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The Nature of Light: What are Photons? V

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Introduction

First, we must thank our committee members and all the authors for their time and effort to make this fifth biennial conference a great success. It is the active efforts of many members in seeking out new valuable contributors, which is adding further quality and the recognition of this "special" conference through its sustained growth. Of course, we must also thank all the SPIE staff, whose tireless professional services are of critical importance: for getting everything done correctly and on time, in spite of the constant pulls by innumerable authors and chairs, demanding innumerable actions "immediately!"

Before highlighting this year's conference (Section-3); let us briefly present the plan for our sixth biennial conference to be held in August of 2015, at San Diego. The year 2015 has also been declared as the celebration of "Year of Light" by the Executive Board of UNESCO [http://www.prweb.com/releases/2012/10/prweb10054327.htm]. We welcome this declaration and we will play our part by promoting a deeper understanding of the nature of light that overcomes the philosophical and cultural prejudices that are holding back enlightened thinking and consequent progress in physics and the society, at large. Those who are interested in developing web-based dialogues with their colleagues and highlight their own epistemology; are welcomed to utilize the website: http://www.natureoflight.org/. Here, the video of Prof. Carver Mead's talk, given at our fifth biennial conference, can be viewed.

1. Call for the sixth biennial conference

While we have stayed on course with the ontological question "*What are photons?*" we are actively soliciting participation from all major fields of physics (classical optics, quantum optics, relativity, cosmology, etc.) from the standpoint of foundational thinking. The two worlds of electromagnetism and material particles are inseparably intertwined: This is quite obvious from the electron-positron pair production out of gamma rays and production of gamma rays from electron-positron collision. The expression wave-particle-duality and the related debate started some 400 years ago with Newton and Huygens; when this expression was understood as lack of our understanding and required raising deeper questions. Instead, over the last hundred years, our prevailing scientific culture succeeded in elevating this lack of knowledge as a new knowledge! That is why the importance of this conference forum is timely and is growing and thriving.

The significance of this forum also derives from historic pragmatic reality. Optical science and engineering have been providing us with the key enabling tools (both incisive thinking and precision measuring instruments) in advancing broader science and technologies since ancient times. ***For this next conference, we would like to explicitly call out for submissions in the broad domains of frequency and***

time, concepts and measurements. The importance of explicitly calling out this sub-field could be valuable in the experimental world since we measure frequency, not the running time.

2. Brief history behind this conference series.

This "special" conference started on the opportune year of 2005 when the whole world was celebrating the centennial celebration of the "Einstein's Miracle Year"! We have just finished the fifth biennial conference and have started planning for the sixth biennial conference to be held during August of 2015; All of you and your very welcomed to participate. Please, start soliciting your colleagues to join us in 2015. In this year of 2013, we have had 64 accepted papers and we are publishing 52. Ten of the accepted papers could not be published so we can adhere to in-person presentation requirement of SPIE. The main issue was due mostly to visa problems and a few of them were due to last-minute withdrawals for various personal reasons. In 2011, we published 56 out of 63 accepted papers. In 2009, we published 31 papers. In 2007, we published 31 papers. In 2005, we published 34 papers. From the sustained improvements in the quality and the quantity of papers indicate that we definitely are serving an important need for our scientific and engineering community. Basic science and engineering are inseparable.

3. Brief summary of the content in this volume.

The readers will find the papers in this volume grouped according the following topics, which were used to broadly categorize various submitted papers:

Session 1: Experiments and Optical Technologies
Session 2: Interaction/Non-interaction of Waves
Session 3, 4, 5: Photon and Photon Models I, II & III
Session 6: Relativity, Space, and Properties
Session 7: Foundational Thinking
Technical Event: The Nature of Light: What are Photons
Session 8, 9, 10: Foundation: QM and Physics I, II, III.
Session 11, 12: EPR, Bell, Duality, and Entanglement I, II.
Workshop and Discussion: on The Nature of Light: What are Photons?

This year, our traditional effort behind the discussion and debate at the end of the meeting was not well organized: We apologize for that. We will do better in 2015. You are welcome to promote topics for such discussions.

One of the major highlights of this fifth biennial conference was the Keynote Speech by famous Caltech Professor, Carver Mead, who is a winner of US Presidential Medal of Science. Mead is most well known as the father of VLSI, which is behind the rapid growth of computer and information technologies by virtue of steady miniaturization of computer chips (doubling of the transistor density in every two years). Mead's path breaking out-of-box scientific thinking can be appreciated from his book, *Collective Electrodynamics*. The summary of

Mead's excellent talk on his views, about the current physics thinking and the nature of photons, has been designated in this volume as 883202 (8832-100).

For all those who are looking for a rational approach to understand EM waves, beyond antiquated "light quanta," will find this volume a "breath of fresh air"– not because we have solved all the problems but because it provides us with a wide variety of novel and yet logical approaches to understand what photons and particles could be. Some of the papers describe both photons and particles as harmonics oscillations, which eliminate the need for wave-particle duality. It comes out loud and clear through another set of papers that photoelectron counting statistics do not establish photons as "indivisible quanta," especially since electrons are discrete particles, and they are always bound to atoms and materials with discrete energy levels, which must be stimulated as dipoles with resonant optical frequencies. Other papers underscore that careful analysis of EPRB experiments does not validate that QM is the final/complete theory of the micro universe. A few other papers lead us to appreciate that there is not a gulf of difference between quantum mechanics (mathematics) and classical mechanics (mathematics), as has previously been made out by the Copenhagen Interpretation of QM. After all, classical biological bodies are continuously functioning and evolving by virtue of quantum mechanical interactions between biological molecules. Some papers underscore that one of the root problem behind the emergence of non-causality in physics is not due to inherent property of nature; but because we use the non-causal Fourier Theorem as a key mathematical tool. First, Fourier modes, existing over all space and time, violate conservation of energy. Second, propagating waves, in the linear domain, do not sum themselves to reorganize their energy distribution in the absence of interacting materials (dipoles). Others have presented the argument that the Uncertainty Principle is really not a principle of nature; it is rather an outcome of our mathematical logics like the Fourier Theorem. Several papers also challenge the fundamental hypotheses behind Relativity and Gravitation. One paper draws our attention that even the historical origin and the physical meanings of the various fundamental constants require serious review. Another paper underscores that Doppler effects for material based waves and EM waves are not different; which has profound implications in understanding the physical processes behind measured Hubble red shifts.

The foundation of the edifice of physics has not been finalized. Our future generations have plenty to investigate and discover. Let us create the right platform so their enquiring minds can keep on flourishing!

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