Light which appeared a fraction of a second before a granite core was crushed in one of a series of experiments carried out by Devereux, McCartney, Merron et al *in London, 1983*

Triboluminescence in rock crystal: lights appearing on the surface of a rock fractions of a second after it has been subjected to friction

and theories relating to earthquake lights (*Bull. Seismological Soc. of America*, vol 63, No 6, 1973). He points out that such lights have been reported up to 80 km from an epicentre and have been seen over water. Explanations range from piezoelectrical effects to violent oscillation of low-level air. (More recently, other US geologists have suggested friction-based instead of piezoelectrical mechanisms.) Earthquake lights and UFOs may have a lot in common, and an explanation of the one type of phenomenon is bound to affect the understanding of the other. If future UFO research continues to provide such strong correlations as in the Dyfed and Egryn examples, then UFOs will have been shown to relate to geology just as surely as have earthquake lights. Neither scientists nor ufologists can credibly ignore this development and its implications.

Light from the rocks

But what can the connection between geology and UFOs be? And why do earthquake lights seem to require the stimulus of an earthquake while UFOs do not (though UFOs may very well be simply an unrecognised form of such lights requiring subtler geological instigation)? Any discussion of fault shearing or compression as the source of energy generation usually invokes the transduction of this stress into electricity. The most obvious candidate for this conversion is the well-known piezoelectric effect, and is a well-worn explanation used for both earthquake lights and UFOs. However, the generation of visible light requires more than this simple transduction; piezoelectricity is thus an unlikely mechanism for earth light propagation. The present writers suggest the phenomenon of *triboluminescence* (TLS) as a more likely candidate for the generation of UFO phenomena than piezoelectricity. TLS is the emission of visible radiation due to frictional forces; it is in effect a cold light emission – a visible radiation that is due primarily to some cause other than temperature. TLS produces light by causing electrons to "jump" from higher to lower energy levels by frictional forces. It is probably this mechanism which Brady's core-crushing experiment demonstrated, and which Devereux and McCartney observed in recent research on rocks. And *New Scientist*'s own *Ariadne* has given numerous other examples in recent months (vol 98, p 56)!

Our own experiments have shown that high pressures are quite unnecessary for the generation of a relatively intense light. Devereux and McCartney have also noted that friction-produced light in samples of rock-crystal and granite is undiminished under water and enhanced in an atmosphere enriched with negative ions – to such a degree, in fact, that the merest touching of a crystal will produce a subtle glow. These investigations are continuing.

Why do such effects occur? One starting point is that most minerals are themselves reservoirs of free electrons, a factor upon which two related dating techniques – thermoluminescence and electron spin resonance (ESR) spectroscopy – depend. Where do the electrons come from and how do they remain in the rock? If a mineralogically simple rock such as chert or limestone is selected (both of which are essentially monominerallic) ESR will show a spectrum of energies characteristic of electrons trapped at sites within the mineral lattice.

Over a geological period of time the electrons, which are knocked out of their atomic orbits by natural radiation, will completely fill the available "traps" in the mineral's lattice. A variety of draining mechanisms can discharge this electron population, and one of the ways electrons may manifest themselves on draining is as visible light. It is the contention of the present writers that triboluminescence may well underlie any fruitful discussion of UFOs and earth lights.

This description of triboluminescence implies sporadic and diffuse events which seem unlikely to account for detached and concentrated luminescent phenomena. After all, only something like 10^{20} electron traps exist per gram of substance. However, it may be that shearing and compression triggers a "cooperative" or "cascade" release phenomenon. Enough energy probably exists in the rocks themselves to favour such a process. Cooperative or cascade events are well documented in conventional areas of luminescent chemistry and could account energetically for a wide range of luminescent phenomena.

This earth lights thesis currently exists between science and ufology: as such it is well placed to perform a bridge-building role and is now acquiring substance at a rapid pace. The challenge to science in this area is not to allow prejudice to prevent it from fulfilling its main function – to observe and understand nature. The challenge to ufology is to take much greater notice than hitherto of an approach to UFOs that holds far more promise than dimensional shifts or little green men. □

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Scientists interested in helping the research outlined in this article are invited to contact the authors at TLH, PO Box 13, Welshpool, Powys.