ARAP WITH IMRE RESEARCH AREA: NANO OPTICS

#	A*STAR Researcher	Designation	Email Address	Research Area
1	Arseniy Kuznetsov	Principal Scientist / Head of Department	arseniy_kuznetsov@imre.a-star.edu.sg	As consumer electronics continuously shrink in size and weight there is a continuous demand for making optical components (e.g. lenses or camera modules), which can be very compact and lightweight while still keeping high performance. While conventional lenses have already reached their fundamental limits, the field of nanoantennas and metasurfaces (so called nano- or flat topic) offers novel solutions for miniaturized optical components that can control light at subwavelength dimensions. In particular, resonant nanostructures made of dielectric and semiconductor materials with high refractive index (so-called nanoantennas) offer a possibility to manipulate the phase, amplitude and directivity of light propagation with sub-micrometer resolution through the design and control of their optical resonant modes. Our group in Singapore was one of the world pioneers of this exciting field and is currently at the forefront of both scientific advances in the field as well as in commercialization efforts. This student project will be carried out within a dynamic, international and interdisciplinary team of researchers toward one of the following major directions: (i) Novel metasurfaces and flat optics for consumer electronics and beyond; (ii) Tunable metasurfaces for next-generation LiDAR and 3D holographic display technologies; (iii) Active metasurfaces for next-generation light sources and displays. Exploration of other research directions is also possible. The skills to be acquired will include design and optical simulations of nanoantennas and metasurfaces as well as nanofabrication and optical characterization of resonant nanostructures. If shows interest, the student will also be able to grasp the concept of applications of metasurfaces and miniaturized optical devices in modern consumer electronics industry. We would like to collaborate with groups, which are interested in nanooptics and novel materials for photonic applications.
2	Dong Zhaogang	Senior Scientist I	dongz@imre.a-star.edu.sg	The research in my laboratory focuses on the advanced nanofabrication and patterning of metallic/dielectric nanostructures with optical resonances. I would like to collaborate with groups which are interested in area of nano optics and nano photonics.
3	Emmanuel Lassalle	Scientist	emmanuel_lassalle@imre.a-star.edu.sg	This project aims to build a microscopic quantum model of an extended light source optically coupled to a resonant nanostructure. Besides being a problem of fundamental significance, it is also crucial for understanding the underlying mechanisms of light emission from such systems. This is important, for example, to establish conditions for room temperature quantum entanglement, which is key for potential future applications. The topic lies at the interface between quantum optics and nanophotonics. It is primarily theoretical and the PhD work will consist of modelling particular quantum systems by carrying out analytical calculations and numerical simulations. However, the project is also oriented towards designing a specific and feasible experiment, with possible collaborations with experimentalists at A*STAR, Singapore to carry this out. The research groups in the prospective collaborating group and Singapore should encompass very complementary expertise, in quantum optics and nanophotonics, respectively. The aim is to bridge these two disciplines to create novel and valuable insights and outputs in both fundamental science and quantum technologies. Both groups should be well established, renowned internationally, and have experienced in supervising PhD students. Through this joint supervision, the PhD student will benefit from working in rich and diverse ecosystems, develop skills covering a breadth of topics, and interact with a wide range of collaborators.

4	Liu Hailong	Scientist	liu_hailong@imre.a-star.edu.sg	The research in my laboratory focuses on 3d printing for micro-optical devices, dynamic metasurfaces, and plasmonic enhanced luminescence. I would like to collaborate with groups which have expertise in two-photon polymerization lithography, phase change materials, and emission nanoparticles.
5	Liu Hong	Senior Scientist / Head of Department	h-liu@imre.a-star.edu.sg	The research in my group focuses on: • Active flat optics using ultraviolet/visible light metasurfaces. We leverage a wide band gap energy semiconductor materials as novel material platform to develop high aspect ratio nanostructures with high transmission efficiency in the UV/visible/NIR spectrum, which potentially can be made into various high performance flat UV optical elements for applications in direct laser writing, spectrometers and filters etc. • 3D micro-printing via two photon polymerization for nanoplasmonic application. I developed a method to direct print functional resin (high refractive index, doped with QDs and phase change materials) as nanoplasmonic emitters for biosensing applications. • Near field optical characterization on 2D materials. To characterize the photon-photon, electrically excited plasmonic property of nanodevice with a scattering based apertureless SNOM. The major Facilities Ihave in my group • Nanofabrication: EBL, 3D Micro printer, PECVD, FIB, wet and dry etching etc; • Optical characterization: photon scanning tunneling microscopy (WITec), scattering- based scanning near field optical microscopy (Neaspec), Raman and PL mapping, AFM etc. I would like to collaborate with groups which are interested in 2D materials synthesis and characterization, phase change materials, near field optics, nanoplasmonics and nanophotonics, 3D nanoprinting etc.
6	Ramon Jose Paniagua Dominguez	Senior Scientist, Deputy Head of Department	ramon_paniagua@imre.a-star.edu.sg	Our group focuses on nano-optics and nanophotonics, in particular on the study of resonant dielectric nanoparticles and metasurfaces, and how these and light-matter interactions in the nanoscale can be used to enhance and control light emission, propagation and detection processes. We have a strong emphasis on translating fundamental properties into disruptive technologies. Our current projects aims at developing future holographic display technologies based on the concept of tunable nanoantennas and metasurfaces. We are open to collaborate with groups in the fields of material science (in particular photonic materials), optoelectronics and optoelectronic devices, as well as groups working in photonics with complementary expertise.
7	Ramon Jose Paniagua Dominguez	Senior Scientist, Deputy Head of Department	ramon_paniagua@imre.a-star.edu.sg	Our group does research in the fields of nano-optics and nanophotonics. In particular, our research focuses on optical metasurfaces, as well as active and tunable nanoantennas for light emission and dynamic wavefront control.
8	Victor Leong	Senior Scientist	victor_leong@imre.a-star.edu.sg	The research in our group focuses on developing integrated single-photon sensors on a silicon photonics platform. We would be happy to collaborate on areas involving photonics technologies
9	Wang Qian	Senior Scientist	wangqian@imre.a-star.edu.sg	I would like to collaborate with groups which are interested in nanophotonics, flat-optics, high-resolution imaging and defect inspection, phase change materials, etc.
10	Wang Qian	Senior Scientist	wangqian@imre.a-star.edu.sg	I would like to collaborate with groups which are interested in nanophotonics, tunable metasurface, high-resolution imaging and sensing, phase change materials, all-optical neuromorphic computing, etc.
11	Wang Qian	Senior Scientist	wangqian@imre.a-star.edu.sg	I would like to collaborate with groups which are interested in near-field scanning microscopy for probing nano-optics.

12	Xu Xuewu	Principal Specialist	Xu_Xuewu@imre.a-star.edu.sg	The research in my lab focuses on the development of metasurface-based spatial light modulators (SLMs) for various applications in 3D and holographic displays as well as light detection and ranging (LiDAR). I would like to collaborate with groups, which are interested in the manipulation of phase, amplitude and polarization of light by tuning the resonances of optical nanoantennas embedded in active materials, especially have expertise in liquid crystals (LCs) such as LC alignment, thin LC cell fabrication and simulation of LC devices.