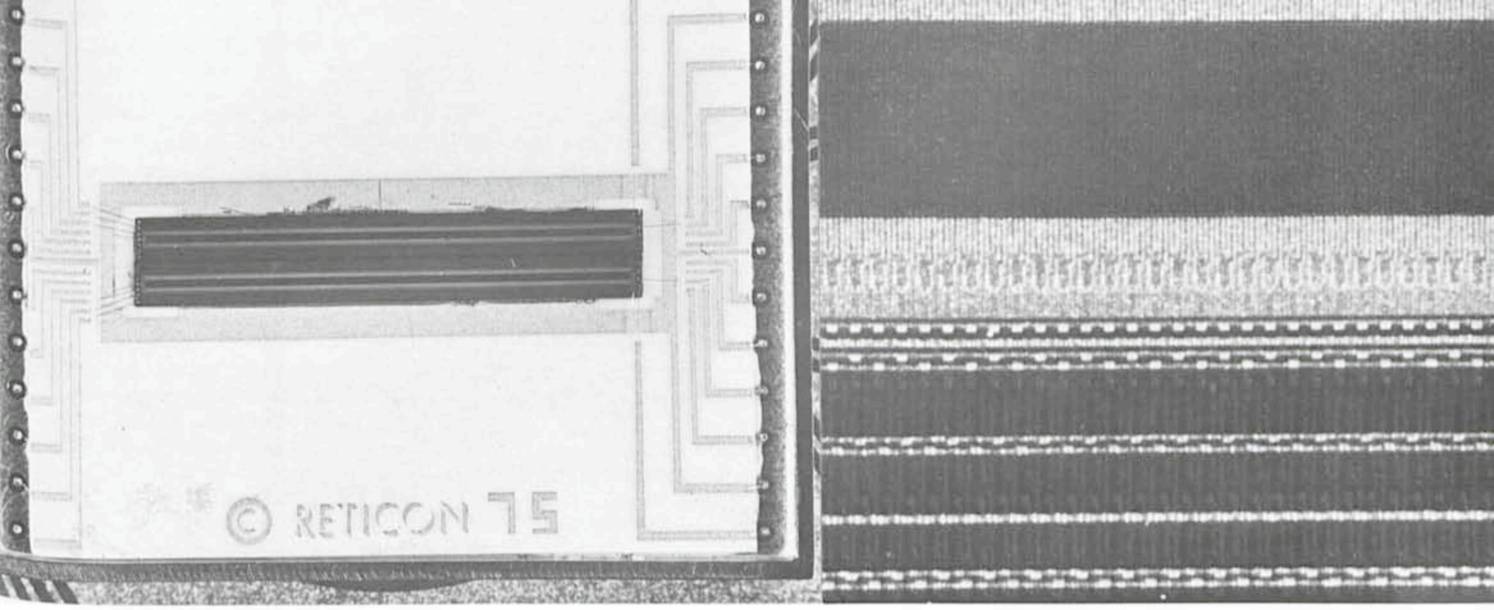

The left photograph shows a dual 1024 photodiode (RETICON) array. The two array chips, each with an active area 25 mm long and 0.43 mm high are the dark, rectangular elements mounted in the centre of their common ceramic substrate. The right picture shows an enlargement of part of an array on which the individual photodiodes (each 0.025 mm wide) may be discerned together with part of the read-out electronics on the chip.

signals sequentially by commutating one after the other to a common video line. The dual array package is shown in the figure.

Associated with each photodiode is a small capacitance upon which an electric charge can be stored by reverse biasing the diode and then allowing it to float. Electronhole (e–h) pairs generated in the diodes due to incident photons (the signal) and to thermal effects (dark current) will slowly discharge the diode capacitance until some specified integration time has elapsed, at which point each diode in its turn is again reverse biased. The amount of charge required to re-bias each individual diode is then a measure of signal plus dark current.

In contrast to the scanner principle, where the signal of only one single spectral element is integrated over a given sampling time, the entire spectrum is projected onto the RETICON surface and the total photon flux is simultaneously detected and integrated as charge, in the case of the diode array. This results in a tremendous increase in efficiency and elimination of atmospheric noise.

The useful response of silicon photodiodes ranges from 0.3 μm to 1.1 μm and within the 4000 Å to 10000 Å region it surpasses the performance of any conventional photocathode. A maximum responsive quantum efficiency (RQE) of 80 per cent is reached (!) in the 7000 Å to 9000 Å region and contributes to the overall performance of the detector.

The Noise

Several sources of noise must be considered. Various noise components associated with reading and processing the charge signals imply that extreme care must be given to the design of the analog electronic circuitry. The total readout noise of a single readout can be minimized to a noise equivalent charge (NEC) of about 800 e–h pairs and sets the absolute low limit of the dynamic signal range. The high limit is determined by the saturation charge of the diode or any other saturation effect in the signal processing. A typical dynamic range of four decades (10,000) can be reached, within which the detector can be considered as linear.

In principle a single measurement may consist of one long exposure or of a series of short coadded ones. But since the noise per readout is constant, it can readily be seen that the detective quantum efficiency (DQE) for low light levels is increasing with exposure time and therefore a single integration and reading gives by far the best result.

As already mentioned, diode capacitance discharge is not only resulting from the incident photons, but also from thermal e–h pair recombination. As a result the RETICON has to be cooled to a temperature as low as –150° C in order to make the dark noise nearly negligible. Unfortunately cooling results in a rapid drop of the RQE at the IR end of the spectral range. Consequently, higher sensitivity at higher temperatures has to be paid for with increased dark noise in this particularly interesting spectral region. Or, in other words, above 8000 Å the limiting magnitude of the RETICON decreases markedly. Incidentally, another limiting factor at the IR end is an increase in crosstalk between adjacent diodes and loss in effective spectral resolution. This effect is attributed to the increasing transparency of silicon at longer wavelengths, which in turn leads to a deeper penetration of red photons and a bigger lateral charge diffusion covering more than one diode width.

Summing up, the RETICON self-scanned linear photodiode array has, by virtue of its high sensitivity over a wide range of wavelengths, its high dynamic and linear signal range and its relative operational simplicity, an excellent application in astronomical spectrophotometry.

Garden Party at ESO Guesthouse

The Director-General invited the participants of the IAU meeting, held in Santiago from January 16 to 19, to a garden party in the ESO Guesthouse.

About 120 guests came: Chileans and people from other Latin American countries, USA and Europe, partly with wives and children.

Apart from a lovely garden in full bloom, ESO was able to offer a candle-lighted summer night, a full moon in the sky, folkloristic dancing and music, and last but not least, nice cool drinks and an appetizing cold buffet.

The guests seemed pleased and so were the hosts: Prof. Woltjer, ESO astronomers and the ESO/Chile administration.

NEWS and NOTES

Move to Munich Delayed

The Max Planck Society has informed ESO that there will be some delay in the construction of the ESO Headquarters Building in Garching. This is mainly due to new legal provisions in Germany imposing stricter regulations on the thermal insulation of buildings. As a consequence, it has been necessary to review the technical specifications of the ESO building.

It is now estimated that the construction will be terminated in the early summer of 1980 and that the move into the new Headquarters may take place soon after.