LIFE ON THE PLANETS OF RED DWARF STARS – A REASSESSMENT. J.Gale[1] and A. Wandel[2]. The Institute of Life Sciences[1] and the Racach Institute of Physics[2], Safra Campus, The Hebrew University of Jerusalem, 91904, Israel. gale.joe@mail.huji.ac.il[1] amri@mail.huji.ac.il[2]

Within the last two decades the multi-millennial question of the existence of extra-Solar-system planets has been resolved with the discovery of numerous planets orbiting nearby stars and the results of the Kepler mission indicating that Earthlike planets are common. Of particular interest in our search for extra-solar-system life clement conditions are planets orbiting Red Dwarf (RD) stars, the most numerous stellar types in the Milky Way galaxy. Early considerations indicated that conditions on RD planets would be inimical to life, as their Habitable Zones (where liquid water could exist) would be so close as to make planets tidally locked to their star. This was thought to cause an erratic climate and expose life forms to flares of ionizing electro-magnetic radiation and charged particles. Moreover, the less photon energy of the radiation of the relatively cool RDs would not suffice for Oxygenic Photosynthesis (OP). Recent calculations show that these negative factors are less severe than originally estimated. Moreover, it has been suggested that OP may evolve to utilize photons in the 700-1000nm waveband. However, projecting from OP and growth patterns of dry-land plants on Earth, we argue that the evolutionary pressure to do so would be small, as on RD planets there will be continuous illumination, of moderate intensity, containing a significant component of photosynthetic 400-700nm radiation.

On Earth, OP has been an essential factor in producing the Biosphere environment which enabled the appearance and evolution of complex life. We conclude that the conditions for OP could exist on RD planets and consequently the evolution of complex life is possible (always with the caveat of "life as we know it"). Furthermore, the huge number of such planets and the long Main-Sequence lifetime of RDs make OP and consequently complex life probable, and statistically more likely than on planets of solar type stars.