dynamics. Much attention has been focused during recent years on the theoretical aspects of the dynamics of barred galaxies. Essentially four kinds of problems have been considered: (a) orbital behaviour of stars in non-axisymmetric potentials, (b) the global response of a gaseous or stellar disk- to bar-like perturbations, (c) the construction of SB self-gravitating equilibrium models using the kinds of orbits which were found with the Schwarzschild-Pfenniger technique (direct, retrograde and stochastic orbits) and (d) N-body simulations of disk evolution involving studies of large-scale stability.

These different approaches are able to give some global and qualitative predictions on the structure of various components in SB galaxies. However, in spite of some progress in our theoretical understanding, the structure and evolution of the bars remain largely unexplained. This problem is important since the bars could be linked to the engine which governs the global evolution of barred galaxies. Some of the most important questions concern the size and axis ratios of the bars, their dynamical interaction with the bulge and halo, the 3-D structure of bars and ovals and their secular evolution, and finally their real frequencies and life-times.

Advances in this field are presently limited by the lack of quantitative photometric and kinematic data. Clearly, SB galaxies have received less attention observationally than SA galaxies probably because of their added complexity. In fact, extensive statistics on the shapes of bars do not presently exist. In order to succeed in constructing a coherent scenario of bar formation and

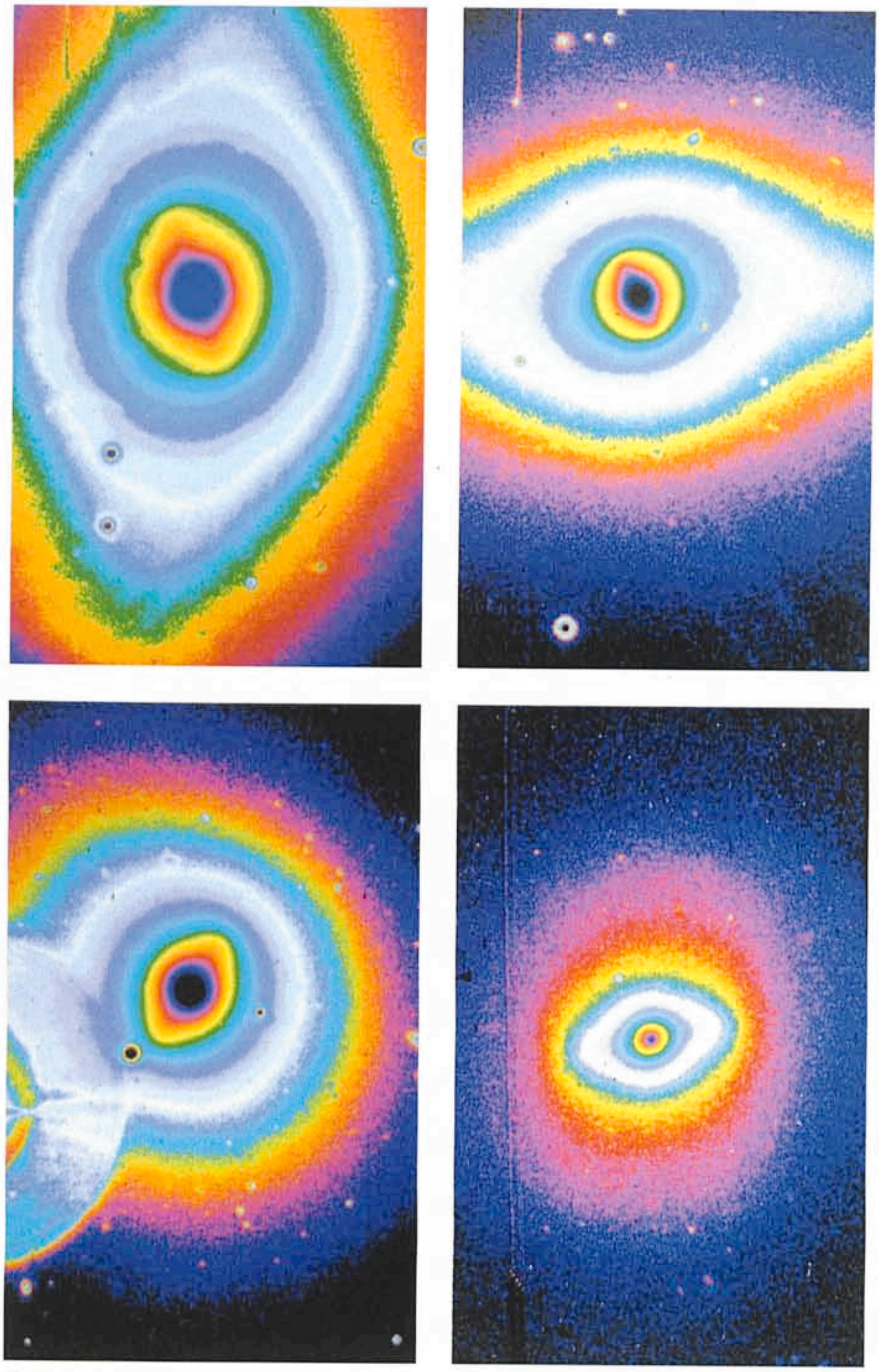

Figure 1: *Pseudo isophotes in the Gunn-Thuan g band for four of the programme galaxies. The galaxies in clockwise order from top left are NGC's 1291, 1543, 1574 and 4477. For all panels except the lower right, North is up and East is to the left. For the lower right, East is up and North is to the right.*

evolution we need additional observational insight into the characteristic parameters of these components such as their lengths, angular speed and axis ratios. Theoretical results on the possible ranges of these parameters can only be meaningfully constrained by surface photometry and kinematic data obtained from a sample of SB and SAB galaxies.

In an attempt to begin to answer some of these questions we have commenced an observational programme on suitable SB0 galaxies. We have already published photometric and kinematic data on our first sample of SB0 galaxies, namely: NGC 1543, 1574, 4477, 4754 and NGC 1291, the latter being an SBa galaxy. We present here a progress report on these observations. We chose face-on SB0 galaxies for two reasons. Firstly, the luminosity profiles are smooth and easy to follow since there is little or no dust and gas to obscure the underlying stellar structure. Secondly, face-on galaxies enable us to measure the vertical (z-direction) photometric and kinematic structure of these components. Two colour 2D surface photometry and spectroscopic measurements were planned in order to (a) obtain density profiles and subsequently deconvolve these profiles to obtain the contributions in luminosity from the different morphological components (bulge, bar, disk, etc.), (b) measure the velocity dispersions in the bulge and bar which hopefully will lead to the structure of these components perpendicular to the disk and to some measure of their triaxiality and (c) use these data for constraining our N-body simulations, now in progress.

2. The Surface Photometry

The surface photometry was obtained from CCD imagery in the Gunn-Thuan g and r system (1976) using the ESO 2.2-m (NGC's 1291, 1543 and 1574) and CTIO 0.9-m (NGC 4477 and 4754) telescopes both located in Chile. An RCA (512 × 320 pixel) CCD was employed at both telescopes orientated N-S for the 2.2-m with an image scale of 0.363 arcsec $pixel^{-1}$ and E-W for the 0.9-m telescope with a scale of 0.495 arcsec $pixel^{-1}$. Figure 1 shows CCD images for four of our programme galaxies.

The raw data frames were reduced in the standard manner for CCD data. As usual, the greatest difficulty performing the surface photometry was the sky brightness determination because of the large size of the galaxies compared to the CCD field size. For those galaxies with nearly circular D_{25} surface brightness levels we used the D_{25} values to make a correction to the intensity levels measured in the extreme corners of the CCD to obtain a best estimate for the true sky surface brightness. These new sky levels were also found to be consistent with the scaled average sky levels from all the other galaxies observed on the same night. This average was also used for those cases where the D_{25} isophotes were not circular. Aperture photometry, taken from the catalogue of Longo and de Vaucouleurs (1983), and its supplement (Longo and de Vaucouleurs, 1985) was used to determine the magnitude zero points. The major and minor axis profiles for NGC's 1574 and 4477 are shown in Figure 2a and 2b, respectively.

NGC 1291 was the only galaxy in our sample for which suitable external photometry existed (de Vaucouleurs, 1975) with which we were able to compare our surface photometry reduction techniques. The agreements were good (see Jarvis et al., 1988 for details). We note, however, that in the region of most interest to us, the bars, small errors in the adopted sky brightness levels have little effect on the surface brightness profiles since the bar surface brightnesses are generally much larger than that of the sky.

3. The Kinematic Data

The kinematic data for our sample of five galaxies were obtained from long-slit spectroscopy using the 3.6-m telescope with the Boller and Chivens spectrograph on La Silla, Chile. The detector was an RCA CCD, used with a 2″ × 2.9′ slit, and a spatial scale of 1.17″ $pixel^{-1}$. The dispersion was 1.74 Å $pixel^{-1}$ over a spectral-range of 4860 Å to 5750 Å.

A standard observing procedure was adopted for all of the observations which extended over two observing runs. Each integration comprised 1,000 sec integrations on the galaxy with calibration arcs between each exposure. This was continued until sufficient counts had been obtained. For all five galaxies two slit positions were measured, one for the photometric major axis and one for the minor axis. At the beginning and end of each night, spectra of several K0 III to K1 III giant stars were observed to form templates for measuring the velocities and velocity dispersions of the galaxies.

The reduction of the data onto a wavelength calibrated logarithmic scale followed fairly standard procedures for this kind of data (see Jarvis et al. 1988 for details). Where necessary, several rows were co-added together in order to improve the signal-to-noise (S/N) ratios. Two variations of a similar method were used to determine the internal velocities, differing only in the choice of template. The velocity determinations were repeated for the different choices of template. The first choice used a template formed from the de-redshifted addition of the standard stars. Every row containing signal was then cross-correlated in Fourier space with this star template and the redshift determined from the peak of the cross-correlation (CC) function. This gave satisfactory results and at the same time the systemic velocity of the galaxy. The second technique made use of an auto-correlation method. The template was taken from the row containing the most counts in the galaxy frame. This corresponded to the photometric (but not necessarily the kinematic) centre of the galaxy. In all cases the template spectra derived in this way had sufficiently large S/N ratios. We found that the solutions were more stable at larger galactocentric distances with these templates probably because of the better match of the template spectra

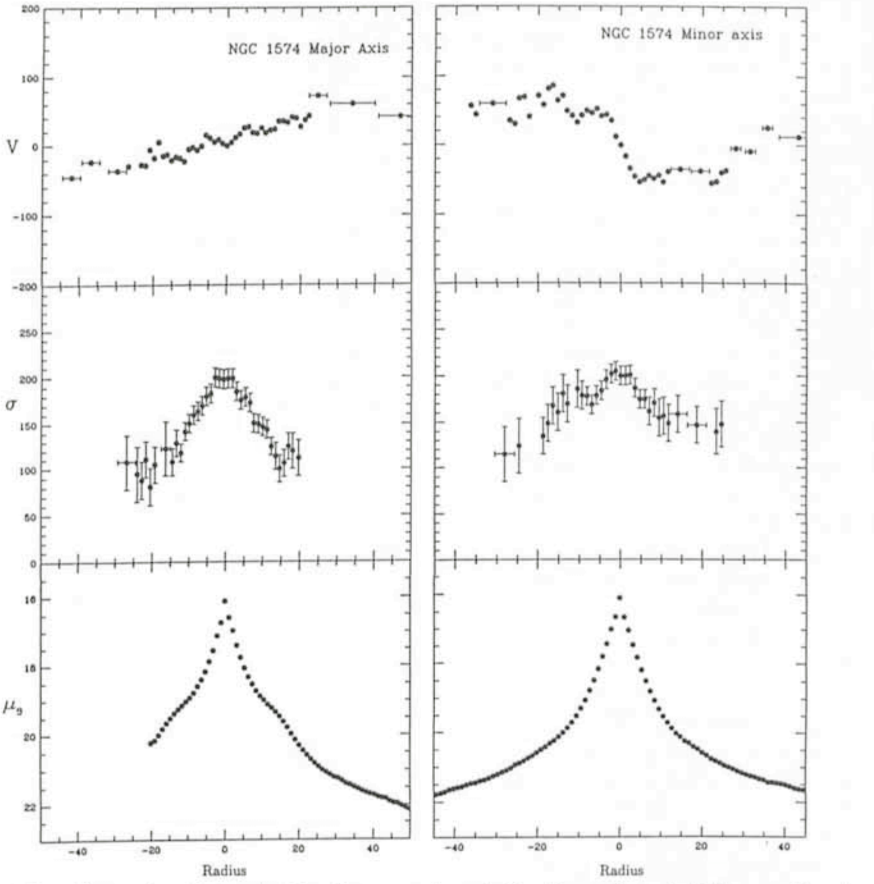

Figure 2a: *Absorption line velocities (top panel), velocity dispersions (middle panel) and luminosity profiles (bottom panel) for NGC 1574. The units of velocity and velocity dispersion are km s^{-1}. The surface brightnesses (μ) are in mag $arcsec^{-2}$ in the Gunn-Thuan g system. Radius is in arcsecs with negative radii denoting positions E of the N-S line.*

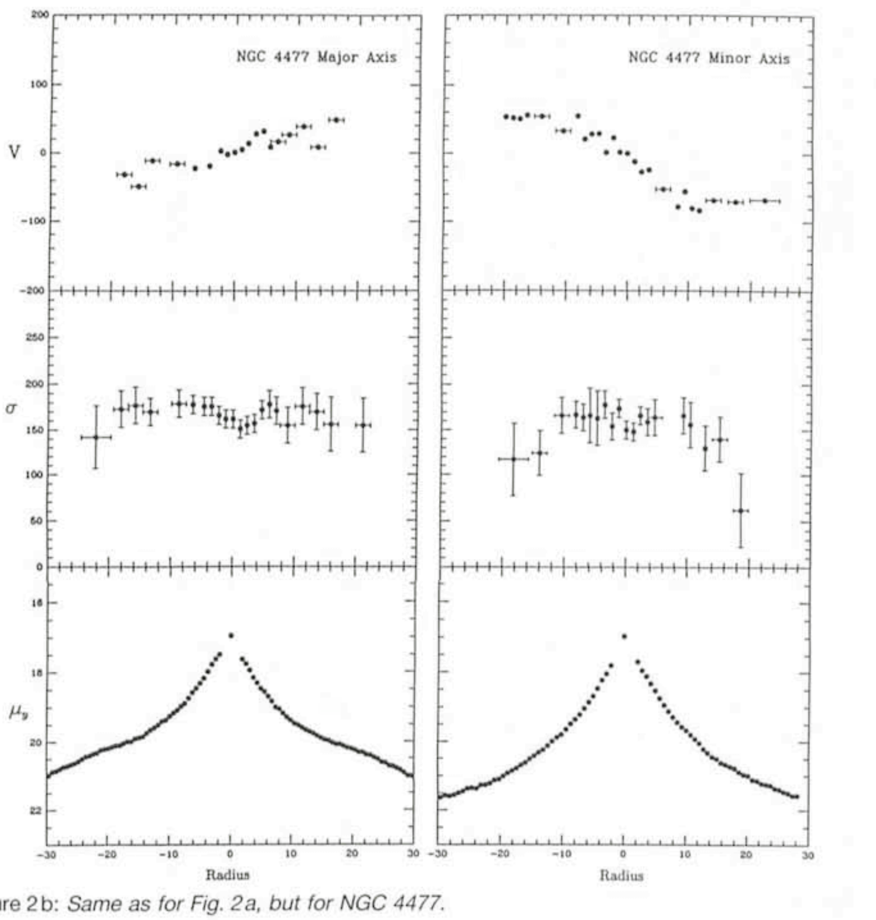

Figure 2b: *Same as for Fig. 2a, but for NGC 4477.*

to the galaxy spectra. For the central parts the match was essentially perfect. Each row of galaxy spectra was then autocorrelated with a template formed from its own central row. The final major and minor axis rotation curves for NGC 1574 and NGC 4477 are shown in Figures 2a and 2b.

The velocity dispersions were determined by a method similar to that of Tonry and Davis (1979) but with some important modifications discussed in detail by Bottema (1988). The galaxy's spectra were first cross-correlated with the star template created earlier. A standard set of CC peaks (about 20, spaced 20 km s^{-1} apart) were then produced by cross-correlating the star template with itself artificially broadened by Gaussian functions of known width. These peaks were then sequentially fitted in a least-squares sense to the galaxy CC function, calculating a goodness of fit parameter in each case. This is where this method differed from that of Tonry and Davis. They fitted only second-order polynomial functions to the CC peaks whereas we fit "real" CC functions which generally resulted in a better fit. The final adopted velocity dispersion was then taken to be the (interpolated) value at the minimum of a plot of the dispersions versus their least-square goodness-of-fit parameter. The error estimation was fairly straightforward since a plot of the best fitting CC function was overplotted on the original data together with the CC functions having dispersions typically 20 km s^{-1} smaller and larger than the adopted value. This method worked very well for our data and had several advantages over the more commonly used Fourier quotient technique (Sargent et al., 1977). One important feature is that the CC method used here works well with low S/N data since a CC peak will almost always appear. Nevertheles, we performed additional tests to see if this method produced consistent velocity dispersion profiles on galaxies with well established velocity and dispersion profiles. See Jarvis and Dubath (1988) for a comparison and detailed discussion between our velocity dispersion results and those of Kormendy and Illingworth (1982) for NGC 4594 using this method. For the purposes of this paper we note that general agreement was very good for both the dispersions and the velocities. Encouraged by this good agreement we proceeded to reduce our programme galaxy data in the same manner.

4. Discussion and Conclusions

The resultant rotation curves show that most of the galaxies have significant amounts of rotation on both axes inspite of all but one of our galaxies being close to face-on. For NGC 1574, the maximum minor axis velocity reaches almost 100 km s^{-1}. The rotation curves are also asymmetric in some cases. This feature has also been reported in other SB0 galaxies (e.g. NGC 936, Kormendy, 1983). The velocity dispersion profiles also show a variety of forms from almost flat in the case of NGC 4477 to sharply decreasing with radius on both the major and minor axes of NGC 1574. The other galaxies are intermediate cases. It is for this reason that we illustrate our results here for only NGC's 1574 and 4477 since these galaxies showed the two extremes in kinematical behaviour with respect to the slope of their velocity dispersion profiles. NGC 4477 has an almost flat velocity dispersion profile on both the major and minor axis similar to what has been observed in other SB0 galaxies (e.g. NGC 6684, Bettoni and Galletta, 1988). However, in contrast, NGC 1574 shows a rapid decrease in velocity dispersion on both axes, and especially on the major axis. Why the bar of NGC 1574 appears more uniformly hot than that of NGC 4477 is not known. However, careful deconvolution and comparison of the bars in these and other galaxies may provide some clues. These will be discussed in more detail in subsequent papers.

In conclusion, we have performed two-dimensional surface photometry in the Gunn-Thuan photometric system of the five face-on southern SB0 galaxies, NGC's 1291, 1543, 1574, 4477 and 4754. We have also obtained the rotation velocity and velocity dispersion profiles along the principal axes of these galaxies. We make the following observations concerning the large-scale features of the V, σ, and μ plots.

(1) Three of the four near edge-on galaxies NGC's 1543, 1574 and 4477 show significant amounts of rotation ($V_{max} \simeq 100$ km s^{-1}) on either the major or minor axis.

(2) The major and minor axis rotation curves of NGC 1543 and the minor axis rotation curve of NGC 1574 show a clear turnover in velocity. This is particularly notable for the minor axis of NGC 1574 where the velocity falls back to zero at r = 30″. This effect has also been observed in other SB0 galaxies (Galletta, private communication).

(3) The rotation curves of several galaxies are noticeably asymmetric with respect to their photometric centres (e.g. NGC 1574, see also NGC 6684, Bettoni and Galletta, 1988).

(4) There is a considerable variation in the slopes of the velocity dispersion profiles between galaxies from almost flat for NGC 4477 to sharply falling with increasing radius for NGC 1574. NGC 1291, 1543 and 4754 are intermediate cases, listed in order of increasing slope in dispersion with radius.

It is clear that even from our small sample of SB0 galaxies their complexity is considerable, based on the large variation of their observable parameters. The interpretation of these observations, in particular the sizes, shapes and luminosities of the bars and their relationship to the observable kinematics will be addressed in future papers through an application of our N-body numerical models.

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Tentative Time-table of Council Sessions and Committee Meetings Until the End of 1988

31 Oct.–4. Nov.	Finance Committee, Chile
14/15 November	Scientific Technical Committee
28/29 November	Finance Committee
1/2 December	Observing Programmes Committee
6 December	Committee of Council
7 December	Council

All meetings will take place in Garching unless stated otherwise.