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FREE ORGANIC RADICALS IN THE MIGHEI AND NOGOYA METEORITES

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FREE ORGANIC RADICALS IN THE MIGHEI AND NOGOYA METEORITES **/4776

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35779

The authors studied electronic paramagnetic resonance signals, linked to the free organic radicals present in the Mighei and Nogoya meteorites. They demonstrate that these meteorites are characterized by a value of g = 2.002 which is entirely comparable to that of lignites and coals. The high concentration of paramagnetic centers in the Mighei meteorite, namely, 10^{17} per gram of carbonized matter, again proves the validity of the analogy which these authors had proposed previously. A discussion of the width of the observed signals leads to the suggestion, in full agreement with recent results by Schulz and Elofson, that the carbonized chondrites have not been subjected to temperatures above 300 - 400° C. The generality of the analogy with the behavior of coals is discussed and gives a supplementary proof for the assumption that an extra-terrestrial biogenic activity exists.

Recently, Duchesne and coworkers (Bibl.1, 2) demonstrated that the carbonized meteorites Alais and Cold Bokkeveld are characterized by the presence of free organic radicals; this is manifested by the appearance, in resonance of electronic spin, of narrow lines (singlets of a width of about 10 oersted in air). These lines, which correspond to a g varying between 1.960 to 2.000, de-

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** Numbers in the margin indicate pagination in the original foreign text.

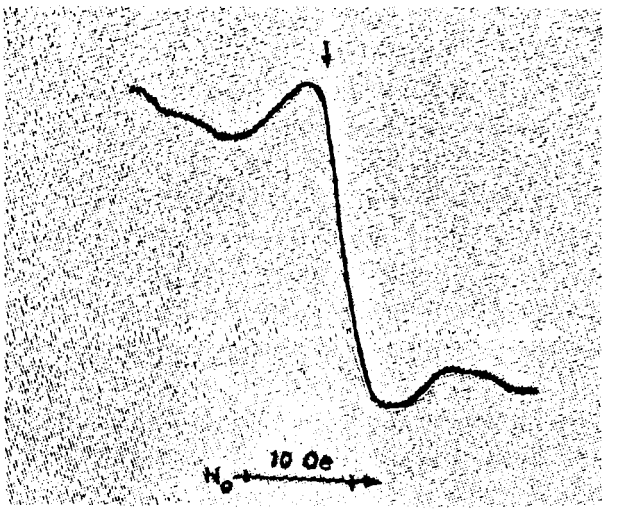
pending on the strength of the internal demagnetizing field of the specimen considered, also have the property of undergoing a considerable contraction to about 6 oe, when the pulverized meteorite is examined in a vacuum of 10^{-3} mm mercury. The concentration of free radicals has been estimated as 10^{16} per gram of carbonized matter.

The purpose of this memorandum is to demonstrate the generality of the previous observations by investigating the chondrites Mighei and Nogoya which, respectively, fell in the Ukraine in 1889 and in Argentine in 1879 and were made available to us by the RR. PP.J.Junkes and E.W.Salpeter of the Vatican Observatory.

The instruments and detection method are similar to those described in our previous report (Bibl.2). Again, as in the preceding cases, we found (in air) a unique line of a width of 8 oe for the Mighei meteorite, as illustrated in Fig.1; this line, in vacuum, contracts to 6 oe. However, the resonance signal appears at $g = 2.002$, which corresponds accurately to that of lignites and coals (Bibl.3), indicating a relatively low strength of the demagnetizing internal field. This result, incidentally, is confirmed by the fact that the broad line of ferromagnetic resonance (Bibl.4), on which the narrow signal is distinguished, is distinctly less intense than for the Alais and Cold Bokkeveld meteorites. It should be noted also that the content of free radicals in the investigated specimens (calculated on the basis of a concentration of carbonated matter of 2.6%) is about 10^{17} in this case (Bibl.5), which is by one order of magnitude greater than the values characterizing the meteorites studied previously and, thus, becomes comparable to the concentrations that are generally observed for lignites (Bibl.3).

With respect to the Nogoya meteorite, the signal presents character- /4777

istics that are similar to those of the Mighei meteorite, with the restriction that its intensity is considerably lower, so that only a very rough estimate of the concentration of free radicals is possible, namely, 10^{15}.



Electronic Resonance Line of the Meteorite Mighei.
The arrow corresponds to g = 2.0036

It seems of interest to mention here that systematic tests, made under identical conditions on the carbonized meteorites Orgueil and Indarch, have yielded no result until now, possibly exactly because of the particularly strong intensity of their ferromagnetism.

A general result, based on the constancy of the widths of the lines in the series of the investigated meteorites, is the fact that these cannot have been subjected to temperatures above 300 - 400° C in view of the fact that 8 oe is exactly the width that characterizes coals and organic matter in this temperature range (Bibl.6). This conclusion agrees fully with the conclusions of a recent investigation by Schulz and Elofson (Bibl.7) on the carbonized matter extracted from the Orgueil meteorite.

With respect to the origin of the carbonized constituents, the width of the observed lines unfortunately does not permit a definite settlement of the ques-

tion whether this width indicates a molecular evolution in the prebiotic phase, followed by a carbonization at a temperature near 300° C, or whether it is directly due to a process of biogenic nature. However, in comparing the actual observations with the results obtained by entirely different methods - for example, by Calvin (Bibl.8) who detected pyrimidic bases in the Murray meteorite, Hodgson and Baker (Bibl.9) who discovered porphyrins in the Orgueil meteorite, Nagy and coworkers (Bibl.10) who identified levorotatory organic compounds in the same meteorite - it must be admitted that there is a large array of arguments in favor of the existence of extraterrestrial life.

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