IMAGES OF VESTA WITH THE PLANETARY CAMERA OF THE HUBBLE SPACE TELESCOPE. B. Zellner, Georgia Southern University, A. Storrs, Space Telescope Science Institute, and E. N. Wells, Computer Sciences Corporation.

Asteroid 4 Vesta was imaged with the Planetary Camera of the Hubble Space Telescope on 1994 Nov. 28 through Dec. 1, at eight epochs spaced about 45 degrees apart in the rotational aspect of the asteroid. Filters were used to isolate bandpasses at 0.439, 0.673, 0.953, and 1.042 microns. We here present 24 images taken in red light. Bright and dark surface features are seen.

The mid-exposure times of the 24 images are listed in the table. Central longitudes are counted from the time of our first exposure, assuming direct rotation with a period of 5.34213 hours.

	1994 UT date					Rotation
Image	Mo	Day	Hr	M	S	Degrees
CV1A	11	28	14	48	17	0
CV1D	11	28	14	57	17	10
CV1G	11	28	15	6	17	20
CV2A	11	30	10	8	17	40
CV2D	11	30	10	17	17	50
CV2G	11	30	10	26	17	60
CV3A	12	1	13	28	17	82
CV3D	12	1	13	37	17	92
CV3G	12	1	13	46	17	102
CV4A	11	30	11	42	17	146
CV4D	11	30	11	51	17	156
CV4G	11	30	12	0	17	166
CV5A	11	28	22	44	17	175
CV5D	11	28	22	53	17	185
CV5G	11	28	23	2	17	195
CV6A	12	1	10	15	17	225
CV6D	12	1	10	24	17	235
CV6G	12	1	10	33	17	246
CV7A	11	30	13	18	17	254
CV7D	11	30	13	27	17	264
CV7G	11	30	13	36	17	274
CV8A	11	29	0	32	17	296
CV8D	11	29	0	41	17	306
CV8G	11	29	0	50	17	316

The image scale of the Planetary Camera (PC) is 0.043 arcseconds per pixel, and the physical resolution for a point source is approximately 0.07 arcseconds FWHM, which corresponds to 86 km at Vesta's distance of 1.7 AU. Our images were subsampled to a quarter-pixel resolution and deconvolved using the maximum entropy algorithm and the point-spread-function of the PC as provided by the Tiny Tim software package.

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The figure presents the 24 processed images in F673N, grouped horizontally by HST orbit but arranged vertically in order of rotational phase as in Table I. Note the spacing is about 10 degrees of rotation between each exposure during a single HST orbit, but gaps as large as 44 degrees exist in the total longitude coverage, in particular between 102 deg and 146 degrees (between the third and fourth lines of Figure 1) and again between 316 and 360 degrees of rotation. For a spherical object with the rotational pole of Magnusson [1] at ecliptic longitude 325 degrees and ecliptic latitude +55 deg., the north pole of Vesta is near the top of the images and the sub-earth latitude was approximately 23 degrees north. The solar phase angle was 11 degrees with sunlight coming from the lower left quadrant of the image, creating a brightness gradient for which no correction has yet been made. The albedo contrast is about 15% in the raw images and up to 25% in the reconstructions. The prograde rotation of Vesta should be apparent in the images.

On the basis of polarimetric and colorimetric variations over the rotation of Vesta, it was long expected that the object would be among the most variegated of large asteroids (Degewij et al. [2]; Gaffey [3, 4]). Variegation could result from distinct lava flows on its basaltic surface and also from possible exposures of deeper mantle material due to heavy surface cratering. Conspicuous albedo markings were also reported from groundbased speckle interferometry by Drummond and Hege [5] and from recent adaptive-optics work at wavelengths near 2 microns with the ESO 3.6-meter telescope (Albrecht, Hainaut, et al., personal communication). Further analysis of our multicolor images should permit comparisons with other data sets, allow us to elucidate the mineralogical nature of the dark and bright areas that we see, and allow improved solutions for the pole and shape of Vesta and the construction of a low-resolution albedo and compositional map of its surface.

References:

[1] Magnusson, P., 1986. Icarus 68, 1.

[2] Degewij, J., Tedesco, E. F., and Zellner, B., 1979. Icarus 40, 364.

[3] Gaffey, M. J., 1983. Lunar Planet. Sci. XIV, 231.

[4] Gaffey, M. J., 1995. Surface lithologic heterogeneity of asteroid 4 Vesta. Submitted to Icarus, December 1994.

[5] Drummond and Hege, 1989. In Asteroids II (R. P. Binzel, T. Gehrels, and M. S. Matthews, eds.), 171. Univ. of Arizona Presss, Tucson.

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