

Coherent phenomena in optics and light-matter interaction

A topical issue in memory of Federico Casagrande

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This issue collects research articles and tutorials written by many colleagues and friends of Federico Casagrande to remember his enthusiasm and creativity in teaching and research. He provided important scientific contributions to the description of the dynamics of nonlinear optical systems such as, for example, optical bistability, the laser with saturable absorber, and the free electron laser. He obtained substantial results in his investigations on phenomena that arise from quantum fluctuations, in particular the first theoretical prediction of photon antibunching in optical bistability, and, in the last decade, the elucidation of special effects in the micromaser and the proposal of new schemes for entanglement transfer and storage.

The issue consists of three tutorials and eleven research papers, closely related to the scientific activity of Federico, and to his collaborations with the contributing authors. Quite naturally this collection realizes a topical issue on “Coherent phenomena in optics and light–matter interaction”, a lively field of research that has attracted the interest of the scientific community for at least the last four decades, and is broad enough to embrace most of Federico’s activity.

At the same time, the special issue is dedicated to recent developments in this area. It presents a selection of examples where coherence of classical or quantum origin, together with fluctuations, gives rise to several phenomena of fundamental interest and of relevance for applications. The examples range from coherence phenomena in condensate or optical systems, to entanglement in light and matter, and to quantum patterns in nonlinear optics.

None of these pages can substitute an afternoon with Federico and his kindness and sympathy. Nevertheless, we believe that he would have appreciated this collection of papers and tutorials, and we hope it could be a useful tool for researchers and students interested in coherent phenomena. We hope that this special issue will also be of interest for the distinguished audience of EPJ ST, fostering and stimulating further collaborations and fruitful scientific exchange between and beyond the presented fields. It would be the best way to celebrate the memory of Federico Casagrande, his enthusiasm, curiosity and patience.

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