

## **Dr. Prem Kumar – Short Biographical Sketch**

Prem Kumar is Professor of Information Technology in the Robert R. McCormick School of Engineering and Applied Science at Northwestern University. His primary research focus is on photonic devices and their applications utilizing the principles of nonlinear and quantum optics (>\$25M cumulative research funding). In particular: generation, distribution, and ultrafast processing of photonic entanglement for applications in quantum information networks; novel quantum light states for precision measurements, imaging, and sensing; and novel optical amplifiers and devices for networked classical optical communications. Although Dr. Kumar's primary appointment is in the Department of Electrical Engineering and Computer Science, a courtesy appointment in the Department of Physics and Astronomy allows him to recruit students from both disciplines into his research group, a privilege that has proven extremely beneficial for his research interests that lie at the interface of basic quantum science and applied information technology. Because of this interdisciplinary exposure, Ph.D. graduates from his research group (34 completed & 2 in progress) have gone on to build careers in academia, industry, and US national labs. His group has cumulatively published >500 research papers (h-index: 54), including 1 edited book, 2 book chapters, 6 patents, >200 journal papers, 45 articles in hard-bound volumes, and 300 conference papers with >90 invited. From Feb'13 to Jan'17, Dr. Kumar was on leave from Northwestern to be at DARPA, where he served as a Program Manager in the Defense Sciences Office. At DARPA, Dr. Kumar created and managed a ~\$20M/year portfolio of programs in basic and applied sciences, targeting a diverse range of topics that included neuro science and engineering, ultrafast laser science and technology, precision navigation and timing, stand-off chem-bio defense, quantum effects in biological environments, and quantum information science and technology. He was also program manager for the Defense Science Study Group, which allowed him to interact with young academic faculty from universities all across the US in various national defense settings. For his strong portfolio of programs in basic science and technology and his mentoring of DARPA Risers—young, noteworthy performers on DARPA programs—Dr. Kumar was selected Program Manager of the Year in 2015 and awarded the Secretary of Defense Medal for Outstanding Public Service in 2016. Prior to joining DARPA, Dr. Kumar served on the National Academies Committee that issued the 2012 landmark study: “Optics and Photonics: Essential Technologies for Our Nation,” which spawned the National Photonics Initiative. Dr. Kumar is a Fellow of the OSA, APS, IEEE, IoP (U.K.), AAAS, and SPIE. He has been a Distinguished Lecturer for the IEEE Photonics Society, Hermann A. Haus Lecturer at MIT, recipient of the Quantum Communication Award from Tamagawa University in Tokyo, Japan, and the Walder Research Excellence Award from the Provost's office at Northwestern University.

## Curriculum Vitae – Prem Kumar

**Education**      Ph.D. (1980)    Physics, State University of New York at Buffalo, NY  
M.Sc. (1976)    Physics, Indian Institute of Technology, Kanpur, India  
B.Sc. (1974)    Physics, University of Delhi, Delhi, India

### Employment

2013–2017      Program Manager, DARPA/DSO (on leave from Northwestern University)  
2005–2008      Head, Solid State and Photonics Division, Department of Electrical Engineering and Computer Science (EECS), Northwestern University, Evanston, IL 60208-3118  
2003–2017      AT&T (SBC) Professor of Information Technology, EECS Dept., Northwestern Univ.  
2002–            Professor, Department of Physics and Astronomy, Northwestern University  
2000–            Director, Center for Photonic Communication and Computing, Northwestern University  
1994–2005      Leader, Photonic Systems and Technology Group, ECE Dept., Northwestern University  
1986–            Assoc. Prof. / Professor, EECS/ECE Department, Northwestern University, Evanston, IL

### Other Work Experience

1985–1986      Staff Scientist, Lincoln Laboratory, Massachusetts Institute of Technology  
1983–1985      (spring terms) Lecturer, Electrical Engineering and Computer Science, MIT  
1981–1986      Research Scientist, Research Laboratory of Electronics, MIT  
1980–1981      Research Scientist, Center for Laser Studies, University of Southern California

### Entrepreneurial Experience

2003–Jan'13    Founder and Managing Partner, NuCrypt LLC, Evanston, IL  
2002–2004      Member of Technical Advisory Board, Baird Venture Partners, Chicago, IL  
2000–2003      Technical Advisor, Santel Networks, Newark, CA

### Awards and Fellowships

Secretary of Defense Medal for Outstanding Public Service, US Department of Defense, 2016; Program Manager of the Year, DARPA, 2015; Hermann A. Haus Lecturer, RLE at MIT, 2013; Fellow, SPIE 2010; Distinguished Lecturer, IEEE Photonics Society 2008–2010; Fellow, AAAS 2009; Walder Research Excellence Award, Northwestern University, 2006; International Quantum Communications Award, Tamagawa University, Japan, 2004; Fellow, IEEE 2003; Fellow, Institute of Physics (U.K.) 2002; Fellow, APS 2000; Fellow, OSA 1996.

**Research Interests** (supervised 32 Ph.D. theses and about as many post-docs; >\$25M research funding)

Photonic devices and applications utilizing the principles of nonlinear and quantum optics: generation, distribution, and ultrafast processing of quantum entanglement; novel optical amplifiers and devices for networked communications; novel quantum light states for precision measurements, imaging and sensing

**Publications** (h-index: 52, over 14,000 cumulative citations)

Cumulative over 500 papers, including 1 edited book, 2 book chapter, 6 patents, over 200 peer-reviewed journal papers, 45 articles in hard-bound volumes, and 300 conference papers with over 90 invited papers.

### Teaching Activities

Basic electrical engineering and advanced photonics and quantum electronics courses at Northwestern; short courses on quantum parametric amplifiers and quantum information technologies at conferences.

### Recent Synergistic Professional Activities

QSE-TARP, OSD(R&E) 2015–present; Centennial Editor, JOSA-B, 2016; OSTP Fast-Track Action Committee on Optics & Photonics, 2013; Optics & Photonics Study Panel, the National Academies, 2011–2012; Active in OSA, IEEE, APS, SPIE, AAAS in various roles: OSA Long-Term Planning Group, 2008–14; General (Program) Chair, QELS'2008 (2006); Topic Chair, 2008 IEEE/LEOS Winter Topicals; Science and Engineering Council, OSA, 2003–06; Program Committee, Optical Fiber Communications Conference, 2003–05; Organizing Committee, Int'l Conf. on Quantum Communication, Measurement, and Computing (QCMC) (Tsukuba City, 2006; Cambridge, 2002; Evanston, 1998, Principal Organizer); Vice Chair/Chair of Steering Committee for QCMC, 2008–2012; Associate Editor, Optics Letters, 1992–95.