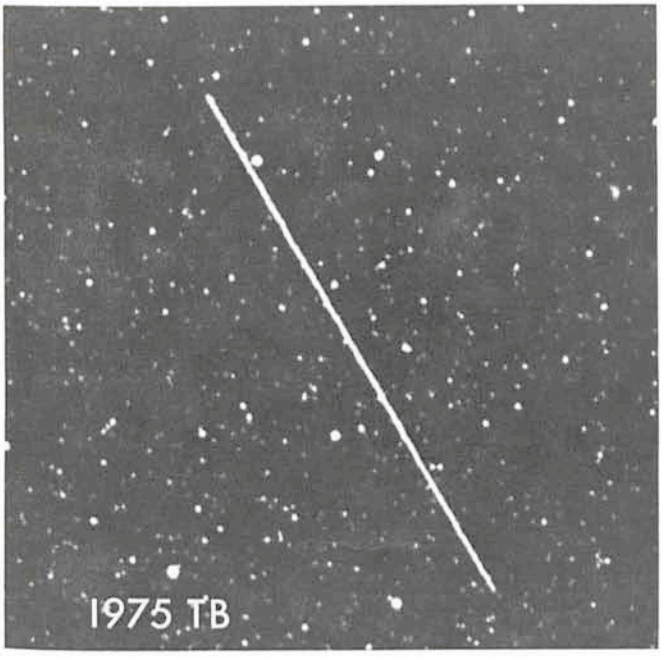
Minor Planets Discovered at ESO

Since the discovery on January 1, 1801 of the first minor planet (asteroid), more than 2,000 have been observed and catalogued. They have once been called "the vermin of the sky" by a distinguished astronomer and not quite without reason. Most of them move in orbits of low inclination, i.e. close to the Ecliptic (the plane of the Earth's orbit around the Sun), and photographs of sky areas in the neighbourhood of the Ecliptic always show some of these minor planets. It goes without saying that the larger the telescope, the fainter are the planets that can be recorded and the larger are the number that may be seen on a plate.

1. Trails on ESO Schmidt Plates

The ESO 1 m Schmidt telescope combines a large aperture with a fast focal ratio (f/3) and is therefore an ideal instrument for the discovery and observation of minor planets. On long-exposure plates, each minor planet in the field is recorded as a trail, due to the planet's movement, relative to the stars, during the exposure. On the ESO Quick Blue Survey plates (cf. *Messenger* No. 5, June 1976), which are exposed during 60 minutes, most asteroid trails are about 0.3 to 0.7 millimeters long. Asteroids down to about $19^{m}.0$—$19^{m}.5$ are seen on these plates. (Fainter minor planets may be observed if the telescope follows the planet, whereby the light is concentrated on the same spot of the photographic plate and not "wastefully" spread along the trail.)

Several of the ESO QBS plates show something like one hundred asteroid trails! It is completely impossible from a practical point of view to measure and follow up so many asteroids and the ESO astronomers who work with the Schmidt plates have therefore taken the natural decision that only "interesting" planets will be re-observed in order to establish their orbit.



This 5-millimetre asteroid trail was found on a 60 min ESO Schmidt plate, taken on October 2, 1975. The asteroid moved with the unusually high speed of 2.5 degrees/day, indicating that it was rather close to the Earth. By a strange coincidence, the trail is situated almost at the very centre of the Sculptor dwarf galaxy, a member of the Local Group of Galaxies.

Minor planet 1975 YA was found in December 1975 at Hale Observatories by C. Kowal. It moves in an orbit slightly outside that of the Earth. During its closest approach to the Earth in 1976, which took place in late June, it came within 55 million kilometres. Unfortunately, at that time it was far south and could not be observed with northern telescopes. However, this trail of 1975 YA was obtained on July 3, with the ESO Schmidt telescope under rather bad weather conditions. Exposure time 10 min on 103a-O emulsion, magnitude of 1975 YA approximately 17.4. The position has already enabled an improved orbit to be computed at the Minor Planet Center at the Cincinnati Observatory.

2. "Interesting" Minor Planets

But when is a minor planet "interesting"? Clearly, first of all when it is large (bright) or if it follows a path that deviates significantly from that of most other planets. Therefore, the positions of bright trails are regularly checked with the "Minor Planet Ephemeris" Yearbook to see whether the trail belongs to an already known planet. "Long trails" (longer than 2 minutes of arc, i.e. a motion larger than 48'/day, which indicates that the asteroid is rather close to Earth), are also picked out. So are trails which are found far from the Ecliptic, pointing to an unusually high orbital inclination. In this way, several tens of "interesting" minor planets have been detected on ESO Schmidt plates.

Due to the extremely heavy workload on the ESO Schmidt telescope, only a few of these discoveries have so far been followed up. Plates of solar-system objects (minor planets and comets) have in practice only been obtained during bad weather conditions or with moon when no other plates were scheduled or could be taken. Examples are two new planets of the Phocaea group, one of the very rare Pallas family (only 5 known), and one Apollo-type asteroid (1975 TB). In all ca-

ses the plates were measured at ESO-Geneva and the orbits were computed by Dr. B. Marsden, Smithsonian Observatory, Cambridge, Massachusetts, USA.

3. Asteroids Recovered

It frequently happens that a minor planet is so far south that it cannot be observed with telescopes in the northern hemisphere. If, moreover, the planet is on the "critical" list, i.e. its orbit is not accurately known and it may therefore get lost, observations by southern telescopes become urgent. The ESO 1 m Schmidt telescope is one of the most efficient southern telescopes for such work and during the past year, several "critical" observations have been made. For instance, a valuable observation was made on June 12, 1976, at declination −58°.5, of Apollo-type asteroid (1580) Betulia, when it was rapidly receding from Earth after the close encounter (19.5 million km) on May 23, 1976. On the night of the ESO observation it was already at distance 53.4 million km and of magnitude 15.

In order to improve the possibilities for following up the discoveries of new asteroids (and making urgent observations of already known ones), ESO astronomers A. B. Muller, H.-E. Schuster and R. M. West will start using the ESO 40 cm astrograph from October 1976. By using sensitized photographic plates they hope to be able to observe all but the faintest of these asteroids, which must still—if possible—be observed with the Schmidt telescope.

4. Why Observe Minor Planets?

Some people may well ask why astronomers still observe minor planets. With over 2,000 known, what do a few more or less matter? They will probably agree that a thorough knowledge of asteroid orbits may be useful when their great-grandchildren make the trip to the Jupiter-Ganymede base. But even now the minor planets are important enough to justify continued observations. Their orbits outline the gravitational field of the solar system and their distribution speaks of events in its early history. The physical study of asteroids shows us early solar-system matter, and a soft landing on a suitable asteroid is quite possible within the next decade. As a matter of fact, one of the top-candidates for this honour, Minor Planet 1976 AA, was discovered with the Schmidt telescope on Mount Palomar, California, in January 1976. So the Europeans, keep trying!

Instrumentation Plan for 3.6 m Telescope

A new and updated plan for the instrumentation of the 3.6 m telescope has been developed within ESO. The plan, which covers instrumentation developments for the period 1977–1980, was presented on May 12 by the Director-General to the Instrumentation Committee, which gave its unanimous support. The plan will be considered by Finance Committee and Council later this year.

A first step in the preparation of the instrumentation plan was a survey of the scientific programmes which the users of the ESO facilities wish to carry out and of the instrumental parameters they consider optimal. For this survey, questionnaires were sent to all persons who have used the La Silla facilities during the last five years. The response was very good with nearly half of the astronomers providing replies. Research plans cover a very wide range of subjects. Roughly one-third of the respondents wish to engage principally in extragalactic and nebular work. Most of the others are planning studies in stellar spectroscopy, especially at medium and high resolutions. Among the instrumental wishes, a rather high-dispersion Cassegrain spectrograph is at the top of the list. The use of efficient modern panoramic detectors is regarded as essential by many respondents.

Some instrumentations for the 3.6 m telescope is already under construction at present. Included are various correctors, a 4–6-channel photometer, a low-dispersion spectrograph with attached image-dissector scanner and a vidicon for direct imaging.

In the instrumentation plan, several new developments are foreseen. Highest priority is given to a cross-dispersed Cassegrain echelle spectrograph and to a high-resolution coudé spectrometer. The former should allow the observation of faint stars at reasonably high dispersions (5 A/mm) when used in conjunction with a modern detector, and the latter observations of brighter objects at very high spectral resolution. Other spectrographs, including one for the near infrared, and a radial-velocity photometer are also being planned. The acquisition of a variety of the newer detectors forms an important element in the plan, since these detectors and the equipment needed for their effective use are essential both for direct imaging and for spectroscopy.

Infrared developments also are given much attention. A special top ring with wobbling secondary is foreseen for the telescope to make it reasonably "clean" in the infrared, and photometric and other accessory instruments are planned.