scribed in the following manner: the narrow *H* lines of type F, prevalent at minimum light, become weaker and gradually form the narrow absorption cores, whose origin must lie in the uppermost strata of the atmosphere. There is little change in radial velocity during this process. Before the cores have disappeared, there are already present broad, shallow lines from deeper layers (because of the Stark effect and the blanketing effect of radiation from the upper layers); these broad absorption features have a negative velocity shift as compared to the narrow cores. They rapidly increase in intensity and finally become the ordinary lines of the A-type spectrum which predominates at maximum light. Again, there seems to be but relatively little change in velocity during this process.

The remarkable, and for the theory of Cepheid variation undoubtedly significant, simultaneous occurrence of two sets of *H* lines with different radial velocities reminds us of Sanford's discovery that the velocity curve as derived from the *H* lines differs from that derived from the metallic lines. It also shows that when we measure the relative velocity as zero, near the phase of median increasing brightness, the atmosphere really consists of two layers having different velocities. The upper layer is still "falling into the star," while the deeper layer is already moving outwards. It is clear that we must use caution in attributing to the main body of a pulsating star motions which strictly apply only to very limited strata. The discontinuity in the velocity curve near zero phase suggests that the mechanism of producing the undisplaced emission lines may consist of the energy liberated from the collision of the two strata.

1. See also *B. A. N.* **10**, 251, 1947.

2. *Mitt. Stw. Budapest-Svabhegy* Nos. 17 and 18, 1943.

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Adel, Arthur. Atmospheric transparency between 16 microns and 24 microns.

The principal region of atmospheric transmission in the infrared lies between 7 microns and 14 microns. It is terminated on its long wavelength side by the great band of CO_2 , with center at 15 microns and some 20,000 Å wide.

A half-century search for atmospheric transparency at longer wave lengths was brought to a conclusion in 1941 with the mapping of the prismatic solar spectrum from 16 microns to 24 microns.¹ There has as yet been no opportunity

for systematic observations in this region, but an instructive estimate of transparency of the window has been obtained by comparing the spectrum of the sun in this region with the emission spectrum of the earth (a radiation thermopile). The solar and terrestrial spectra were observed in a manner which renders their areas in the same ratio as their effective radiation intensities. From the known radiation intensity of the earth, that of a near black body at 300°K, the effective radiation intensity for the sun in the new window may be computed; and the ratio of the latter to the computed value for 6000°K is the transparency.

On an average day atmospheric transparency between 16 μ and 24 μ is about 3 per cent, and may rise to nearly 15 per cent on exceedingly dry days. It would appear that the escape of radiation from the earth's surface to space in this spectral region may not be neglected from a meteorological point of view.

The dispersed emission spectrum of the moon should be detectable in the new region, as should the integrated radiation from Jupiter, with the large telescopes.

1. Arthur Adel, *Ap. J.* **96**, 239, 1942.

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Aller, Lawrence H. Spectrophotometry of central stars of the planetary nebulae.

The central stars of the planetary nebulae usually display spectra characterized by both emission and absorption lines, e.g., NGC 2392; Wolf-Rayet features, e.g., NGC 6751, 6905, or 40; or a pure continuous spectrum without any emission or absorption lines in evidence, e.g., NGC 7009, 3242, or 7662.

The program carried out at the McDonald Observatory under cooperative arrangements with the University of Chicago and the University of Texas involves systematic observation of the nuclei of the planetary nebulae with as high dispersion as possible. The material has been supplemented with plates taken with the Crossley reflector at the Lick Observatory for the energy distribution in the continuum.

The present paper concerns the absorption line spectra of the nuclei of NGC 246, 2392, 6210, 6543, 6826, 6891 and IC 4593. Absorption lines of *He II*, *C III*, and *C IV*, and emission lines of *O VI* ($\lambda 3811$, $\lambda 3838$) characterize the central star of NGC 246. The temperatures of the other objects