

THE SILVER STAR CHROMITE DEPOSIT, MADISON COUNTY, MONTANA

By H. L. James

The Silver Star chromite deposit, which is 3 miles in a direct line west of Silver Star, Madison County, Mont., was examined and mapped by H. L. James of the Geological Survey in May 1943. It had previously been examined briefly by the Geological Survey and by the Bureau of Mines. The property was trenched and sampled by the Mineral Resources Survey, under the auspices of the W. P. A. and the State of Montana, in 1941.

The Silver Star deposit is located in the NW $\frac{1}{4}$ sec. 10, T. 2 S., R. 6 W., about 4 miles by dirt road from the town of Silver Star and about 6 miles from the Silver Star station on the Northern Pacific Railroad. Approximately 500 tons of ore was shipped in 1942 and early 1943 by the Silver Star Corporation, the present owner and operator of the deposit. Development consists of about 25 trenches and pits and about 650 feet of underground workings.

The chromite occurs as bodies of disseminated and massive ore in a lens of pre-Cambrian serpentine which has been intruded concordantly into gneissic quartzite and amphibolite. The serpentine, now partially altered to talc, hornblende, chlorite, and mica, is 40 to 125 feet in width and has a minimum length of 700 feet along the strike. The metamorphic rocks and serpentine trend in a general northeasterly direction, dip steeply to the southeast, and have a very pronounced linear structure which plunges northeast at an angle of approximately 35°.

Three distinct ore bodies, consisting of pods of massive chromite enclosed in disseminated ore, appear to be present in the serpentine. The major ore zone is at or close to the north contact of the serpentine with quartzite and has been explored by four trenches, a large open pit, and by several hundred feet of underground workings including three raises. Inasmuch as all workings intersecting this zone have encountered ore, the essential continuity of this ore body, containing approximately 15 percent of Cr₂O₃, appears reasonably indicated for a strike length of from 250 to 300 feet. The full width is known only in the open pit and in the immediately underlying crosscut, where it appears to be about 25 feet. None of the remaining trenches or underground workings completely crosscuts the ore zone, but a minimum width of approximately 4 feet is indicated. The normal strike of this ore zone, the serpentine, and the enclosing rocks is northeast-southwest and the dip is to the southeast. Departures from this strike and dip are interpreted as due to a drag fold with a 35° plunge to the northeast, a direction parallel to the mineral alignment in the metamorphic rocks.

A second ore body lies about 40 feet south of the main ore zone and is exposed in two trenches. The length indicated is about 40 feet, with a width of approximately 5 feet. Ore is exposed in underground workings 80 feet below the surface in the proper projected position but is probably not to be considered strictly continuous with the surface showings.

A third ore body, on which the discovery exposure was made, occurs on the crest of the ridge southwest of the main ore body. Ore has been exposed in two pits which indicate a length of about 45 feet and a width ranging from 8 to 14 feet for this pod.

The chromite from the Silver Star deposit is low in chromic oxide content and high in iron content. The chromic oxide content of concentrates from five samples of the ore ranged from 37.63 to 44.79 percent and the chromium-iron ratio from 0.83 to 1.29. Under the microscope the massive ore is seen to consist of very large chromite grains, as much as several millimeters in diameter, with only small amounts of interstitial silicate minerals. In one sample, however, the serpentine was intergrown in such a way that it could not be separated completely with heavy liquids. The disseminated ore consists of grains 1 millimeter or less in diameter in a matrix of serpentine which in places is altered to biotite. In both disseminated and massive ore a relatively large amount of hematite is present—as much as several percent—which occurs as interstitial grains and as minute needles oriented along octahedral planes of the chromite. Little or no magnetite was observed in the specimens examined. The high iron content of the chromite is probably due in part to intergrown hematite which probably cannot be completely separated mechanically.

Analyses of cleaned chromite and chromite ore
from the Silver Star deposit, Montana
[M. K. Carron, analyst]

Specimen	Cleaned concentrate				Ore				Percent chromite
	Cr ₂ O ₃	Cr	Fe	Cr:Fe	Cr ₂ O ₃	Cr	Fe	Cr:Fe	
S. S. 1	40.25	27.53	24.51	1.12	32.18	22.01	20.63	1.07	80.0
S. S. 2	37.63	25.77	30.89	.83	19.60	13.41	17.85	.75	52.1
G45, 46, 47	44.79	30.63	24.74	1.24	25.08	17.16	15.90	1.09	56.0
HJ-15-43	41.45	28.37	22.01	1.29	36.59	25.02	21.35	1.17	83.3
HJ-42-43*	38.72	26.50	25.76	1.03	17.32	11.85	13.75	.86	44.7

*Estimated to contain 5 to 10 percent of serpentine intergrown with chromite. Serpentine could not be completely eliminated with heavy liquids.

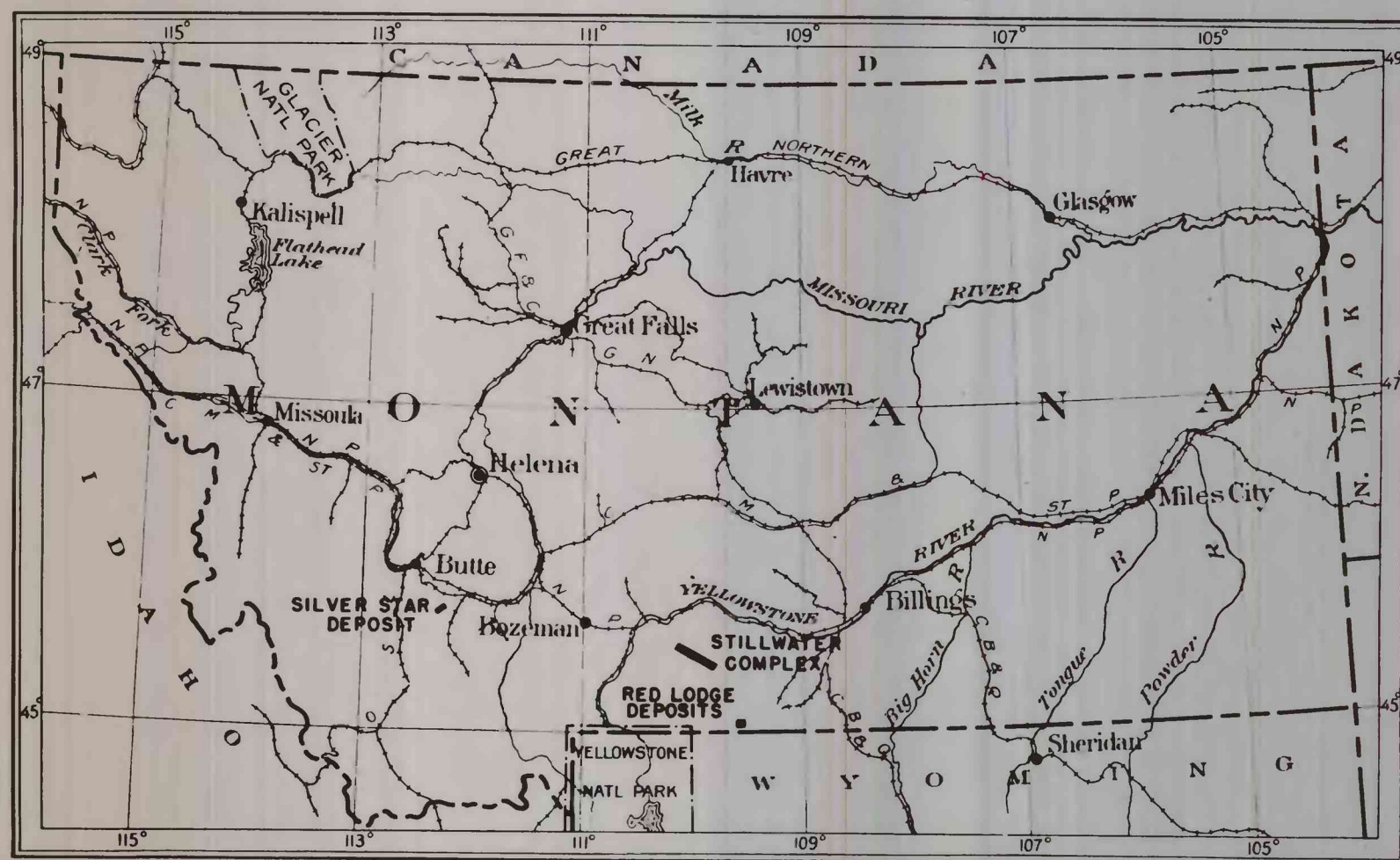
S. S. 1. Ore from 1-foot massive lens 15 to 20 feet west of discovery pit. Collected by J. W. Peoples.

S. S. 2. Ore from dump of most westerly pit on main ore zone. Collected by J. W. Peoples.

G45, 46, 47 (combined sample). Six-foot, 8-inch channel sample across disseminated chromite in hanging wall of open pit. Collected by R. M. Garrels.

HJ-15-43. Massive ore from face of east drift on main ore zone. Collected by H. L. James.

HJ-42-43. Disseminated ore from No. 3 raise, west drift on main ore zone. Collected by H. L. James.



INDEX MAP OF MONTANA SHOWING PRINCIPAL CHROMITE DEPOSITS