Description of Funded Research Projects
1st Call for H.F.R.I. Research Projects
to support Post-Doctoral Researchers

H.F.R.I.
Hellenic Foundation for
Research & Innovation

Research Project Title:

Quark-Gluon Plasma Thermalization and Plasma Instabilities in AdS/CFT

Principal Investigator:
Dimitrios Giataganas

Popular Title:

Thermalization *of The Quark- Gluon Plasma*

Scientific Field:
Natural Sciences, High Energy Physics, Fundamental Sciences, Constituents of Matter

Host Institution:
University of Athens

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String theory is the most promising candidate for quantum theory of gravity in theoretical physics. However, in the recent years it has grown as a rich mathematical structure and tool that has allowed outstanding applications to very different areas of physics and mathematics. One of its important achievements is the gauge/gravity correspondence, a duality between a quantum field theory and gravity. More precisely, the correspondence relates the quantum physics of strongly correlated many body systems where the computations are not easily tractable, to the classical dynamics of gravity in one higher dimension where we have developed the necessary tools to complete the corresponding computations. The duality is also sometimes referred to as holographic due to the extra dimension that is needed to formulate it. The idea is now 20 years old, but remains one of the most active research topics in high energy theoretical physics.

Perhaps the most impressive application of the gauge/gravity duality is on the physics of the quark-gluon plasma. A state of very dense and extremely hot matter which behaves as a strongly coupled fluid and is created and observed in the experiments of CERN. It has been also the state of our universe at the very first moments after the big bang. One of the most known theoretical achievements of the duality, is the prediction that the quark-gluon plasma behaves as the most ideal fluid in nature and that it is strongly coupled. Our research proposal attempts to build on all these recent developments and to study how the quark-gluon plasma is created and thermalize. By studying these questions we will obtain a deeper understanding of the physics of fundamental quantum building blocks of nature, their interactions, and how our universe evolved right after the big bang.

To reverse brain drain in Greece and in long term even to contribute to brain gain, by forming an active and internationally recognized research group in theoretical high energy physics.

To increase awareness for a very new and fast developing research area of high energy physics which answers fundamental questions of nature, and is not yet widely known within society due to its novelty.

To allow the public and especially the graduate and undergraduate students to gain experience and motivate themselves for succeeding in sciences, by ensuring their interaction with international leaders of the field that will be invited to Greece for research collaboration and seminars.

To me, H.F.R.I. funding would mean...

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It is an excellent opportunity to build and lead an active research team in theoretical high energy physics in our home country.

The Principal Investigator,
Dimitrios Giataganas

Funding

Amount: 200,000 €

Duration: 36 months

Foundation: H.F.R.I.

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