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Microbial Life and Shock Compression - Life or Death?

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Extreme shock compressions represent a threat to organisms that inhabit planetary surfaces such as rocks. For example, a giant impact on a planetary surface can sterilise the surrounding region by passage of the resulting shock wave. Modelling of the limit of the zone of lethality depends on a knowledge of the response of micro-organisms to extreme shock. Similarly high speed ejecta can be launched into space from an impact site and may carry viable micro-organisms if they can survive the shock of the launch. Or potentially a rocky body arriving from space may introduce life to the Earth, provided the putative organisms can survive the shock of the impact (amongst other hazards). The results of a variety of laboratory experiments on shock compression of micro-organisms will be presented and discussed (with some data from the author and some from the literature). Some of the experiments involved firing spore and microbe laden projectiles at speeds of up to 6 or 7 km s⁻¹ into a variety of targets. Other experiments used flying plate techniques to subject layers of spores to extreme shocks. The conclusion is that micro-organisms can survive extreme shock pressures (10's of GPa) in short duration events, albeit with a very small, but measurable, survival rate. These pressures cover the range likely to be found in giant impacts from space for example.