

An appeal to the Executive Council of IUPAP for its consideration during its meeting in Singapore in November 2014

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Dear Prof. Jarlskog and Members of the Executive Council of IUPAP,

I am writing this letter to you due to my past association with the IUPAP as a member of the Commission C4 (Cosmic Rays) during 2002-8 and as its Chair during 2008-11. I consider it as my responsibility and duty to bring to your notice that the decision to rename the IUPAP Commission C4 by the Executive Council during its meeting in October 2013, on the recommendation of Prof. Johannes Knapp, Chair, C4, has created a storm within the cosmic ray community. I am sure that you must be aware of the same by the number of representations sent to you late last year which were signed by very distinguished and respected members of the cosmic ray community.

I wish to recall that the IUPAP General Assembly during its meeting in November 2011 at London had considered the proposal from the German Physical Society to rename the Commission C4 as Commission on Astroparticle Physics. On being asked to give my reaction as C4 Chair, I had mentioned that the proposal was discussed at the last meeting of the Commission during the 32nd International Cosmic Ray Conference (ICRC) at Beijing in August 2011. There was consensus during the meeting that the proposal should be discussed widely within the broad cosmic ray community and its opinion should be collected and discussed in the Commission before giving any recommendation to the IUPAP. It was clear from the discussion in the Commission that the proposal was very controversial and required careful consideration. Thereafter, the following resolution was approved during the 2011 GA: **Chair of C4 should consult with C4 members and BROAD community in order to bring a recommendation on the action to be taken on this proposal to the late 2012 Executive Council meeting.**

Since the ICRCs are held only once in 2 years, the C4 Chair, Prof. Knapp, raised the issue of "C4 name change" during the inaugural session of the 33rd ICRC held at Rio de Janeiro, Brazil during July 2013. Unfortunately I was not able to attend the ICRC at Rio due to health issues. However, going by the representations sent to you by Prof. Eun-Suk Seo and others, it seems that the issue was raised in a very casual manner and conference participants were invited to convey their views by submitting their choice (support name change from Cosmic Rays to Astroparticle Physics / do not support) to the C4 Chair. No special session was called during the week-long conference to discuss the issue in a broad forum. Importantly, the participants did not believe that this sudden poll would be the only input for recommending the name change to the IUPAP Executive Council. It seems only 150 out of a total of 839 participants in the Rio meeting, gave their opinion; 6 abstained, 90 supported name change and 54 opposed. It really pains me even to think that Prof. Knapp thought this tiny fraction to be representing of the BROAD cosmic ray community and recommend to the IUPAP Executive Council to change the name. But this recommendation did not really surprise me since Prof. Knapp had left the C4 members in no doubt even during our discussion in Beijing in July 2011 that he strongly supported the name change. However, I had hoped that he would set aside his personal opinion when asking for the views of the cosmic ray community and conveying them to the IUPAP.

I do think and very much hope that you and the members of the EC would agree that 90 out of a total of ~ 5000 active members of the cosmic ray community worldwide do not in any way constitute a significant majority. In fact, it does not constitute even a significant minority. Therefore, in my view, the EC has ignored a very important part of the resolution adopted by the GA in November 2011 which asked the C4 Chair to consult the BROAD community before bringing in a recommendation. I feel sad to know that the C4 Chair has expressed his inability to consult the broad cosmic ray community in his communication to Prof. Moskalenko. During my tenure as Chair (2008-11), I had contacted nearly 2500 members of the community several times through e-mail to inform them of various developments, deadlines for paper submission, award nominations, etc. This databank of ~2500 members became available to me, thanks to the list of participants provided by the organizers of various ICRCs (29th ICRC at Tsukuba in 2003, 29th ICRC at Pune in 2005, 30th ICRC at Mexico in 2007 and 31st ICRC at Lodz in 2009). I would have been happy to give this list to Prof. Knapp if he had asked for it in order to communicate with the broad cosmic ray community.

I also want to point out a fact, known very well to most members of the cosmic ray community, that the participation in any ICRC is dominated by cosmic ray researchers working in countries near the location of the specific ICRC. It was therefore expected that the participation in 33rd ICRC in Brazil was dominated by countries in South America. Cosmic ray research in South America received a big push recently by the installation and operation of the very large and impressive Pierre Auger Observatory in Argentina. This observatory aims to give new and exciting information on the energy spectrum and composition of ultra-high energy cosmic rays at energies $> 10^{19}$ eV. Though the observatory is considered by most of cosmic ray researchers as an excellent facility to improve our understanding of ultra-high energy cosmic ray astrophysics, it is also looked upon as an excellent facility to give new and exciting results on particle physics in a new and almost inaccessible energy range in near future through man-made accelerators. In fact, it would not be wrong to claim that this new name "astroparticle physics"

came into fashion only recently with the start of a few large and very promising experiments such as Auger Observatory, IceCube at Antarctica, etc. I may also mention that the present C4 Chair is a very active and productive member of the Auger Observatory. Based on my experience of attending 20 ICRCs from 1971 to 2011, I was not surprised that there were more younger researchers present at the ICRC in Brazil who consider themselves “astroparticle physicists” and not “cosmic ray physicists”, due to their limited exposure to the rather broad topics covered under cosmic rays. Most of us, older members of the community, feel that the results of the limited poll carried out by the C4 Chair at the Rio meeting would have been totally different if a similar poll was conducted elsewhere, say, at the ICRC at Salt Lake City in 1999 or at the ICRC at Tsukuba in 2003.

In summary, I hope, you would agree with the conclusion drawn by many of us in the cosmic ray community that (i) the C4 Chair has not obtained the views of the BROAD cosmic ray community, (ii) the recommendation by C4 Chair to rename C4 has been given on the basis of the views of a tiny minority of the cosmic ray community and (iii) the decision taken by the IUPAP Executive Council based on this recommendation of C4 Chair violates the spirit of Resolution 5 of the IUPAP General Assembly of November 2011. In view of the above, I humbly and very respectfully request you to put in abeyance the decision taken by the Executive Council in October 2013 to rename the Commission C4 as Commission on Astroparticle Physics for a few years and restore the old name, namely, Commission on Cosmic Rays.

In my humble opinion, a new survey should be conducted by a competent and impartial team of eminent and widely respected physicists, working in the area of cosmic rays in the heliosphere, production, acceleration and propagation of cosmic rays in the galaxy, high energy interactions and non-accelerator particle physics including direct and indirect search for dark matter and other exotic particles and phenomena, to seek the opinion of the BROAD cosmic ray community on the proposal to rename C4. For example, the team may consist of a few of very prominent and well-known former C4 Chairs, Prof. Arnold Wolfendale (University of Durham, UK), Prof. Thomas Gaisser (University of Delaware, USA), Prof. Peter Wentzel (ESTEC, The Netherlands), Prof. Harm Moraal (University of Potchefstroom, South Africa) and others. In addition, the proposal to change the name should be discussed in a broader forum at the coming ICRC in The Hague next year.

I would also like to take this opportunity to mention a few more issues which are very relevant to the topic discussed here. In my view, the opinions of even the majority of participants in an ICRC should not be taken as the view of the broad cosmic ray community. I have seen from my experience of attending 20 of the 21 ICRCs during 1971-2011, that each ICRC has representation which is very specific to the area where the conference is being held. For example, a particular ICRC may have more participants who are working in the area of cosmic rays in the heliosphere while another ICRC may have more participants working in the area of ultra high energy cosmic rays. Expectedly, their views would be significantly different on the issue of changing the name of C4 from “Cosmic Rays” to “Astroparticle Physics”. Therefore, it is suggested that a survey of the community is likely to be unrepresentative of the broad community if it is restricted to participants in a specific ICRC. Therefore it would not be proper for the IUPAP Executive Council to be swayed by the results obtained from the survey of the participants at the 33rd ICRC at Rio de Janeiro in July 2013 even if it was based on a much larger

number of participants, which unfortunately it was not. Only 90 out of 750 participants expressed the opinion that the name of C4 should be changed to Commission on Astroparticle Physics.

During his beautiful presentation of his recommendation in favor of the 'name change, C4 Chair, Prof. Knapp has correctly mentioned that the name 'cosmic rays' was suitable till recently since we were dealing mainly with 'charged particles from space'. He mentions that the name 'cosmic rays' is not appropriate any more since it covers only a part of the research area in C4 (cosmic rays, gamma rays, solar and heliospheric physics, neutrino and dark matter). Surprising indeed! We have been studying cosmic gamma rays since early 1970's and all of us were quite happy to include them in cosmic rays since it was generally agreed that gamma rays of GeV and higher energies could not be produced in space without having much more energetic particles (cosmic rays) accelerated somewhere in space. It is indeed strange to mention solar and heliospheric physics without mentioning the dominant role of charged particles produced by the Sun (solar cosmic rays) and their propagation in the heliosphere. Similar is the case of neutrinos which have been studied since 1960's as part of cosmic rays as high energy neutrinos also cannot be produced without interactions of energetic charged particles (cosmic rays) somewhere in astrophysical setting.

Cosmic ray physicists realized very early that they need good understanding of high energy particle interactions (particle physics) to understand the production of energetic particles (including gamma rays and neutrinos) in astrophysical sources and their propagation in space and also to study them through their interaction in atmosphere and detectors on satellites, balloon platforms, ground or deep underground. In the process, some startling discoveries have been made by cosmic ray physicists in the area of particle physics, like neutrino oscillations, increase in particle cross-sections with increasing energy, etc. 'Exciting discoveries' in particle physics were also claimed in cosmic ray experiments, such as observations of quarks and monopoles which turned out to be false alarms and detector effects. All these studies in particle physics were labelled by cosmic ray physicists as well as by particle physicists as 'non-accelerator particle physics' and nobody asked for a name change of C4 from 'cosmic rays' to 'non-accelerator particle physics'. Even today groups trying to study ultra-high energy neutrinos, for example, using IceCube, call themselves as 'particle astrophysicists' and not astroparticle physicists, for very understandable reasons.

In fact, as far as I remember, the ICRCs used to have one or more sessions on 'search for exotic particles and phenomena'. I believe that same spirit should continue with exciting searches for dark matter particles without changing the name of C4. It is a fact that many members of C4 as well as C11 (Particles and Fields) and C19 (Astrophysics) are deeply involved in searches for dark matter. While members of C11 are also involved in 'direct' detection, members of C4 and C19 are involved mainly in 'indirect' detection. Therefore, it is nice to organize sessions in ICRC focused on 'dark matter' as it is to organize sessions on 'Astroparticle Physics' in ICHEP, bi-annual meetings organized by C11. While studies on dark matter and its indirect detection in astrophysical studies is a very interesting and exciting subject for some of our colleagues in the cosmic ray community, it is not a sufficient and justifiable reason to change the name of C4 to 'Astroparticle Physics'.

It is a matter of record that less than 10% of the papers presented at the 32nd (Beijing) and 33rd (Rio de Janeiro) ICRCs were connected with ‘astroparticle physics’, remaining being concerned with the traditional subjects of solar cosmic rays, acceleration and propagation of cosmic rays, elemental and isotopic composition of cosmic rays, energy spectrum and composition of TeV-PeV-EeV cosmic rays through studies on extensive air showers, studies on astrophysical sources of energetic cosmic rays through observations of GeV-TeV-PeV gamma rays and neutrinos, etc. This conclusion is based on a detailed study of the papers presented at these two IUPAP supported conferences whose results are summarized below in the appendices A and B.

I would be deeply grateful to you and all the members of the Executive Council for taking some time to read the note and for giving it due consideration.

With warm regards.

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Appendix A: Topics covered by contributed papers presented at 32nd ICRC (Beijing, 2011) ICRC 2011 (Beijing) Proceedings

Vol. 1: Extensive air showers and high energy cosmic rays, observations and simulations at energies $< 10^{16}$ eV and at energies $10^{16} - 10^{18}$ eV (77 papers). Of these 77 papers, only 3 papers (0225, 0740 and 1251) discussed matters related to antiprotons in cosmic rays, which may be considered related to “astroparticle physics”

Vol. 2: Observations and simulations at energies $> 10^{18}$ eV (79 papers). Of these 79 papers, only one paper (1170) tried to relate to “astroparticle physics”

Rest of the papers (152 out of 156) dealt with standard “cosmic ray physics”, namely, production, acceleration and propagation of high energy cosmic rays in intergalactic and interstellar space, energy spectrum and composition and nature of cosmic ray sources

Vol 3: New experiments and instrumentation (88 papers); only one (1335) dealt with “astroparticle physics”

Vol 4: Muons Experiments (13 papers); Only 3 (0510, 0890 and 1054) papers are barely related to “astroparticle physics”

Solar, atmospheric and related neutrino experiments (11 papers); 5 were related to “astroparticle physics”

Neutrino telescopes and neutrino astronomy (50 papers); only 1 (0701) was related to “astroparticle physics” while others considered astrophysical aspects of neutrinos

Theory and calculations (8 papers); None were related to “astroparticle physics”

Muons and neutrino tomography (2 papers)

New experiments and instrumentation (11 papers)

Vol. 5: Hadronic interactions (accel. and cosmic ray experiments) (19 Papers)

Proton decay and new phenomena: experiments and theory (1 paper)

Exotic particle searches; experiments and theory (13 papers)

Dark matter searches (19 papers)

Cosmology (6 papers)

New experiments and instrumentation (9 papers)

Vol. 6: Direct measurements of primary cosmic rays with balloons and satellites (30 papers)

Cosmic ray sources and composition (26 papers)

Cosmic ray propagation (19 papers)

Acceleration of cosmic rays (8 papers)

New experiments and instrumentation (24 papers)

Vol. 7: Diffuse emission (12 papers)

Galactic sources (57 papers)

Vol. 8: Extragalactic sources (52 papers); paper (0881) relates to quantum gravity and

Paper (0883) discusses Lorentz invariance

Extragalactic sources (gamma ray bursts) (16 papers)

Vol. 9: New experiments and instrumentation (69 papers)

Vol.10: Sun and Solar emissions; energetic photons, neutrons and atoms (4 papers)

Energetic charged particles (10 papers)

Particle acceleration on/near the Sun (12 papers)

Solar flares and coronal mass ejections (13 papers)

Ground level enhancements (5 papers)

New experiments and instrumentation (6 papers)

Interplanetary transport of Solar energetic particles (9 papers)

Propagating interaction regions and shocks (2 papers)

Co-rotating interaction regions and shocks (1 paper)

General acceleration and transport phenomena (7 papers)

Forbush decreases and other CME related phenomena (15 papers)

Vol.11: Origin and acceleration of anomalous cosmic rays (2 papers)

Transport of GCR and ACR and their modulation (21 papers)

Gradients, anisotropies, en.spectra, composition and charge states (11 papers)
Short-term and long-terms variations and interpretations (29 papers)
Solar minima and maxima (6 papers)
New experiments and instrumentation (7 papers)
Space weather (9 papers)
Terrestrial effects (28 papers)
Cosmogenic nuclides (5 papers)
Effects on planets, moons and space missions (3 papers)
New experiments and instrumentation (7 papers)

Summary: Of a total of 933 papers available in the proceedings, only 55 papers refer to topics directly or indirectly related to “astroparticle physics”. Note that 19 papers in Vol 5 related to cosmic ray or accelerator studies of high energy particle interactions are integral part of cosmic ray studies since a good knowledge of particle interactions, learnt from cosmic ray and accelerator experiments is essential input in simulations of most of the cosmic ray observations.

Appendix B: ICRC 2013 (Rio de Janeiro) Proceedings (papers in the proceedings have not been sorted in volumes or topic wise and have not been numbered)

Extensive air showers, cosmic ray energy spectrum, composition (103 papers)
Neutrino physics, astronomy and astrophysics (81 papers)
Cosmic ray isotopic and elemental composition, energy spectra,
Propagation, etc. (123 papers)
Solar cosmic rays and energetic particles in the heliosphere (131)
Gamma ray astronomy and gamma ray astrophysics (225 papers)
Ultra-high energy cosmic ray physics and astrophysics (175 papers)
LHC results (7 papers)
General topics including special detectors (60 papers)

Astroparticle physics (35 papers) (Lorentz invariance 3, Axio search 1, Wimp search 4, BSM 2
Gravitational wave 2, Primordial black holes 3, Magnetic monopole 2, Neutrino
oscillations 5, Strange quark matter 3, Q-balls 1, Solar neutroinos 1, Tau neutrinos 1)
Dark matter searches and detectors (29 papers)

Summary: Of a total of 952 papers in the online proceedings (excluding highlight and rapporteur papers), only 64 papers may be considered related directly or indirectly to “astroparticle physics”, remaining 888 papers (93% of the total) are related to various streams of cosmic ray physics and astrophysics.