THE COMPOSITE IMAGE OF SANDULEAK −69° 202, CANDIDATE PRECURSOR TO SN 1987A IN THE LMC

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The image of Sk −69° 202 was scanned and analyzed on eight (of 32 available) blue through near-infrared photographic plates obtained at the prime focus of the Cerro Tololo Inter-American Observatory 4-meter telescope during 1974–1983. Both intensity syntheses of the image and density differences were derived by means of reference stars from the same plates, including the similar nearby object Sk −69° 203. Several of the density differences are shown in Figure 1. The analysis shows that the 12^m blue supergiant in Sk −69° 202 (Star 1) has two companions with V magnitudes, position angles, and separations $15^m.3$, 315°, 3″ (Star 2) and $15^m.7$, 115°, 1″.5 (Star 3), respectively. Both companions appear to be early-type stars; there is no evidence for a bright red star in the system. The two companions are responsible for the spectra observed by the International Ultraviolet Explorer following the decline of the SN in the far UV, so that Star 1 has disappeared and was probably the progenitor. The most likely interpretation is that it was a post-red supergiant evolving blueward in the HR diagram.

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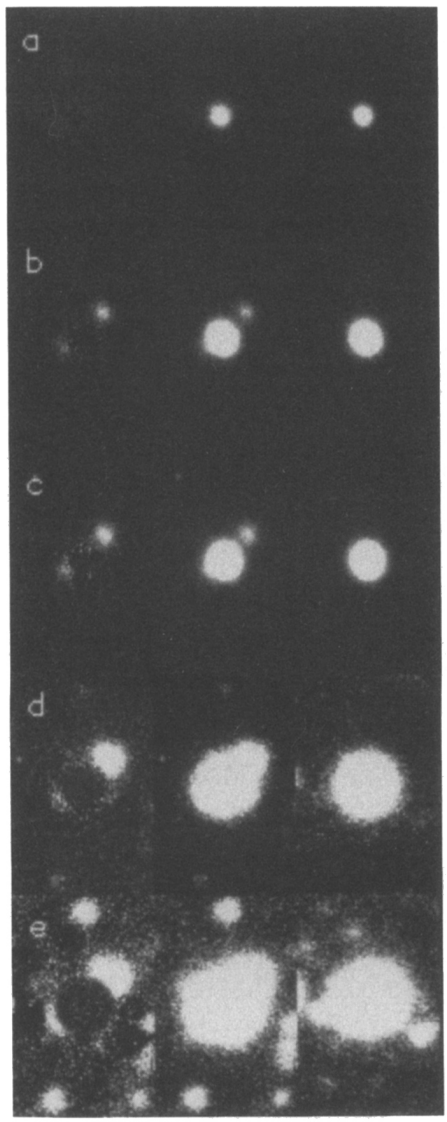

Figure 1 – Density differences from 5 plates, Sk −69°202 minus Sk −69°203. The left panel of each row shows the image subtraction from a given plate, while the center panel is the original image of Sk −69°202 and the right panel is that of Sk −69°203, from the same plate. North is up and east to the left in each case. Star 2 is at 3″ in PA 315° and Star 3 is at 1.″5 in PA 115°. (a) Plate No. 345 (4765 Å, 2 min—the apparent "nebulosity" is spurious), (b) No. 5973 (4765 Å, 10 min), (c) No. 5976 (5000 Å, 10 min), (d) No. 719 (6725 Å, 30 min), (e) No. 4858 (IV–N, 90 min).