Astronomical Sources of Circular Polarization and the Origin of Chirality

Ramon Wolstencroft; Royal Observatory Edinburgh
M. Scarrott; Dept of Physics, University of Durham
D. Stockdale; Dept of Physics, University of Durham
P. Draper; Dept of Physics, University of Durham
S. Bowlzer; Dept of Physics, University of Durham

Asymmetric photolysis of a racemic mixture of chiral molecules by a source of circularly polarized light (CPL) has long been favoured as a likely mechanism for the cause of molecular chirality on Earth. If this process occurs in interstellar space as Bailey *et al.* (*Science* **281**, 672, 1998) argue, then the net chirality induced would have had to survive the journey from a molecular cloud to the surface of the early Earth or any other young planet where life may have tried to develop; and to survive in particular the passage through the atmosphere and the surface impact. The specific proposal of Bailey *et al.* was prompted by their discovery of a high degree of circular polarization in the near infrared (up to 17%) in the Orion molecular cloud: they envisage organic molecules on the surfaces of interstellar grains being selectively dissociated to the benefit of one of the two isomers by CPL in the UV, where the main absorption bands occur. Their conjecture relies on a lengthy extrapolation from the NIR, where they observed the CPL, to the UV. We have very recently carried out imaging circular polarimetry at optical wavelengths in the same region of Orion to test their conjecture and our results will be presented. It is important to note that if the process advocated by Bailey *et al.* does occur, but the process of delivery to the planet racemises the interstellar grains' chiral cargo, then the mechanism of asymmetric photolysis by the daytime sky proposed by Wolstencroft (*IAU Symposium* **112**, 171, 1985) may be a viable option.