

CONTRIBUTIONS TO THE INVESTIGATIONS OF CLASSICAL OPTICS–BALLISTIC ELECTRONS ANALOGIES

Daniela DRAGOMAN¹

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It is with emotion and gratitude to those who made this moment possible that I deliver this traditional reception speech. It was quite difficult for me to choose the topic of this speech since during my scientific activity I investigated a quite wide range of domains of interest, which include: (i) phase space studies of optics and quantum physics, regarding especially the evolution of light beams and quantum wavefunctions, as well as the development of a phase space formalism of quantum mechanics, (ii) modeling of ballistic nanostructures and extending their applications in nanoelectronics, reversible logic, high-frequency devices, etc., (iii) quantum–classical analogies, encompassing classical optics–ballistic electrons analogies and classical–quantum optics analogies, and, not least, (iv) nanophotonics, in particular plasmonics, metasurfaces and optical vortices. After some consideration, finally I have decided to present in front of you some contributions to the subject of classical optics–ballistic electrons analogies.

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1. Introduction

The subject of this reception speech is one of the most interesting research topics that I dealt with, at the same productive from the point of view of the results obtained and still of relevance, namely the analogies between classical optics and ballistic electrons, which propagate coherently and are described by the same quantum wavefunction. After a short introduction in the topic, I will focus on some personal contributions to the development of this subject.

At a first glance, to emphasize analogies between domains of physics that are so different can be surprising. Indeed, ballistic electrons, i.e., those that do not suffer

¹Prof., PhD, Faculty of Physics, University of Bucharest, full member of the Academy of Romanian Scientists, (e-mail: daniela@solid.fizica.unibuc.ro).