Three ERC Consolidator Grants for ICFO

Professors Darrick Chang, Gerasimos Konstantatos and Leticia Tarruell granted ERC Consolidator Grants for mid-career research leaders

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Today, December 9th, the ERC has announced the awarding of its Consolidator Grants to 327 top researchers in Europe. The funding, worth a total of ?655 million, will give researchers a chance to have far-reaching impact on science and beyond. The grants fall under the 'Excellent Science' pillar of Horizon 2020, the EU's research and innovation programme.

ICFO has been especially successful in this call, with three grants awarded to Group Leaders at the institute:

ICREA Prof at ICFO Dr. Darrick Chang, awarded for the project **A New Spin on Quantum Atom-Light Interactions (NEWSPIN)**, which aims to establish that interference in light emission is in fact a much more powerful resource than the level that we currently exploit it

within quantum optics. For quantum applications, the project aims to establish protocols with exponentially better error bounds than those currently known. Underlying this powerful paradigm shift will be the development of a quantum many-body theory of multiple scattering involving photons and atoms, which takes advantage of state-of-the-art tools from condensed matter physics. Beyond robust new routes toward applications, our theory will also reveal exotic new quantum phenomena and lead to new insights into fundamental questions in optics, such as the physical limits to how large the refractive index of an optical material can be. In total, we anticipate that NEWSPIN could greatly enrich our understanding of atom-light interactions and their realm of possibilities.

ICREA Prof at ICFO Dr. Gerasimos Konstantatos, awarded for the project **Mid- and Long-wave infrared Colloidal Quantum Dot Optoelectronics (INFRADOT)** addressing the current challenge of high cost and fragmented solutions that limit the potential and wide-spread use of optoelectronic materials in the mid and long-wave infrared in applications in sectors such as safety and security, quality control, environmental monitoring, imaging, just to name a few. It will develop groundbreaking, lowcost, highly efficient material and device platforms operating in this so far under-exploited part of spectrum. In order to overcome the fundamental constraints arising from the bandgap of available materials, INFRADOT will lead to a paradigm shift in colloidal quantum dot (CQD) technology, by making a leap from - the so far used - interband transitions to intraband transitions. In order to make efficient use of intraband transitions in CQDs, INFRADOT will address several fundamental challenges. The advances made in this project will lead to a new disruptive technology for the MWIR/LWIR, as well as provide extremely important directions in other fields that utilize hot carriers, for catalysis and energy harvesting applications.

ICFO Prof. Dr. Leticia Tarruell, awarded for the project **Unconventional Superfluids in Quantum Gases with Competing Interactions (SuperComp)** that aims to exploit the full potential of ultracold quantum gases with competing interactions to unlock the observation of unconventional superfluid phases that have until now defied experimental realization. To this end, SuperComp will explore three distinct mechanisms resulting in unconventional superfluid behavior: quantum fluctuations, engineered dispersion relations, and interactions with non-zero orbital angular momentum. Exploiting combinations of bosonic and fermionic potassium atoms, SuperComp will realize novel types of ultradilute quantum liquids, supersolid-like gases and liquids, density-dependent artificial gauge fields, elastic multi-body interactions, and investigate a new approach towards the long-sought px+ipy topological superfluid phase of 2D Fermi gases. These experiments will deepen our understanding of the mechanisms responsible for unconventional superfluidity, and impact not only the field of quantum gases, but also the much broader range of disciplines where unconventional superfluids or superconductors play a key role.

For this call, the ERC has evaluated 2506 research proposals, out of which ~13% have been selected for funding. **Remarkably, all three of the proposal submitted by ICFO researchers in this call were successful.** On this occasion, ERC President Professor Jean-Pierre Bourguignon, commented: i¿½This funding not only empowers bright minds from across Europe to purs e their most ambitious ideas at a critical stage of their careers, but also helps train t e youngest generation of researchers as members of their ERC teams. To prepare for t e challenges of tomorrow, Europe must stick to the vision of investing in frontier researc , which has proved time and again its crucial added value. That is why so many count n Europe's leaders to endow the i¿½Excellent Sciencei¿½ pillar of Horizon Europe wi h the resources essential to strengthen Europe as a whole.i¿½

This new round of grants should create over 2000 jobs for postdoctoral fellows, PhD students and other staff working in the grantees' research team.

ICREA Prof. at ICFO Dr. Darrick Chang

ICREA Prof. at ICFO Dr. Gerasimos Konstantatos

ICFO Prof. Dr. Leticia Tarruell