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The Salem, Oregon L6 Chondrite

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Abstract—The Salem, Oregon meteorite fall of 1:05 a.m. (07:05 GMT) May 13, 1981 (lat. 44°58′45″N., long. 123°58′10″W) was heard by two observers. A 22.2 g fragment was recovered immediately from a total recovery of 61.4 g from a single individual. No other fall related phenomena were observed. It is a heavily fusion-crusted, shock-veined, L6 chondrite.

EVANS *et al.* (1987) HAVE OBSERVED unusually high levels of cosmic ray produced ^{26}Al, ^{22}Na, ^{54}Mn, and ^{56}Co in the Salem, Oregon meteorite. They interpret these data and the fact that Salem has an unusually thick fusion crust as indicating that it is a primary object, a product of a very small body in space. This is noteworthy as most single individual recoveries of stony meteorites have proven to be fragments from bodies that were significantly larger in space, an individual fragment from what must have been a shower. Evans *et al.* (1987) also reported an LL5 classification attributed to J.C. Laul. The fall and recovery have been described by Pugh (1983), and he also reported the same amphoterite classification. The purpose of this note is to make generally accessible basic information about the circumstances of fall, the physical characteristics of the fragment provided to us, and to support a revised classification as an ordinary L6 olivine hypersthene chondrite.

The Salem meteorite hit the house of Deputy Sheriff James P. Price at 1:05 am (07:05 GMT) on May 13, 1981. Price was in front of the house talking with a colleague when both men heard a fluttering sound overhead, followed by the sounds of the meteorite hitting the house and of debris falling nearby. A piece still warm to the touch (22.2 g), was found within a few minutes on the driveway within 3 m of the officers. Because of scientific training, Price surmised it was meteoritic. More pieces were recovered the next day (17.7, 9.9, 8.1 and 3.5 g) for a total of 61.4 g. Three of the pieces fit together to form about half of an individual. The two remaining pieces fit together, but did not fit with the first three, indicating that about one-third of the individual was not recovered. The location of the fall was lat. 44°58′45″N, long. 123°58′10″W. (NW1/4NW1/4 sec. 8, T. 7S., R. 2W., Willamette Meridian, Marion County, Oregon). Neither a fireball nor sonic phenomena were reported.

A 7.6 g fragment, the remainder of the original 8.1 g piece, was donated to the National Museum of Natural History in 1987 by Mr. Price (catalog number 6394). Two polished thin sections were prepared for study, leaving 6.7 g for preservation and future study. The piece is covered in part with an unusually thick fusion crust; a slightly thicker fusion crust (2.8 mm) was noted on another piece (Pugh, 1983). Our piece included an area of anterior surface, a 1.4 cm length of flange produced by oriented atmospheric passage, and an area of markedly thicker posterior surface. The anterior surface crust is smooth, about 0.7 mm thick, thickening slightly close to the flange, and it has several hairline cracks. A slight flange-overhang with an accumulation of fusion crust 2.5 mm thick separates anterior from posterior surfaces. The posterior crust is about 1.5 mm thick and highly vesicular, with individual vesicles from 0.1 to as large as 0.5 mm in diameter. The thick fusion crust on both types of surface suggests an unusually low velocity and long path of ablative heating.

A 1.3 cm^2 polished thin section was examined microscopically and with the electron microprobe. Silicate materials are relatively course-grained, and one large (2 mm) fine-grained radiating pyroxene chondrule and several much smaller apparent chondrule fragments were observed. Olivine (Fa_{24}; 15 points, 1.8%MD), low-Ca pyroxene (Fs_{21}; 11 points, 0.7%MD), and plagioclase (An_{11}) are the major silicates. Troilite, kamacite, and small amounts of taenite and chromite are present. All petrographic and compositional data are consistent with an olivine hypersthene chondrite classification, an L6 according to Van Schmus and Wood (1967).

Superimposed on this chondrite texture are effects resulting from atmospheric ablation, preterrestrial shock, and reheating. Fusion crust at the edge of the ablation flange consists of a 1.4 mm thick vesicular melt crust underlain by a 0.9 mm heat-altered and darkened zone. The melt crust tapers toward the center of the anterior surface to less than 0.1 mm, and the heat-altered zone tapers to 0.7 mm. Posterior-surface fusion crust was not present on the section at hand. A shock-veined region of approximately 10% of the section area bisects the section perpendicular to the anterior surface. Here silicate areas are opaque and partially transformed to melt. They contain metal and/or sulfide globules in the few-micron or less size range, troilite in the association varies from recrystallized to melted and is drawn out into veins, and kamacite has been converted to martensite. Metal textures in these areas suggest reheating superimposed upon a shock distorted structure. The small size of this Salem individual and the unusually thick fusion crust suggest that reheating sufficient to affect all of the metal may have occurred during atmospheric passage.

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