Dielectric media appear to light as changes in the geometry of space. This analogy between media and geometries has been fruitful in the development of transformation optics where concepts from General Relativity inspired ideas for novel applications such as invisibility cloaking. The lecture explores whether and how ideas from quantum optics can, in turn, help understanding some problems in astrophysics and cosmology. In particular, it discusses (1) ideas and experiments for probing the quantum physics of the event horizon and (2) a problem in the theory of Casimir forces that may be related to the riddle of dark energy.