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Autore	Gonçalves Paulo André Dias
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Outlook -- Appendices.

Sommario/riassunto

This thesis presents a comprehensive theoretical description of classical and quantum aspects of plasmonics in three and two dimensions, and also in transdimensional systems containing elements with different dimensionalities. It focuses on the theoretical understanding of the salient features of plasmons in nanosystems as well as on the multifaceted aspects of plasmon-enhanced light–matter interactions at the nanometer scale. Special emphasis is given to the modeling of nonclassical behavior across the transition regime bridging the classical and the quantum domains. The research presented in this dissertation provides useful tools for understanding surface plasmons in various two- and three-dimensional nanostructures, as well as quantum mechanical effects in their response and their joint impact on light–matter interactions at the extreme nanoscale. These contributions constitute novel and solid advancements in the research field of plasmonics and nanophotonics that will help guide future experimental investigations in the blossoming field of nanophotonics, and also facilitate the design of the next generation of truly nanoscale nanophotonic devices. . .