



**Faculty of Natural Sciences
Jamia Millia Islamia
New Delhi**

National Science Day Lecture

Photonic Crystal Structures, Fabrication through multi-beam interference & Applications

by

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Abstract: Nanophotonics deals with light-matter interactions that occur at subwavelength dimensions. Physical or structural nature of many nanostructured materials can control these interactions. Many applications of nano-photonic structures, and large scale realization of photonic devices demand a cost-effective, high spatial resolution, accurate and easy pattern transfer method to fabricate such structures in 1D, 2D and 3D over large area. There are many methods for fabrication of nano-photonic structures which include e-beam lithography, direct laser writing and holographic or interference lithography. Interference lithography (IL) based method is very cost effective where, fast and large area patterning is possible. We investigate a reconfigurable and scalable phase controlled interference lithography approach leading to fabrication of simple as well as complex photonic structures with submicrometer periodic features, in a single step over large area. Fabrications of various photonic structures have been achieved with potential for many applications such as, photonic circuits, photonic devices, light extraction, optical tweezers, biosensors, nanoscopy, metamaterials etc..



Dr. Joby Joseph is Professor in the Department of Physics, IIT Delhi, where he has been a teaching faculty since 1996. He holds Ph.D degree (1992) in Physics and M.Tech. degree (1988) in Applied Optics from IIT Delhi. He worked as Senior Optical Engineer at Aprilis Inc., Maynard, MA, USA from Dec. 2002 to Dec. 2003, towards the development of an ultra-high density holographic digital data storage device. He has carried out post-doctoral research at Kobe University, Japan from April 1993 to June 1995 and Univ. of Massachusetts, Boston, USA from June 1995 to July 1996.

His research interests are: Optics and Photonics covering optical processing using photorefractive, biological and polymer materials, Fourier Optics, holographic data storage, optical pattern recognition, digital holography, optical data security, holographic lithography for photonic crystal fabrication & nano-photonics.

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