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CONFERENZA STAMPA DI PRESENTAZIONE DELLA SETTIMANA DI STUDIO SU "ASTROBIOLOGY" (CASINA PIO IV, VATICANO, 6-10 NOVEMBRE 2009)

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Alle ore 11.30 di questa mattina, nell'*Aula Giovanni Paolo II* della Sala Stampa della Santa Sede, ha luogo la Conferenza Stampa a conclusione della Settimana di Studio su "Astrobiology", organizzata dalla Pontificia Accademia delle Scienze e dalla Specola Vaticana (Casina Pio IV, 6-10 novembre 2009).

Intervengono: P. José Funes, S.J., Direttore della Specola Vaticana; il Prof. Jonathan Lunine, Università di Tor Vergata (Roma), Dipartimento di Fisica; il Prof. Chris Impey, The University of Arizona, Department of Astronomy and the Steward Observatory, Tucson (USA); la Dr.ssa Athena Coustenis, Observatoire de Paris-

Meudon, LESIA/CNRS (Francia).

Ne pubblichiamo di seguito gli interventi:

• **INTERVENTO DI P. JOSÉ FUNES, S.J. Why the Vatican is involved in Astrobiology?**

On the occasion of the International Year of Astronomy the Pontifical Academy of Sciences has organized a Study Week on Astrobiology.

This is a quite appropriate topic for the Academy which has a multi-disciplinary membership, since it is a field which combines research in many disciplines, principally: astronomy, cosmology, biology, chemistry, geology and physics. This is not the first time that such a topic is subject of interest in the Vatican. In 2005 the Vatican Observatory conducted a Summer School on this topic and brought together as a faculty some of the most important researchers in this field.

Although Astrobiology is an emerging field, and still a developing subject, the questions of life's origins and of whether life exists elsewhere in the universe are very suitable and deserve serious consideration. These questions offer many philosophical and theological implications, however the meeting will be focused on the scientific perspective.

Among the objectives of the Pontifical Academy of Sciences, the promotion of natural sciences and stimulation of interdisciplinary approach to scientific knowledge are counted; the Study Week on Astrobiology tries to accomplish these goals.

[01630-02.01] [Original text: English]

• **INTERVENTO DEL PROF. JONATHAN LUNINE**

Astrobiology is the study of life's relationship to the rest of the cosmos: its major themes include the origin of life and its precursor materials, the evolution of life on Earth, its future prospects on and off the Earth, and the occurrence of life elsewhere. Behind each of these themes is a multidisciplinary set of questions involving physics, chemistry, biology, geology, astronomy, planetology, and other fields, each of which connects more or less strongly to the central questions of astrobiology. Stimulated by new capabilities for scientific exploration on and off the Earth, astrobiology seems to be establishing itself as a distinct scientific endeavor. The Study Week provides a special opportunity for scientists from different basic disciplines to spend an intensive week understanding how the work in their particular specialty might have an impact on, or be impacted by, that in other areas.

Nowhere is this more evident than in the work being done on how life formed on the Earth and evolved with the changing environment. It is becoming clear that Earth's climate has not been particularly stable over time, and major environmental crises have occurred that are documented in the geologic record. How life has responded to this, and what the implications might be for Earth-like planets around other stars with somewhat different histories, cuts across all the disciplines of astrobiology from astronomy, to planetary and geological sciences, to biology.

[01631-02.01] [Original text: English]

• **INTERVENTO DEL PROF. CHRIS IMPEY**

Four hundred years ago, Galileo Galilei turned his telescope to the heavens and forever changed the way we view ourselves in relation to the universe. In addition to cementing the Copernican revolution with his observations, he showed that the Moon was a geological body like the Earth, with mountains and valleys. Four hundred years later, the study of other worlds has grown to prominence in astronomy. In the past 15 years, technological breakthroughs have led to the discovery of over 400 planets beyond the Solar System. The smallest of these is not much more massive than the Earth. Meanwhile, lab experiments have made progress in tracing the processes by which simple chemical ingredients might have evolved into cells about four billion years

ago, and scientists have discovered life in surprisingly diverse, inhospitable environments on the Earth. It is plausibly estimated that there are hundreds of millions of habitable locations in the Milky Way, which is just one of billions of galaxies in the universe.

As scientists gather to discuss progress in astrobiology, we still only know of one planet with life: our own. But there is a palpable expectation that the universe harbors life and there is hope that the first discovery is only a few years away. This meeting gathers an interdisciplinary set of scholars, whose expertise spans astronomy, planetary science, geology, chemistry, biology, and environmental science. They will present the latest research results and engage in deep discussion on the nature and prospects of life in the universe. If biology is not unique to the Earth, or life elsewhere differs bio-chemically from our version, or we ever make contact with an intelligent species in the vastness of space, the implications for our self-image will be profound. It is appropriate that a meeting on this frontier topic is hosted by the Pontifical Academy of Sciences. The motivations and methodologies might differ, but both science and religion posit life as a special outcome of a vast and mostly inhospitable universe. There is a rich middle ground for dialog between the practitioners of astrobiology and those who seek to understand the meaning of our existence in a biological universe.

[01632-02.01] [Original text: English]

● **INTERVENTO DELLA DR.SSA ATHENA COUSTENIS**The exploration of Outer planets and their systems

The outer giant planets and their systems offer many opportunities from the astrobiological point of view. In Jupiter's system, Europa, a large satellite covered with a fractured icy crust is thought to contain vast amounts of liquid water beneath its surface. Within this ocean might be life, though to find it will require penetrating a crust whose depth will be measured by the Europa Jupiter System mission in the 2020's.

In the Saturnian system, two satellites are of particular interest for astrobiologists: Titan and Enceladus. Titan is a complex world more like the Earth than any other: it has a dense, mostly nitrogen atmosphere with about 2% of methane, and active climate and meteorological cycles where the working fluid, methane, behaves the way that water does on Earth. Titan is therefore very rich in organic molecules, which are formed in the upper atmosphere and then deposited on the surface. Its geology, from lakes and seas to broad river valleys, dunes and mountains, while carved in ice is, in its balance of processes, again most like Earth. Beneath this panoply of Earth-like processes an ice crust floats atop what appears to be a liquid water ocean. The organic deposits, in coming into contact with the liquid water in the underground could possibly undergo an aqueous chemistry that could replicate aspects of life's origins. Enceladus, a smaller moon, ejects large amounts of water and organics in the space from plumes located in its southern pole. The implied requirement for liquid water reservoirs under its surface, significantly broadens the diversity of solar system environments where one might possibly expect conditions suitable for living organisms, and calls for future exploration of the Saturnian system both with orbiting and *in situ* elements.

[01633-02.01] [Original text: English]

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