

FINDING METEORITES ON IMPROBABLE GROUNDS: THE WESTERN EUROPE CASE

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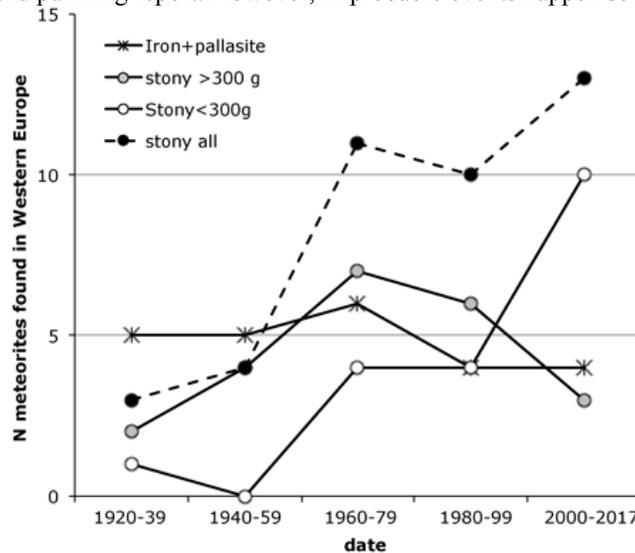
Finding meteorites in Western Europe appears to be highly improbable with respect to hot and cold deserts, thus leading to suspicion of fraud about the geographic provenance for newly announced finds. Still finds have been made regularly over the last century (study period 1920-2017, not counting Osterplana fossil meteorites), with a nearly constant rate around five per twenty yr period for irons plus stony irons, and the same rate for large stony meteorites (>300 g). Only small stony meteorites have shown a steady increase from one in the 1920-1939 period to four in the 1960-1979 and 1980-1999 periods and up to ten since 2000.

Only this last increase could possibly be imputed to fraud since the incentive from the meteorite market to forge a European find is recent. Thus, there is potentially a handful of meteorites that could have been unduly declared from Western Europe in the XXIth century, and one has actually been proven to be such a fake European find [1]. On the other hand this increase can be attributed to the steady increase of time passed on the field by amateur naturalists or treasure hunters and to the efficiency of outreach activities on the public awareness about meteorites. Interestingly the find rate in Eastern Europe (Russia plus Ukraine, etc.) since 1960 has also remained constant for irons plus stony-irons and has increased more slowly for stony meteorites. Practically only large stony meteorites have been declared.

As the authors of the declaration to the Nomenclature Committee of the Meteoritical Society of two finds from France made in 2016 (Abbans-Dessous and Mercantour, both ordinary chondrites) we felt concerned by the question of detecting an eventual fraud. This is particularly a concern when the finder is also a meteorite dealer or when the meteorite appears on the market right after its declaration.

These two meteorites have a weathering grade W1, making the trace element method put forward in [1] potentially ineffective. On the other hand short-lived isotopes could confirm a recent fall date. We will present various investigations, including trace elements and short-lived isotopes counting, made to evaluate the probability that these two finds indeed fell where the finder declared. In both cases the finding circumstances seem rather improbable (road surface and high mountain top). Abbans-Dessous is a 3 g fully crusted LL6 found in 2015 that revealed short-lived isotopes consistent with a fall date coincident with Chelyabinsk. However, their respective magnetic properties and petrologic type excludes their identity. Mercantour (a L4-6) has been suspected to be a Saharan meteorite (possibly NWA 869, a massive L3-6 that has yielded thousands of stones for a total weight of about 7 tons [2]) based on the presence of quartz grains in cracks. However, these grains surface (optical and SEM examination) are not typical of wind-blown sand and are comparable to grains found in the local moraines (as provided by the finder). Comparison with NWA869 seems to exclude it to be the same meteorite.

At this point we are left in both cases with the option to trust the finder's report or to remain skeptic toward a highly improbable event and puzzling report. However, improbable events happen sometimes.



Reference: [1] Folco L. et al. (2007) *Meteoritics & Planetary Science* 42 : 321–330 [2] Metzler K., et al. (2011) *Meteoritics & Planetary Science* 46:652-680