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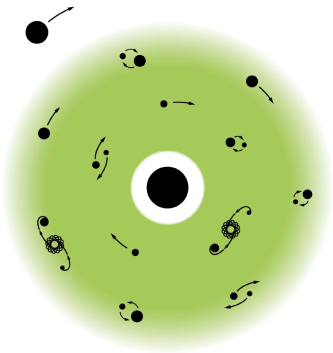

PRESS RELEASE:

The Mani L. Bhaumik Insititute for Theoretical Physics at UCLA has been awarded a European Research Council Synergy Grant

UCLA is among the partners of the international consortium, GWSky, awarded 12 million euros by the European Research Council for precision studies of gravitational waves. The 3 million euro UCLA portion of the grant will be managed by Profs. Zvi Bern and Mikhail Solon of the Mani L. Bhaumik Institute for Theoretical Physics.

5 November 2024

Existing and future gravitational-wave detectors will observe signals so precisely that they will be able to detect possible deviations from Einstein's theory of relativity and the standard model of particle physics. To fully exploit this unique instrumental capability, fundamental advances are needed in the theoretical description of black holes, the gravitational waves they emit, their cosmic environment and physics beyond the standard model. Providing the necessary theoretical framework is the aim of the GWSky project, awarded with 12 million euros over the next six years by the European Research Council. The ERC Synergy grant involves four nodes, the University of California (Los Angeles), SISSA (Trieste), the Niels Bohr Institute (Copenhagen), and the Max Planck Institute for Gravitational Physics (Potsdam).

The aim of the project, called "GWSky: Making Sense of the Unexpected in the Gravitational-Wave Sky" is to use gravitational-wave data from existing and future observatories on Earth and in space for precision studies of fundamental physics, cosmology and astrophysics. This includes data from the

current detectors of the LIGO-Virgo-KAGRA collaboration as well as the future ground-based observatories Cosmic Explorer and Einstein Telescope, and the space-based LISA detector. GWSky aims to develop innovative theoretical tools to interpret gravitational-wave signals with the required precision. To fully capitalize on upcoming facilities, theoretical models must achieve a level of precision that matches experimental advancements—up to 100 times more accurate than what is currently available. The aim is to identify and understand possible anomalies in the signals, which could reveal new physical phenomena not predicted by Einstein's theory of General Relativity. These anomalies could result from unknown gravitational effects, the presence of the astrophysical environment, or inaccuracies in our solutions to the Einstein equations. The upcoming flood of highly precise gravitational-wave data from future upgrades and detectors has the potential to revolutionize physics and astrophysics, but only if we have the right theoretical and statistical tools available. Using the theoretical tools developed by GWSky, physicists will be able to investigate the effect of the astrophysical environment on gravitational waves, as well as explore and test alternatives to Einstein's general relativity.

"We are facing an enormous scientific challenge to produce solutions of Einstein's theory of General Relativity and to implement them in gravitational waveform models at the level of precision required to fully reveal new physics. I have great confidence that we will meet this challenge, thanks to the remarkable team we assembled. we are developing innovative computational methods to achieve the precision required. At UCLA, innovative calculational methods are being developed to meet the precision challenge. I look forward to many years of collaboration on great science with my colleagues in GWSky," says Zvi Bern.

ERC Synergy Grants

The European Research Council awards Synergy Grants for scientifically excellent research projects through a complex and competitive selection process. Grants are awarded for a period of six years and are generally worth up to 10 million euros. Additional funding can be requested for large-scale equipment relevant to the project. Funding is available for projects involving two to four Principal Investigators (PIs). In the current selection round, the ERC is funding 56 projects out of 540 evaluated research proposals from all scientific disciplines.

The GWSky project will receive a total of 12 million euros, of which 3 million euros will go to UCLA.

Besides Prof. Zvi Bern from the University of California, Los Angeles, the other PIs of this ERC Synergy Grant are:

Prof. Enrico Barausse, Scuola Internazionale Superiore di Studi Anvanzati (SISSA), Trieste, Italy

Prof. Alessandra Buonanno, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany

Prof Maarten van de Meent from the Niels Bohr Institute, Copenhagen, Denmark