

Chinge, Part II

by Roy A. Gallant

May 1997

I left Portland, Maine on June 21 and was met in Moscow by a grinning and waving Kathy. The next day Tsvetkov joined us and we boarded an Aeroflot flight for the 4,100 kilometers across the Urals and then the Steppes of Central Asia to Krasnoyarsk, where Kathy lives. Overnight in her apartment, repacking, and then a Yak-40 flight south to Kyzyl, the capital of Tuva, another 450 kilometers. Overnight in Kyzyl, then a 1.5-hour drive over some 90 kilometers by minivan to the village of Bai-Haak, where we were met by Major Sergei Sapelkin, chief forest agent for the district that includes the Chinge site. I had met Sergei in 1992 when we climbed over the Sayan Mountains by horseback to overlook Mongolia.

A Gorkey all-terrain van with seven double seats bounced and jolted us for another 1.5 hours over 20 kilometers of rutted forest trail up into the Tannu-Oola Mountains. At one stage, a small mountain winter glacier threatened to block our passage, but the Gorkey bounced over it, leaping one crevasse with a meter-wide yawn. The big question was whether the Gorkey would be able to make it over the steep pass yet to come. If it couldn't, then an interesting climb by horseback awaited us. Fortunately, it did. And my concern about careening out of control down the opposite slope turned out to be groundless, well mostly so.

The last time Tsvetkov had been to the old gold mine site, which was to be our camping area, was in 1986. The 27-hectare, 1-kilometer wide Chinge river valley was then a green carpet of lush vegetation with the clear stream a few meters wide locked in along either side by steep, 245-meter-high grass- and coniferous-clad slopes. Tsvetkov had described it as a mountain paradise. But no more, and the expression on his face when our Gorkey drove up to the one remaining miners' log cabin revealed his shock as he quickly surveyed our surroundings.

The gold miners had been back for one final assault on the unspoiled valley. They had worked the area for two years before abandoning it in 1995. This time they had modern equipment with all of its destructive force. In place of the carpets of wild grasses, wild flowers, and myriad small shrubs were heaps of small boulders, then rocks, then sand, and a large mud pool. The surface of the Moon would have been at least as hospitable. About a 1.5-kilometer stretch of the valley to the edges of the steep slopes on either side of the stream was utter devastation.

First the giant bulldozers scraped away all living matter and the alluvium. Then the draggers scraped up a mixture of underlying rock, gravel, sand, and mud. The dragger first spit out the heavy rock rubble, heaping it into endless piles. Next it spit out the coarse gravel into still more piles. Then it washed the gold out of the finer sand and mud. The gold was then caught in a fine-mesh grid, collected, put in portable vaults, and then taken to Bai-Haak. About 50 miners had worked the area in consecutive 12-hour shifts. In their last year here

they collected about 40 kilograms of gold. Then they left as suddenly as they had come. They also left their litter of rusted and discarded machine parts, fuel containers, broken bulldozer tracks, and any other equipment that was no longer serviceable.

We pitched our tents not far from the stream and set up a makeshift table and cooking area near the old cabin. Our carpet was sorted rocks the size of tennis balls, rotting planks with nails sticking through, and strewn tree stumps. Tsvetkov just kept shaking his head in disbelief.

The next morning with backpacks, shovels, and cameras we hiked downstream for about 3 kilometers. Two-thirds of the way the rock rubble abruptly ended where the bulldozers had stopped fashioning their lunar terrain. The remainder of the hike took us up and over a small mountain glacier and then into the unspoiled terrain that Tsvetkov had remembered. Ten minutes later we were standing at the junction of Meteorite Valley and Chinge Creek, the point where Tsvetkov's first expedition had found meteorites.

Our target area was another two or so kilometers up the v-shaped valley. It is an old glacial valley carved out during the last ice age. Its steep, thickly-wooded slopes are inclined some 20 to 50 degrees. In some places the stream was only a trickle, in others it was a meter or more broad but rarely more than half a meter deep.

The most likely places to find meteorites, Tsvetkov told us, was at the head of small pools, which occurred in step like fashion along the stream bed. His reasoning went like this: In ages past when the meteorites came to this valley, some may have been deposited at random along the stream, as was the case with some of the meteorites recovered in the Chinge Creek. But others most likely were washed down in post glacial times by swiftly-flowing spring melt water. They were tumbled downstream along the then exposed bedrock of the new valley and, like gold nuggets, trapped in depressions at the bases of small waterfalls at the heads of the numerous pools.

The digging was not easy, for over the centuries debris of rocks, alluvium, and dead trees had clogged the stream and in places even hid it from view. Dima, our digger-in-chief, hacked away at a dead tree at the head of the first pool we excavated while Tsvetkov, Kathy and I dug and tumbled boulders and smaller rock matter out of the way to clear the head of the pool.

Hour after hour of this work, always monitoring our piles of debris with a metal detector, brought only fatigue, hands numbed by the cold water, and bruised fingers. Other than the sharp rocks, the only other natural enemies were bears and ticks. Of the two, ticks were the more worrisome, for a bite could bring on encephalitis. So at the end of each day a thorough examination of our clothes and bodies for ticks was in order. Yes, we found some and Kathy had been bitten. All she could do was wait out the incubation period of about two weeks for fever to start. It didn't.

The first pool was not rewarding. So the next day, mostly in the rain, we dug our way into another one. This one required building a dam to hold back the water from the pool above, and, of course, the dam kept breaking. Kathy ended up shoveling more water than rocks. Tsvetkov said not to fret, for rarely does the first day of digging a pool produce results. Sometimes you have to dig through a meter of rubble before reaching the bedrock where the meteorites are found.

The next day found us back at Pool #2. After two hours of digging, and my trying to get a fire started with wet wood, I heard a trio of

cheers go up amid a rapid series of beeps. A fine fragment specimen was removed from a pile of rubble. About the size of a hand, it weighed 864 grams. We also found a second but smaller fragment.

At one stage the metal detector started beeping at something lodged beneath an enormous boulder at one edge of our pool. Although we could reach it underwater, and even wiggle it slightly, we dared not dislodge it for fear of the large boulder above slipping down and entombing it forever. Finally, we managed to prop up the large boulder, then with cautious digging, prying, and wiggling, Tsvetkov triumphantly withdrew it and with difficulty held it high over his head. There was much cheering from all four of us. The meteorite was a large fragment that weighed in at 7,900 grams and, presumably, like the other Chinge specimens is 83% Fe and 16% Ni with Co and other trace elements.

The origin of the Chinge meteorites has yet to be learned. In 1947 E. L. Krinov was the first to propose that it might have been a crater-forming object. Although the 1963 expedition failed to find any evidence for large impact craters, it was nevertheless felt that smaller impact craters with diameters of several dozens of meters might exist.

Evidence for such multiple cratering was suggested by morphological studies of the many fragments, although their long storage in the ground has resulted in deformation. The most likely region to search for such small craters was in Meteorite Valley where most of the meteorites so far recovered have been found. But the preservation of craters seems highly unlikely due to active slope processes. Then it was argued that possibly the stream's bedrock would reveal impact fracturing. Although bedrock deformations similar to deformations typical for well-known impact craters were found in Meteorite Valley, firm conclusions about them cannot be made.

As with the Sikhote-Alin shower, it is possible that the Chinge object began to break up first in the atmosphere and then further fragmented when relatively large pieces impacted the ground. In such a case we would expect the morphology of the meteorites to be revealing _ i.e. some would be "individuals" with characteristic regmaglypts due to ablation; and others would be "fragments" with sharp edges, although in this instance noticeably dulled by long-term chemical erosion in the soil. Both subclasses of the meteorite have been identified for the Chinge fall. Krinov even included a third subclass _ fragments from the interior of the meteorite as well as outer region fragments.

Has it been possible to determine a trajectory of the fall? The closest Tsvetkov has come to suggesting one is based on the occurrence at the northern region of lots of small meteorites while at the southern area there a few relatively large pieces. This mass distribution could suggest a hypothetical trajectory of roughly from north to south.

In 1982 the Russian mineralogist Vera Semenenko published her findings on the inner structure _ crystal structures and fractures _ of Chinge specimens. She said that the absence of internal crystal distortions suggested a meteorite shower with atmospheric fragmentation rather than impact fragmentation as evidenced in crystal distortions of the Sikhote-Alin fragments, but not in the individuals.

In 1981 at the All Union Meteorite Conference held in Moscow, the Estonian geologist Yulo Kestlane was the first to hypothesize that the Chinge meteorite fall was prehistoric and impacted a glacier. Presumably, the greatest number of fragments were carried along with the glacier as it carved out Meteorite Valley. Eventually those fragments were released by the ice and deposited on the bedrock of the

meltwater stream. Then over the ensuing millennia the fragments were buried beneath rubble of rocks, sand, layers of alluvia, and vegetation.

Three years later at another All Union Meteorite Conference, N. V. Lukina gave a paper putting a possible age of the Chinge meteorite at from 20,000 to 25,000 years. The age was based on the geology of the valley and the depth of meteorites beneath the alluvium. A younger date of from 10,000 to 12,000 years also has been proposed.

So far, a total of some 250 meteorites have been recovered from the site, although the exact number cannot be known due to the undocumented history of meteorite finds between Chernevich's death in 1917 and the 1978 expedition led by Tsvetkov and commissioned by the Committee on Meteorites. The last two expeditions of 1981 and 1986 were authorized by the Geochemical Institute.

Most of the Chinge meteorites recovered to date are in the Academy of Sciences in Moscow. Like the uncertainty of the total number of meteorites recovered, there is equal uncertainty about an estimated total mass of recovered objects, although it must be considerably more than 350 kilograms. It would be sheer speculation to attempt to attach a number to the mass of the pre-atmospheric object.

The Chinge meteorite story is a fascinating one, and one waiting to be resolved. For the present, however, the Geochemical Institute's lack of funds prevents the Russians from organizing future expedition. But that may change. Until only recently both the Tunguska and Sikhote-Alin sites were off limits to foreign scientists. But now the Russians are doing all they can to woo foreign scientists to Tunguska in an attempt to solve the mystery of that cataclysmic event. And next September 8-10 will see the first Sikhote-Alin International Conference, to be held in Vladivostok, with the possibility of foreign scientists being permitted to visit the site.

The Russians are opening their doors slowly and inviting qualified visitors to enter. This is especially so within the scientific establishment. So don't be surprised if in the very near future Chinge, too, will be beckoning.

Photographs 2,3,4 courtesy Dmitry Yurkovsky and Ekaterina Rossovskaya, no. 1 the author.

Well-known author Roy Gallant's latest work is The Day the Sky Split Apart: Investigating a Cosmic Mystery, Simon & Schuster, 1995.



[Return to the back issues list](#)

© Copyright Pallasite Press 1997