

The Golden Age of Cataclysmic Variables and Related Objects - II Concluding Address

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Abstract

Before to conclude officially this workshop — far from me the idea to attempt some concluding remarks already dealt at the meeting with various burning by Joseph Patterson, Mariko Kato, Dmitry Bisikalo, and René Hudec —, I would like to comment few highlights coming out from our fruitful week of discussions about *The Golden Age of Cataclysmic Variables and Related Objects - II*, without any pretension of completeness.

Keywords: cataclysmic variables and related objects - photonic astrophysics.

Undoubtedly the advent of spacecrafts gave a strong impulse to astronomy; starting roughly from middle 1970ies almost all the electromagnetic spectrum was continuously surveyed by the many space experiments. The cataclysmic variables (CVs) historically were the first systems for triggering the studies of the accretion disk around white dwarfs (WDs) starting from the 1960's with the schools of Warsaw (Poland) and Cambridge (UK). However, they lost rapidly their primeval importance because of the advent of the first X-ray space experiments that, with their limited sensitivity, were mostly detecting X-ray binary systems (XRBs) that showed X-ray emissions abundantly over the thresholds of their detectors. This thanks to the presence of neutron stars or black holes as companions of the optical low-mass or high-mass stars. The X-ray emission of CVs is about 2–3 orders of magnitude lower than that of XRBs. Thus the bulk of CVs observations was coming for long time from optical and UV regions, and sometimes from IR and seldom from radio bands.

In the last decade results coming from the new generation satellites, especially in the hard X-ray and γ -ray regions, renewed the interest of scientific community about CVs. This, together with the new developments in searching for the progenitors of type Ia Supernovae was the main reason for an new explosion of interest about CVs.

During this week of a deep discussion about CVs and related objects, mostly through the physical processes occurring inside those systems, has shown the most powerful way for a better and faster development of our knowledge of the cataclysmic processes, rather usual in the Universe.

Among the many experimental and theoretical results discussed during this workshop, I would like to remark one important old idea developed by Vladimir Lipunov in 1980's, that, in my opinion, will stress the future of CVs physics.

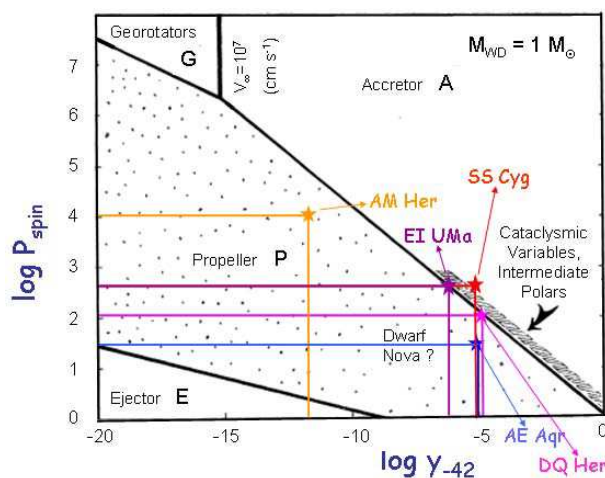


Figure 1: Lipunov's diagram for gravimagnetic rotators calculated for $1 M_{\odot}$ white dwarf. The positions of the polars AM Her and AE Aqr, and the intermediate polars DQ Her, EI UMa, and SS Cyg are marked (after Lipunov, 1987).

This is the physical description of CVs as gravimagnetic rotators (Lipunov, 1982, 1987). In this way the behaviour of CVs is completely determined by the spin period of the WD and the gravimagnetic parameter $y = \dot{M}/\mu^2$, where \dot{M} is the mass accretion rate onto

the gravimagnetic rotator having mass M , and μ is its magnetic moment. This is valid also for all the compact objects, like neutron stars and black holes. In this way, the behavior of CVs is completely independent of the optical phenomena which until now have been those which prevailed in cataloging such systems in different classes. Figure 1 shows a part of Lipunov's diagram where polars (PCVs), intermediate polars (IPCVs) and non-magnetic CVs (NMCVs) are situated.

As discussed by Giovannelli & Sabau-Graziati (this workshop), it appears evident that the most suitable approach for studying CVs from a physical point of view is to consider them as gravimagnetic rotators.

The detection of several SW Sex systems having orbital periods inside the so-called 'period gap' opens a new interesting problem about the continuity in the evolution of CVs. Are the IPCVs and PCVs smoothly connected via the SW Sex-like systems placed just in between? In order to fully understand the emission properties and evolution of CVs, the mass-transfer process needs to be clearly understood, especially magnetic mass transfer, as well as the properties of magnetic viscosity in the accretion discs around compact objects. Consequently, the investigation on the magnetic field intensities in WDs appears crucial in understanding the evolution of CVs systems, by which it is possible to generate classical novae (e.g., Isern et al., 1997) and type-Ia supernovae (e.g., Isern et al., 1993). In those catastrophic processes the production of light and heavy elements, and then the knowledge of their abundances provides strong direct inputs for cosmological models and cosmic ray generation problems.

After this workshop it appears evident, once more, the importance of Multifrequency Astrophysics. However, there are many problems in performing Simultaneous Multifrequency, Multisite, Multiinstrument, Multiplatform and Multienergy measurements due to: i) objective technological difficulties; ii) sharing common scientific objectives; iii) problems of scheduling and budgets; iv) politic management of science.

During this fruitful workshop, we hope to have demonstrated once more the "*Vulcano Theorem*" enunciated in 1984 in my concluding address: **It is possible to develop science seriously even if smiling.**

But, as you probably suspected, this workshop has been organized under "*Peaceful Surroundings*". Therefore, I would like to mention and to support Tolstoy's philosophy.

"Think again", was written by Tolstoy in 1904, at the beginning of the Russian-Japanese war. The human conditions described by Tolstoy in the war are "Like spiders in a glass".

This is a pamphlet that is not only against carnage...:

"Again the suffering that benefits nobody, again the lies, and again the universal process of stupidity, the turning of men into beasts..."

...but that is also against the racism and the hypocrisy of the educated:

"Scholars ... deal extensively with the laws of the migration of peoples, the relationship between the white and the yellow race, between Buddhism and Christianity, and according to their deductions and considerations justify the killing of men ..."

... It shows unequivocally the Tolstoyan base of Gandhi's non-violence doctrine:

"I cannot act in any other way than God requires of me, and therefore, as a man, I cannot take part in any war, neither directly nor through a third party, nor by giving orders, nor by cooperating in any form, nor by encouraging doing it:

I cannot, I will not and I will not do it."

And finally, I would like to conclude with few wonderful words of Dr Daisaku Ikeda (2001) – 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, the 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".

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

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remarks of the workshop.

Finally, on behalf of all participants, I would like to express my warm tanks to the Chef, Mr Daniele Inzerillo, who prepared for us a large number of delicacies.

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

References

- [1] Giovannelli, F., Sabau-Graziati, L.: 2015, this volume.
- [2] Ikeda, D.: 2001, *For Today and Tomorrow* - the thought of 30th May, Edizioni Esperia.
- [3] Isern, J., Hernanz, M., García-Berro, E.: 1993, in *White Dwarfs: Advances in Observation and Theory*, M.A. Barstow (ed.), Kluwer Academic Publ., Dordrecht, Holland, NATO ASI Ser., C403, 139.
- [4] Isern, J., Hernanz, M., Abia, C., José, J.: 1997, in *Frontier Objects in Astrophysics and Particle Physics*, F. Giovannelli & G. Mannocchi (eds.), Italian Physical Society, Editrice Compositori, Bologna, Italy, 57, 113.
- [5] Lipunov, V.M.: 1982, *Ap&SS*, 85, 451-457. [doi:10.1007/BF00653467](https://doi.org/10.1007/BF00653467)
- [6] Lipunov, V.M.: 1987, *Ap&SS*, 132, 1-51. [doi:10.1007/BF00637779](https://doi.org/10.1007/BF00637779)