the half-power bandwidths are centered approximately at 0.44, 0.54, and 0.63 μm, respectively, with a bandwidth of about 80 nm, although atmospheric absorption affects the effective wavelength appreciably. Radiation that reaches the surface in the visible wavelengths is diffuse. No useful signal was detected by the blue channel because of the efficient removal of blue and ultraviolet radiation by the atmosphere. Data were obtained successfully from all cameras, and results of the imaging experiment have been published (*11*).

A version of the first color panorama images produced from the raw data for the Venera 13 site (*11*) is shown in Fig. 2 (upper panel). Almost no signal was recorded in the blue channel for all cameras. The distinctive orange hue of the diffuse radiation present at the surface of Venus (*11*) dominates the resulting color image in Fig. 2 (upper panel) and masks the true color of surface materials in the scene. In order to examine the color of rocks and soil, corrections must be made for the spectral character of the incident radiation.

The digital image data were analyzed further to extract spectral information from the lander panorama and to produce color pictures of the scene as it would appear with "white-light" illumination. Four steps required for this calibration are summarized here and will be described elsewhere (*13*). First, the raw data were transformed from an approximately logarithmic brightness scale to a linear scale by using the published average instrument response curve for the detectors (*11*). Second, spectral calibration used brightness values of test charts and color chips included within the field of view of each camera. The spectral characteristics of the color chips measured before the mission in the laboratory at 500°C were found to be significantly different from room-temperature measurements (*11*). The "gray" chips included in the color chart and on the spacecraft, however, were still gray at high temperature (equal reflectance in the red and green channels). This information was used to calibrate the red and green channels of the color image data by scaling the green image data so that values for the gray chip are equal in the red and green channels. Third, to achieve color balance in the resulting color image, an artificial channel of blue data was created by linear extrapolation from the red and green channels ($B = 2G - R$), and again was scaled to keep the intensities for the gray chip equal. For this procedure it is assumed that the effective wavelengths of the red, green, and blue channels of the reproducing systems (film or color monitor) are separated by approximately equal

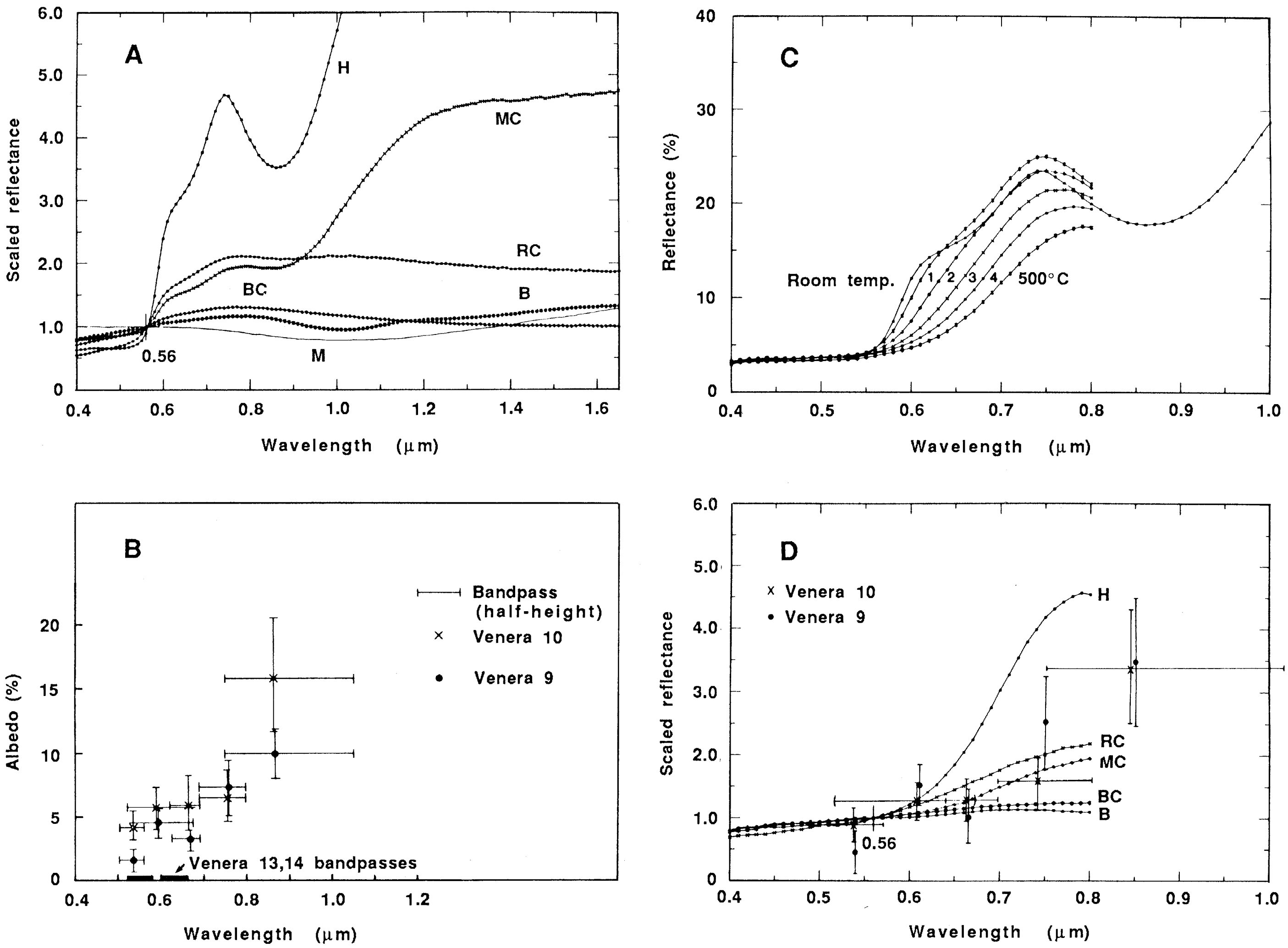

Fig. 1. (A) Laboratory reflectance spectra (0.4 to 1.6 μm) of typical basaltic materials at 25°C. The hematite (H), red cinder (RC), and maroon cinder (MC) exhibit the characteristic absorption edge near 0.55 μm due to ferric iron. All spectra are scaled to unity at the effective wavelength of the Venera 13 green channel (0.56 μm) to facilitate spectral comparisons. Basalt, B; black cinder, BC; magnetite, M. (B) Reflectance properties of the Venusian surface at the Venera 9 and 10 landing sites (*12*). Horizontal bars indicate the width at half-height of the Venera filters. (C) Laboratory reflectance spectra (0.4 to 0.8 μm) of the ferric oxide hematite at temperatures ranging from room temperature to 500°C. These observed spectral effects are fully reversible for pure hematite. (D) Laboratory reflectance measurements at 500°C of the basaltic materials in (A) compared to the Venera surface measurements (scaled to 0.56 μm). Filter widths are indicated only for the Venera 10 data.