30 years ago, on November 13th, 1952, a highly luminous meteor was observed and exploded over a bush region in Cameroon. It must have been a very large object according to the witnesses, but it seems to have fragmented in small stones. Only 7 tiny stones were recovered at the time, of which 4 reached the Muséum d'Histoire Naturelle in Paris. 3 are LL6 brecciated fragments (and supposedly 6 of the 7 stones, according to the 1952 report of M. Koch, a geologist); the 4th is a peculiar enstatite-chondrite. A previous description (Orcel and Jeremine (1) pointed out the duality of the specimens without giving them the proper classification, owing to the lack of chemical analyses. Mason and Wiik (2) recognized the brecciated stones as an amphoterite.

Two questions remain to be solved: - the nature of the enstatite stone, - its belonging to the same meteorite shower as the LL6 specimens.

The enstatite specimen. One centimeter wide polished section and one thin section are the only material available for this study. The observation of the thin section allows us to recognize chondrules and to notice the absence of olivine and orthopyroxene; all pyroxenes are clino- or striated ones. The abundance of metal and troilite gives an appearance of opacity to the matrix especially in a rather thick section (40 μm), but the polished section shows that the rather coarse silicate portion of the matrix is chiefly made of clastic rounded debris and pyroxene laths; there is very few micrometer sized material; when present, it is enclosed in sulfide grains. The opaque phases are represented by nickel-iron, as chondrules and irregular grains enclosing pyroxenes laths and low-reflectivity silica-rich blebs, troilite and schreibersite, plus two tiny inclusions in a large pyroxene crystal which proved to be an iron-manganese-zinc sulfide. No other unusual minerals, specific of enstatite chondrites, nor graphite were found.

Mineral chemistry. The microprobe analyses performed on the different mineral phases allow the following remarks.

Unlike the 4 type I enstatite chondrites studied by Leitch and Smith (3), Galim contains a single population of enstatite crystals but with a rather wide variation of FeO content, going from 0.76 to 5.73 %, the peak value being at 1.5% for FeO, 0.13% for CaO, 0.15% for Al₂O₃, 0.12% for MnO, <0.05% for Na₂O, Cr₂O₃ and TiO₂.

Silicocytes with variable proportions of Na, Ca, Fe, Mg, sometimes a little Cr and Ti are found mainly as inclusions in kamacite or between pyroxene crystals in chondrules. They are presumably glassy and the glass does not seem to have evolved to crystalline albite. When very SiO₂ rich, they probably crystallize judging from the hexagonal contours of some blebs, or concentrate in small chondrules containing often drops of troilite, and rimmed by a somewhat different enstatite with enhanced contents of minor elements.

Kamacite is the main metallic phase, and the only one occurring in spheroids with Ni contents from 5.6 to 6.72 at.%, Co contents from 0.42 to 0.74 at.%, Si is present at a lower level than usually in enstatite chondrites. S has been detected but not P.

There is little taenite but it occurs in two different places and under two different varieties: cloudy taenite may be present in a few chondrules, with Ni >34 at.% at the center of the areas; tetrataenite is found in the matrix with 46.6 to 50 at.% Ni and less than 0.22 at.% Co, enclosing most often kamacite rounded cores.

Schreibersite is nickel rich Ni⁻¹.⁷₅Fe⁻¹.₂⁵P and have a stable composition
whenever close to kamacite alone, or between kamacite and taenite.

Apart from traces of Ni, troilite is normal, without any Cr, Mn or Ti concentrations as usually found in enstatite chondrites, and seems to have filled up any previously existing void.

Because of the lack of bulk chemical analyses (for this type of work, there is no longer any rock fragment left) we can only rely upon the indications given by the mineral chemistry to note that though close to enstatite chondrites (with some characteristics of type I, and others of type II) some differences occur, essentially related to the redox state of the material, owing probably to a lower C/O ratio: no graphite nor carbides are found; a small fraction of the iron is oxidized; there is a low Si content in nickel-iron, no chalco-
philic Ca, Ti, Mn, Cr.

Galim should be then another specimen belonging to that ill-defined domain where the oxidation conditions are intermediate between the E and the H chondrites, but it has no olivine (so a lower Mg/Si ratio than the H chondrites) and cannot be called a forsterite chondrite.

LL6 Specimens. Contrarily to the enstatite specimen, the LL6 stones are of an ordinary brecciated type, and seem to have experienced several episodes of brecciation. One of them was accompanied by the melting of troilite which invaded all the cracks and had in some places a corrosive effect, as can be seen by the rounded contours of the minerals at the contact with the sulfide. Olivine is Fa_{28}, pyroxene Fs_{21}, Wo_{1.7}, plagioclase is Ab_{0.85}Or_{0.15}An_{0.10}; the chromite is rather high in MgO and low in MnO for a LL chromite. All the metallic grains analysed are unzoned or very slightly zoned taenites with 40 at.% Ni (± 1.5) and from 1.60 to 2.72 at.% Co.

Do the enstatite and amphibolite specimens belong to the same meteorite shower?

Obviously, this cannot be ascertained. The pebbles gathered by cattle-breeders who saw them fall, at the periphery of the presumed strewnfield, are quite fresh. M. Koch wondered if the proportion of dense to light stones would not be different at the main falling point. But the enstatite specimen may also be a unique xenolith, such as the H xenolith found in St Mesmin LL chondrite (4). Though its bulk composition differs from that of an enstatite chondrite, we may also recall the small clast found in LL3 Piancaldoli (5), with all its fibroradiated enstatite microchondrules. If the belonging of the Galim pebbles to a same meteorite shower is once verified, it would mean that the LL parent body trapped through various shock events some exotic materials from a wide variety of environments.

References: