

APPENDIX 6ORIGIN OF LAYERING IN WRIGGLITES

Several different hypotheses for the development of the rhythmic layering in wrigglites have been advanced. These are that the layers

- (1) represent bedding in an unusual sediment, which has been subsequently metamorphosed. (Zasedatelev, 1973)
- (2) are replacement, layer by layer, of pre-existing stromatolites. (Stainton, pers comm)
- (3) are colloform layers, representing a solidified gel precipitate, which has replaced limestone (Stevenson & Jeffery, 1964)
- (4) are crustiform layers, rhythmically deposited in cavities in the limestone. (Trustedt, 1907)
- (5) are deposited by replacement of limestone at diffusion "fronts" moving outwards from a fracture along which mineralizing fluid infiltrates. (Knopf 1907, Jahns 1944, Eskola 1951, Beus 1966, Sainsbury 1969).

The last hypothesis is the one which best fits the observed facts and it is the only process capable of building up the observed geometry. (Fig.8). The mechanism in more detail is:- Fluids infiltrate along fractures and pipe-like openings in limestone. The components in the fluid move into the limestone diffusion along grain boundaries, down a concentration gradient. The fluid, assumed to be acidic, fluoride rich, and containing iron, silicon, aluminium, tin, tungsten, etc. as fluoride complexes, reacts with the calcite. Layers of fluorite, magnetite and idocrase etc. deposit by volume-for-volume replacement of limestone. The fluid continues to diffuse from the fracture, through these deposited layers, and a new set of layers forms in the same way. The process continues until limestone is entirely replaced by wrigglite or until the effective limiting distance of diffusion from the fractures is reached, or until the fluid infiltrating along the fractures is spent. The process is analogous to the formation of Liesegang Rings. There are irregularities in the advancing diffusion fronts caused by slightly differing rates of diffusion from one place to another - this produces local thickening and thinning and the irregular contortions in the layers. The last phase in the process is the filling of the fracture itself, to produce usually a coarser grained central vein or coarser grained patch of fluorite and other minerals. This central vein might contain late stage minerals or might be the locus for alteration of wrigglite by later fluids of different composition. The geometry of interfering sequences produced by this process is illustrated in Fig. 8.