

Interstellar planetary protection

C. S. Cockell

Planetary and Space Sciences Research Institute, Open University, Milton Keynes, MK7 6AA.
UK

In the coming decades the detection of Earth-sized extrasolar planets, either lifeless or exhibiting spectral signatures of life, will undoubtedly encourage design studies for craft to visit these planets. These missions will require the elaboration of an interstellar planetary protection protocol. Assuming that a dose of 18 MRad is required to sterilise a spacecraft, a critical mean velocity exists below which a craft becomes self-sterilizing during the interstellar cruise. Given uncertainties in the surface conditions of a destination extrasolar planet, particularly at microscopic scales, then both lander and orbiter interstellar missions should be completely free of all viable organisms, necessitating a new planetary protection category (VI under existing policies) applied to 'orbiters and landers bound for star systems with unknown local conditions for habitability'. The necessity for complete sterilization is made more acute by the totally unknown potential biochemistries and biologies elsewhere, and the potential inoculation of a lifeless planet that is habitable. These considerations have implications for existing craft on interstellar trajectories such as Pioneer 10, 11 and Voyager 2, and future Solar System missions where an eventual outbound craft may intercept a star system. They suggest that any craft leaving the Solar System whose projected trajectory will intersect with a star system prior to self-sterilization should be completely sterilized prior to launch according to the new interstellar planetary protection category. I explicate other principles of interstellar planetary protection.