

Concluding Address

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Before officially concluding this workshop (and it is far beyond my powers to attempt some concluding remarks beyond those already dealt with on the various burning questions presented by Diego Turrini, Janusz Ziółkowski, and René Hudec), I would like to comment on a few highlights coming from our fruitful week of discussions about *Frontier Research in Astrophysics - II*, without any pretension of completeness.

Frontier Research in Astrophysics - II

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[†]A footnote may follow.

1. A few highlights

The composition of the Universe is constantly changing. The Universe began with hydrogen and helium. Through fusion in the stars and explosive supernovae, other heavier elements were created from these two elements. Overtime more and more light elements were turned into heavier elements. In spite of the many results coming from ground- and space-based experiments along with observations of the whole electromagnetic spectrum and the study of charged particles coming from cosmic sources of different natures, we know very little about the Universe: only $\approx 4\%$ of the content of the Universe is known (and not yet very well), while $\approx 96\%$ is till now practically unknown. This is where dark matter and dark energy are supposed to lay, as Giovannelli (2010) indicated with the latin phrase "*Hic Sunt Leones*". Expressed in English, that reads as "*Here the Lions Live*". Figure 1 shows the sketch of the composition of the Universe

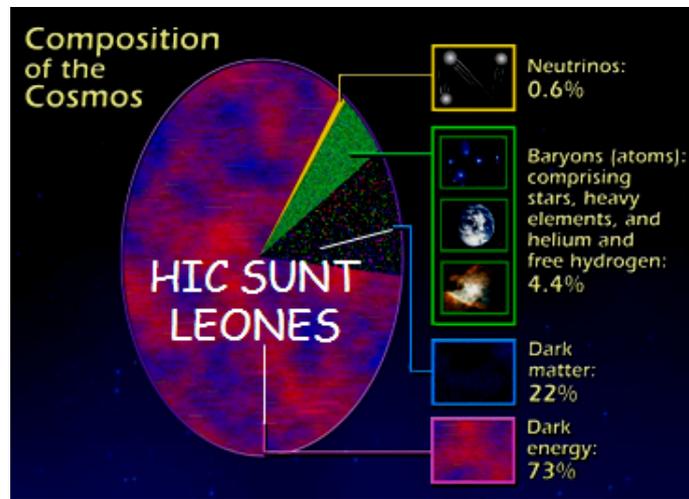


Figure 1: The composition of the Universe as the present knowledge (Giovannelli, 2010, from the image of Anne Feild, STScI).

But the Universe that contains by definition all the matter or all the energy available showed one important event that was possible to be detected on the Earth. This event was a further direct experimental demonstration of the validity of the General Relativity. Indeed, on September 14, 2015 at 09:50:45 UTC the two detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) simultaneously observed a transient gravitational-wave signal. It matches the waveform predicted by general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. The signal was observed with a significance $\geq 5.1\sigma$ (see the talks by Gondek-Rosinska, Stella, and Belczynski, this workshop).

The Higgs boson discovery was announced by the ATLAS and CMS collaborations on 4th July 2012. Evidence for a new particle with the mass of about 125 GeV and the properties of the Standard Model Higgs boson (see the talk by Luci, this workshop). This result, if confirmed, would complete the SM of physics.

The search for Dark Matter at accelerators could contribute to the advance in the knowledge of our Universe (see the talk by Auriemma, this workshop).

But in my opinion, the extraordinary highlights of this workshop has been presented by Bernd Aschenbach. With his recalibration of the Sedov's relation about the age of SNRs, he determined the age of the SNR RX J0852.0-4622 (Vela Jr) as 725 yr, instead of 1714 yr (Aschenbach's talk, this workshop). This fact produces an extraordinary meeting of interests between science and historical events, as follows.

Indeed, in the book "*The writings of Nichiren Daishonin Vol. I, p. 196*" appears the description of the Tatsunokuchi Persecution of Nichiren Daishonin ("the Buddha of the last day of the law"): *Nichiren Daishonin presented to the public authority the "Risho Ankoku Ron" (Establishing the Correct Teaching for peace in the country) three times. It was a strong and clear criticism to the behaviour of authority. For this reason he was persecuted and sentenced to death. In the day of the planned execution, early in the morning, the soldiers stopped and began to mill around in excitement. Shijo Kingo (a beloved Nichiren's disciple), in tears, said: "These are your last moments!", and Nichiren Daishonin replied: "You don't understand! What greater joy could there be? Don't you remember what you have promised?" and started to chant Daimoku (Nam Myoho Rengue Kyo: a mantra that help you to be tuned in with the Universe), and sat down for execution.*

Before the executioner tried to behead Nichiren, a round shining object (as bright as the full Moon) appeared suddenly from the direction of Enoshima. The executioner fell on his face, his eyes blinded. The soldiers were filled with panic. Some ran off into the distance, some jumped down from their horses and huddled on the ground, while others were thrown in saddles.

The execution was stopped. The date was 12th September 1271 (725 yr ago)! The event culminated 10° above the horizon, celestial declination -46° (the position of Vela Jr), $M_v = -12$ (the brightness of the Full Moon); SN Ia has $M_v = -19$ and with Sedov-relation modified, Aschenbach finds the distance of 385 pc, and age of 725 yr!

The research of potential habitable exoplanets has been strongly supported during last two decades. Indeed, this field of astrophysics is now probably the most exciting since the discovery of Earth-like planets could open a serious debate about the possibility of life outside of solar system. For instance, Kepler 438b is the most Earth-like planet ever discovered. It could be home for alien life. The temperature is just right for liquid water to flow. Thanks to the ≥ 4000 confirmed planets by Kepler within its search space of ~ 3000 lyr, 12 of them Earth-size, we can expect in the habitable zone of our Galaxy at least 1200 Earth-size planets. So we can be optimist in thinking about the possibility of finding planets able to harbour alien life.

However, we must wait for scientific confirmation of "alien life" We must wait even more for the discovery of "intelligent life" (Giovannelli & Sabau-Graziati's talk, this workshop). But, the number of planets is growing very fast. Thus, we can reasonably affirm that **the Universe is full of life...** Hoping to avoid to be burned alive, like Giordano Bruno (Nola 1548 – Roma 17th February 1600), burned alive by the Saint Inquisition for his belief (reported in "*De l'infinito, universo e mondi*"), that affirmed the existence of a huge universe full of worlds (planets). He used to say: *Whether we like it or not, we are the cause of ourselves. Being born in this world, we fall into the illusion of the senses: we believe in what appears. We ignore that we are blind and deaf. Then the fear attacks us and we forget that we are divine, we can change the course of events.*

But the conclusions of Giordano Bruno are exactly the same reported in *The Lotus Sutra (the Central text of Mahayana Buddhism)*: it exposes a grand vision of the universe: through the concept of the "major system of worlds", a concept on huge scale that implies both the existence of countless

galaxies and the possibility of sentient life on other planets other than our own. Siddhartha Gautama – Shakyamuni (the sage of Shaka between the VI and V century B.C.) had sensed this wonderful result. This means that great thinkers, independent of the epoch in which they lived, achieve the same good results! (see the talk by Giovannelli & Sabau-Graziati, this workshop).

2. Conclusions

In this workshop, the presence of women has been particularly pleasant and intentional as well as the presence of many young colleagues, some of them still PhD students.

This is the age of the youth. Young people do not depend on anyone or draw strength from others. The courage of young people is unparalleled. They fears nothing. The courage of youth is boundless, is the strength to never give up (Daisaku Ikeda, 2001b).

Probably the most important scientist and artist ever born, Leonardo da Vinci, said *Tristo è lo discepolo che non supera lo maestro suo!*. Expressed in English, that reads as *Grim is the disciple who does not exceed his master!*

During this fruitful workshop, we hope to have demonstrated once more the "*Vulcano Theorem*" enunciated in 1984 in my concluding address of the first historical workshop on *Multifrequency Behaviour of Galactic Accreting Sources*: **It is possible to develop science seriously even if smiling.**

But, as you probably suspected, this workshop has been organized under "*Peaceful Surroundings*". For this reason I want to conclude with a few wonderful words of Dr Daisaku Ikeda (2001a) – president of the Soka Gakkai International (SGI) – reported in the booklet *For Today and Tomorrow* - the thought of 30th May:

"The one who has many friends has greater opportunities for growth. In this way, one both makes society a better place, and lives happier and more satisfied. In all cases, human relations, inter-personal interaction and communication are of vital importance. We must establish and nurture friendship and contacts with many people, both in our environment, and in society in general.

In this manner our life will open up and will flourish".

We could go back to early childhood when we were as the "Little Prince". To quote:

One sees clearly only with the heart. What is essential is invisible to the eye (from *The Little Prince* by Antoine de Saint Exupéry, 1943).

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I hope to meet all of you once again during our next Mondello Workshop.

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