

treated in the lengthy investigations of Owen and Kuiper (1964), Chamberlain and Hunten (1965), and others. However, using a scanning spectrometer built by Moroz, and a Cu:Ge photoconductive detector cooled with liquid nitrogen, it was possible to obtain good spectra of Mars in the  $1.2\ \mu$  region with resolution  $1700$ , or about  $7\ \text{\AA}$ . The  $125\text{-cm}$  reflector of the Southern Station of the Sternberg State Astronomical Institute (Moscow) was used in its location in the Crimea at latitude  $45^\circ\text{N}$ . The northern latitude of the observatory made it difficult to observe Mars because of the planet's low declination.

Figure 1 shows representative spectra of Mars and the moon (at similar airmass) taken on June 6–7 and June 5–6, 1969, respectively. While the band designated 023

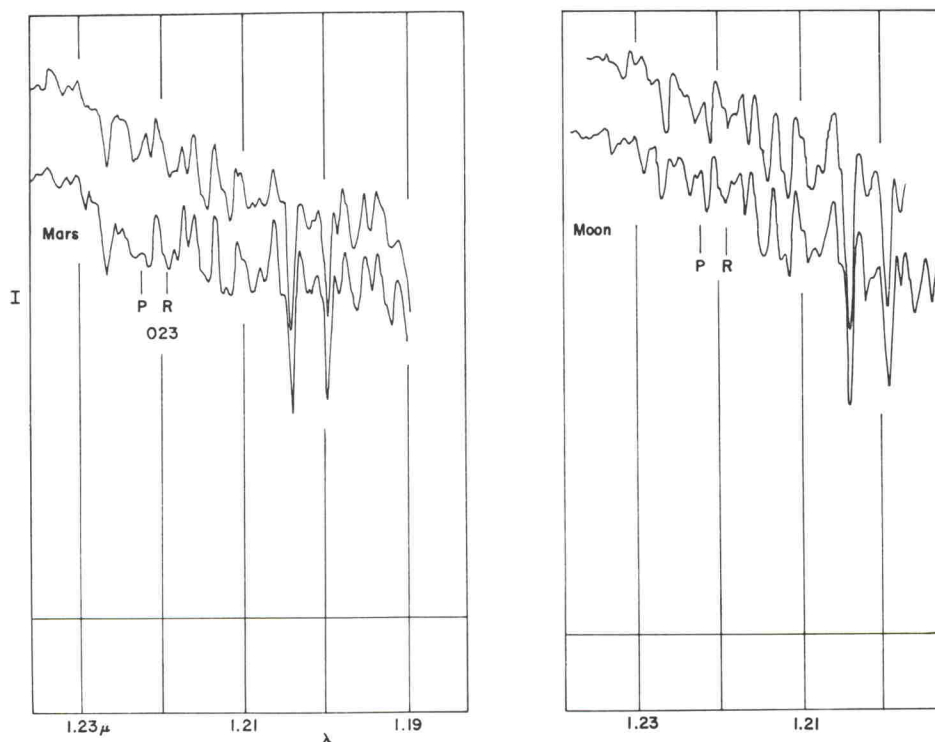


Fig. 1. Spectra of Mars and the moon in the region of the bands of  $\text{CO}_2$  at  $1.2206$  and  $1.2055\ \mu$ . Made with scanning spectrometer having resolution  $7\ \text{\AA}$ .

(old style) shows distinctly in the Martian spectrum, the companion band (103) at  $1.2055\ \mu$  ( $8294.0\ \text{cm}^{-1}$ ) is too strongly blended with telluric water vapor lines to be disentangled for measurement. The 023 band was measured by Moroz on the original tracings, and he found  $2.6\ \text{\AA} \pm 0.5\ \text{\AA}$  for the equivalent width. It is upon this value that the following analysis is based. The spectra were taken with the slit accepting an equatorial strip across the planet.

In this analysis, the empirical approach used by Owen and Kuiper (1964) was adopted. Laboratory spectra of pure  $\text{CO}_2$  were made at the Lunar and Planetary

Laboratory using a scanning spectrometer adjusted to give the same spectral resolution as that with which the Mars spectra were obtained. The gas was admitted to the 40 m multiple-pass White cell and for a given pressure, spectra were taken at three or four different total path lengths up to 2.47 km (64 traversals through the cell). Because the bands at 1.2206 and 1.2055  $\mu$  are weak, they did not show well on the spectra with

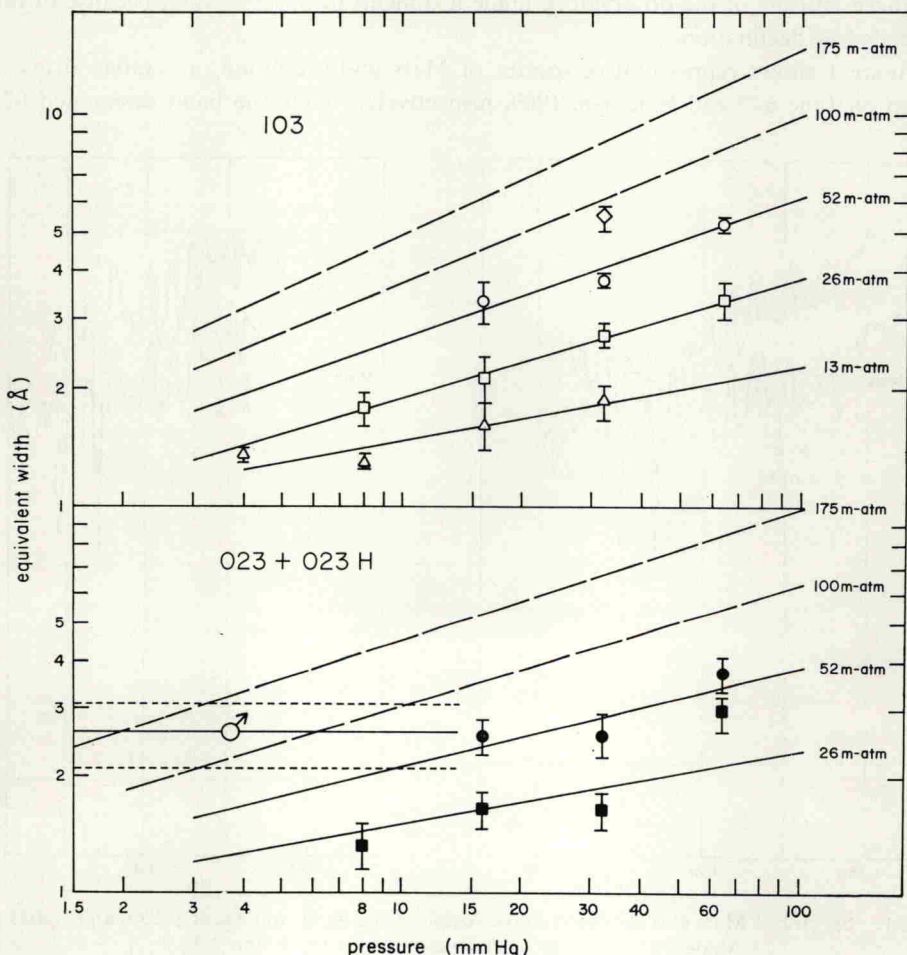


Fig. 2. Curves of growth of the  $\text{CO}_2$  bands at 1.2055 (103) and 1.2206 (023) microns from laboratory observations. The curves of growth for the 023 band include a small contribution from the hot band 023H. This contribution does not exceed about 10%.

only 4-mm Hg pressure in the cell, but at 8 mm pressure and higher they were easily seen and measured.

The laboratory data are plotted in Figure 2 for both bands observed in the laboratory. While only the 1.2206  $\mu$  band is considered in this report, the data for the 1.2055  $\mu$  band are also included for possible future use. The data at first show that