NEARBY ASTROBIOLOGICALLY INTERESTING STARS: A CATALOGUE

Gustavo Frederico Porto de Mello[1], Eduardo Fernandez del Peloso[2], Luan Ghezzi[2]
1 - OV/UFRJ
2 - ON/MCT

The existence of life based on carbon chemistry and water oceans relies upon planetary properties, chiefly climate stability, and stellar properties, such as mass, age, metallicity and Galactic orbits. The latter can be well constrained with present knowledge. We present a detailed, up-to-date compilation of the atmospheric parameters, chemical composition, multiplicity and degree of chromospheric activity for the astrobiologically interesting solar-type stars within 15 parsecs of the Sun. We determined their state of evolution, masses, ages and space velocities, and produced an optimized list of candidates that merit serious scientific consideration by the future space-based interferometry probes aimed at directly detecting Earth-sized extrasolar planets and seeking spectroscopic infrared biomarkers as evidence of photosynthetic life. The initially selected stars are 98 solar-type stars within the total population (excluding some incompleteness for late M–dwarfs) of 499 stars closer than 15 pc. A comprehensive and detailed data compilation for these objects is still lacking: a considerable amount of recent data has so far gone unexplored in this context. We present 33 objects as the nearest biostars, after eliminating multiple stars, young, chromospherically active, hard X–ray emitting stars, stars with short planetary companions, potentially disruptive to orbital stability inside the habitable zone, and low metallicity objects. Nine of these biostars, Zeta Tucanae, Nu Phoenicis, Alpha Mensae, 47 Ursae Majoris (with two giant planets with long periods), Beta Canum Venaticorum, 61 Virginis, 18 Scorpii (the solar twin), HD69830 and HD104304 reproduce well most of the solar properties and are considered premier targets. We show that, approximately, 7% of the nearby stars are optimally interesting targets for exobiology, and that only about 2% have properties truly close to those of the Sun.

ARE WE BEING EARTH-CENTERED WHEN SEARCHING FOR LIFE IN THE COSMIC NEIGHBORHOOD?

Carlos Alexandre Wuensche[1], Cláudia Alencar Santos Lage[2], Amâncio Friaça[3], Sergio Pilling[4], Heloisa M. Boechat-Roberty[5]
1 - INPE
2 - UFRJ
3 - IAG/USP
4 - Laboratório Nacional de Luz Síncrotron - LNLS
5 - Observatório do Valongo

One of the paths to search for life outside Earth has focused on chemical tracking of water and organic primordial molecules in spectroscopic data obtained from natural satellites or planets in our own Solar System (see, e.g., Hua and Ponnamperuma 1985; McKay et al. 1996; Rodgers et al. 2003; Bockelée-Morvan et al. 2005). This approach implies that life should have followed a pattern somehow similar to the one found on Earth. In the very likely case of a negative answer to the above assumption, which is the exact form of life we are searching for? In the present work we pose some questions regarding the general posture of being Earth-centered when searching for life traces in the cosmic neighborhood, discussing the trend to assume life as depending upon a particular function of DNA. We conclude that most of the general assumptions of Earth-centeredness can be relaxed based upon our recalculation of the Galaxy chemical evolution, the abundances of complex biomolecules found in our Galaxy (e.g., PAHs, PAHNs, purines and pyrimidines, in the works of Kuan et al. 2003; Snyder et al. 2005; Hudgins et al. 2005; Pilling et al. 2006), the calculation of possibility of existence of habitable zones for liquid compounds other than water and the existence of biomarkers other than oxygen and ozone.