Review of *Astrobiology and Humanism: Conversations on Science, Philosophy and Theology*, Julian Chela-Flores

This work might be seen as an autobiographical journey of sorts in which the author invites many of his colleagues to join him in the journey. In their journey together they are sharing conversations, as the title indicates. The overarching theme of the conversations is the perennial discussion of the relationship between the natural sciences and the theology of religious belief. Among the natural sciences the concentration is on astrobiology, the study of the origins and evolution of life in the universe. In this regard the treatment of a "second genesis", that life has begun elsewhere than on the earth, is thorough and rigorous. On the one hand some of the author's colleagues hold that the evolutionary pathways that have occurred on the earth have a high probability of occurring on other worlds. Others conjecture that life on the earth is rare, if not unique. Obviously, the challenge is an observational one, namely, to find life elsewhere. The author draws an interesting conclusion (page 45) that Darwin, consistent with what he saw as a certain continuity in the evolutionary process, established a context for considering the possible emergence of spirit from matter without subscribing to a reductionism. While science cannot, of course, deal with spirit, it might very well explore the coherence of the emergence of spirit with the tenants of scientific evolution. This may be one of the key issues in the meeting of "Astrobiology and Humanism," to recall the title of this work. A related issue that is carefully discussed is the much debated one of the extent to which there is convergence in the evolutionary process.

This work serves as an excellent first-hand history of the origins and development of astrobiology, as it engages most, if not all, of the principal scientists involved. It is an excellent source of bibliographical material for anyone who wishes to research this history in more detail.

I note a few minor matters. On page 46 reference is made to Galileo's publication as "The Celestial Messenger." I think that the more correct translation of the original "Sidereus Nuncius" is "The Starry Message." On the same page we read: "He [Galileo] made his own telescope to observe the motion of the satellites of Jupiter." This seems to imply a plan on Galileo's part to observe those satellites, whereas he was actually surprised to discover them. On page 87 change "Sturve" to "Struve". On page 90 change "surficial" to "surface". In the discussion on page

93 about the Kuiper Belt it would have been interesting to have heard why Pluto is now considered to be a dwarf planet.

George V. Coyne, S.J.
McDevitt Chair in Physics, Le Moyne College
Director Emeritus, Vatican Observatory