Editorial of special issue on quantum imaging

Quantum detection technology and quantum imaging based on two-photon interference effects, along with various new conceptual imaging schemes inspired by the two-photon interference quantum imaging, have significantly redefined the sight and content of imaging technology. This has rejuvenated the ancient discipline of imaging science, transforming it into a burgeoning field at the intersection of statistical and quantum optics, information science, applied mathematics, artificial intelligence, computer vision, light field manipulation technology, and compressive sensing technology. These advancements provide practical and innovative technological approaches to greatly enhance the capability and efficiency of image information acquisition in various application scenarios.

Profs. Ling-An Wu and Kaige Wang are esteemed pioneers in the field of quantum information technology in China, especially recognized for their seminal contributions to the domain of quantum imaging and its practical applications. Through their mentorship, they have cultivated a significant number of skilled professionals who are now at the forefront of China’s quantum imaging research endeavors. Despite their advancing age, their unwavering commitment to the scientific pursuit and their profound love for the discipline have served as an inspiration to numerous young talents, and they have motivated many young Chinese scientists to delve into the intricate and rewarding field of quantum imaging.

In commemoration of the 80th birthday milestones of Profs. Ling-An Wu and Kaige Wang, the Chinese Laser Press, through its esteemed journal, *Chinese Optics Letters* (COL), has curated a special issue dedicated to the field of quantum imaging. This special issue is presented as a token of our highest respect and to convey our heartfelt congratulations to these distinguished scholars.

As Prof. Yanhua Shih, one of the guest editors of this special issue and the distinguished pioneer in quantum imaging, has written for the special issue: “This special issue is for the celebration of the 80th birthday of Prof. Ling-An Wu and Prof. Kaige Wang. Both of them are pioneers in the research field of quantum optics, and both have important contributions to the research of ghost imaging.”

Prof. Shih has also pointed out, “Since its first experimental demonstration in 1995, ghost imaging has attracted great attention from the scientific community. The physics community named ghost imaging a ‘ghost.’ Ten years after the experimental demonstration of ghost imaging with entangled photon pairs, we found that the point-to-point ghost image-forming function is not only the property of entangled photon pairs. Two-photon interference of randomly created and randomly paired photons in a thermal state can produce a similar point-to-point image-forming correlation without the use of any imaging lens. Ghost imaging has received a great deal of attention, not only because of its interesting physics but also because of its attractive applications. For example, ghost imaging can add imaging function to a light detection and ranging device, namely an Imaging LiDAR; ghost imaging can also cause an X-ray microscope to be three-dimensional (3D) and make it turbulence- and vibration-resistant.”

This special issue includes four invited reviews, discussing nonlocal two-photon interference ghost imaging, quantum-enhanced microscopic imaging, magnetic field imaging with radio-frequency optically pumped magnetometers, and an information-theoretic perspective on performance assessment and fundamental limit of quantum imaging; and six original research papers, ranging from the sensitivity of ghost imaging, imaging through scattering medium, and high-resolution 3D imaging to spectral imaging and quantum projection computational ghost imaging.

Finally, we extend our heartfelt thanks and express our profound appreciation to *Chinese Optics Letters* for providing the opportunity to publish this special issue and to all the authors for spending their precious time and contributing their high-quality papers. The special issue not only celebrates the 80th birthday of Prof. Ling-An Wu and Prof. Kaige Wang but also showcases the diversity of current research in the domain of quantum imaging, which hopefully will interest young researchers and students and pave the way for future investigations in quantum imaging.

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References