THE APACHE POINT ATLAS OF DIFFUSE INTERSTELLAR BANDS[a]

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In a new attempt to discover the origin of the long unidentified diffuse interstellar bands (DIBs), a new atlas of lines between 3900Å and 8700Å has been constructed. Spectra with S/N $>$ 1000 for four stars: HD 183143, HD 166739, Cygnus OB2 5 and HD 204827, recorded with the echelle spectrograph on the 3.5-meter telescope at Apache Point Observatory, are compared with spectra of similar quality for unreddened stars of the same or similar spectral types. The spectra have a resolution of 8 km/sec. Above 5000 Ångstroms, the atlas is thought to be complete for equivalent widths above 2 milli-Ångstrom, for the narrowest bands. Except for the weakest lines in regions of strong telluric absorption, features have been measured independently in each star without reference to shapes and wavelengths in other atlas stars, to avoid any prejudice as to the nature of the bands or the conditions under which they form. Over 500 bands are listed, over 150 of which are not previously listed in the literature. About half the bands have strengths above 5 milli-Ångstroms in the atlas stars, and among these, 70% have FWHM between 1 and 2 Ångstroms. The fraction decreases with wavelength, there being relatively more bands with widths above 2 Å as one moves to lower wavelengths. The number of bands per Ångstrom, above 5 milli-Ångstroms in equivalent width, peaks at 6600 Ångstroms where there are 15 bands per 100 Ångstroms. Longward of 6200 Å, for weaker lines, the line density is much higher. Several bands exhibit structure which changes from one line of sight to another and the relative strengths of many lines change from star to star. The atlas is to be the basis for correlation studies of band strengths and for studies of the relationships between the DIBs and other interstellar parameters.

[a]Based on observations from the APO 3.5-meter telescope, owned and operated by the Astrophysical Research Consortium.