Horizon Europe Expression of Interest

BOGAZICI UNIVERSITY LIFESCI Center for Life Sciences and Technologies

1. Contact details

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2. Specific skills related to the research topic

-Synthesis of drugs/anticancer drug molecules
-Nanomaterials (for Targeted Drug Delivery)
-Nanomaterials (for Cell and Tissue Growth)
-Novel Scaffolds (for Wound Healing/Cell&Tissue Growth)
-Nanomedicine
-Biomaterials
-Biomedical Instrumentation
-Biomechanics
-Biophotonics
-Clinical Engineering
-Medical Imaging
-Neuroengineering
-Artifical Intelligence (Machine Learning, Supervised/Unsupervised Learning Algorithms) -AR/VR/XR/Haptics
-Data Management (Management of Big Data by using AI and relevant algorithms such as ML or Complex Event Systems Processing etc.)

OUR UNIVERSITY

Among the flagship universities in Turkey and Eastern Europe, Boğaziçi University (BOUN) is an elite research university in natural and social sciences, humanities, engineering, education, and applied disciplines. Established in 1863, Boğaziçi is endorsed by the European Universities Association (EUA) and all departments of the Faculty of Engineering have been accredited by the Accreditation Board of Engineering Technology (ABET) since 1998.

Boğaziçi comprises 4 Faculties, 2 Schools, 6 Institutes covering 29 undergraduates, 67 Graduate and 33 PhD Programs as of November 2021. Besides the success of the university is the consequence of the multidisciplinary core group-which has strong connections abroad- conducts the research around the world. Furthermore, BOUN has different Technology Transfer Intermediaries including Research Web Site, Technology Transfer Office, Teknopark, KOSGEB/TEKMER, and 157 Research Laboratories and 32 Research Centers.

Boğaziçi aims to accelerate technology and innovation by providing value added-high quality and internationally well-known education and applicable research activities. One of the main research fields of Boğaziçi is Biomedical Technology. In parallel with this, it conducts research and developing new technologies, biotechnological products in the field and the university provides know how to spin-off companies, start-ups and SMEs for the manufacturing of innovative products. 75% of patent applications made by the university is in the field of biotechnology. The university comprises a state-of-the-art **thematic incubator**, - *Center for Life Sciences and Technologies*-which supports biotechnological initiatives in the field of health technology. It also provides services to the sector in experimental animal and test/analysis subjects, which are pioneering in terms of our country. Furthermore, it's **Internationally certified Clean Room and modular pilot production facility** that is used by the companies for their first production(prototyping), which supports research and development activities.

Center for Life Sciences and Technologies (LifeSci):

Established in 2009 at the Kandilli Campus along the Bosphorus strait, the ***Center for Life Sciences and Technologies*** rests on approximately 7500m2, comprising two units 1- Research and Innovation, 2- Deep Tech Facility, the former comprising a Polymer Pilot Production Facility and an Advanced Genomic Analysis Unit. Furthermore, a biorefinery is in the pipeline within the scope of Istanbul Microalgae Biotechnologies Research and Development Unit. The latter unit is focused on accelerating research/development activities of SMEs active in the Life Sciences domain, with a focus on specific cutting-edge technologies and high value-added products. BULifeSci has 3 centers, which are: *In-vivo Medical Device Development Unit, Test Analysis Unit and Experimental Animal Production and Care Unit/Vivarium*.

1) In-vivo Medical Device Development Unit: Activities related to the production of prototypes of microsystem-based medical devices used/implanted in human body. Not only the design and development of devices are carried out in the clean room but also the manufacturing tasks are implemented in this room (such as new generation endovascular catheters, guide wires and smart sensors implanted in the body, electrical stimuli and in-body systems that release drugs in a controlled manner only, when necessary, can be provided). In Vivo Medical Device Development Unit provides its users with an infrastructure that will not only mechanically assemble endovascular catheters consisting of plastic and metal units from basic materials, but also integrate optical, electronic, and mechanical microsystems into these catheters.

2)Test-Analysis Unit: In the unit, microscopic, biological, and rheological tests of biocompatible materials are carried out (from impurity and metabolic analyzes of drugs to physical and chemical characterization of biosimilar products). Studies are carried out on the purification and analysis of drug active ingredients and nano drugs. These substances are also tested on cells in vitro. Pharmacokinetic tests and toxicity studies are also implemented in this center. The analyses on body fluids and organs obtained from the experiments are also realized in this unit.

3) Experimental Animal Production and Care Unit/Vivarium: Vivarium is built on approximately 450 m2 closed area. In the center, mice, rats, rabbits and zebra fish are reproduced

and tended. There is 'individually ventilated cage systems' (IVC) in the center. Both IVC and reverse osmosis systems were first implemented in Turkey at the Vivarium of BULifeSci. Many research activities such as hemogram, blood biochemistry, metabolic tests, ultrasonographic examination, in vivo imaging (IVIS), microsurgical procedures (catheterization, onostomoses, etc.), specific injections (intravitreal, intraneural, etc.), tumor cultivation are carried out in this center. Additionally, veterinary diagnosis/treatment services, small interventions, biochemical examinations, and surgical operations are also provided at this center.

4) Other: In addition, the Center contains leading multiple labs and research units which include but are not limited to:

-Apoptosis and Cancer Immunology Laboratory
-Behavioral Neuroscience Lab
-Beta VLSI Design Laboratory
-Biodesign Laboratory
-Biomaterials Research Laboratory
-Biomaterials Production and Characterization Laboratory
-Biomechanics Laboratory
-Biophotonics Laboratory
-Biosystems Engineering Research Group
-Biotransformations and Microbial Genetics Laboratory (BIOMIG)
-Cancer Signaling Laboratory
-Computational Imaging Laboratory
-Developmental Neurobiology Laboratory
-Haptics & Robotics Lab
-Inorganic Materials Laboratory
-Laboratory of Genome Regulation (GenReg)
-Medical and Biological Physics Laboratory
-Medical Device Testing Laboratory
-Medical Imaging Laboratory (BUMIL)
-Medicinal Chemistry Laboratory
-Micro Nano Characterization Laboratory (MNL)
-Microalgae Biotechnology Research Center
-Neurosignal Analysis Laboratory
-Organic Supramolecular Chemistry Laboratory
-Photonics Group
-Polymer Research Center
-Psychoepigenetics Laboratory
-Retina Lab Group
-Robotics Laboratory
-Signal and Image Processing Laboratory / Speech Processing Group (BUSIM/SPG)
-Systems Biology Laboratory
-Tactile Research Laboratory
-Signal and Image Processing Laboratory / Volumetric Analysis & Visualization Laboratory (BUSIM/VAVlab)

3. References

A.Successfully Completed Previous R&D Projects

Project name	Funded under	Start-end date	Project Objectives
Improving Therapy and Intervention Through Imaging	FP7-PEOPLE	16 April 2012 - 15 April 2016	-To develop new techniques and methodologies to assist in the development of new therapy surgical procedures. This will clearly improve the position of the European partners towards technology transfer to the healthcare technology industry. -To improve the healthcare of European citizens by providing new and safer means of therapy and surgery. -To increase the skills and knowledge of the EU partners in order to better perform clinical translational research implying new technologies.
Personal Technologies for Affective Health-AFFECTIVA	H2020-EU.1.3. H2020-EU.1.3.1.	1 January 2017-31 March 2021	This project integrates the latest Human-Computer Interaction and Biomedical Engineering findings in designing and developing personal health systems for mental health, with the most influential outcomes and models of emotion regulation from Clinical Psychology. The overall aim is to support self-understanding and successful adoption of adaptive emotion regulation strategies in daily life.
Dissecting the Genome-wide Action of Interferon Regulatory Factor 4 (IRF4) in Melanoma	FP7-PEOPLE	1 August 2011-31 July 2015	This project aims to study the role of IRF4 in melanoma cells using cellular, molecular, and genome-wide approaches as the first segment of the research program aimed at investigating the critical gene regulatory and epigenetic networks in cancers. Specifically, the requirement of IRF4 in the tumorigenicity of melanoma cells was studied.
SENSPRO (Sensory Feedback for Improved Prosthesis Control)	FP7-PEOPLE	1 April 2014-31 March 2018	This project seeks for sensory feedback for improved prosthesis control. First, relative contribution of feedback modalities (vision, proprioception, and artificial proprioception) on coordinated manipulations is investigated. Then, based on these results, new sensory feedback systems are developed for persons with an upper-limb amputation.
SusChEM: Time-series Characterization and Modeling of Non-model Microalgae at the Systems-level for Sustainable Chemical Production	National Science Foundation (NSF) – Standard Grant	01 Sept 2014-31 August 2018	This project aims to develop fundamental and applied engineering tools and metrics to better understand how photosynthetic organisms can be exploited to produce high-value products with applications in energy, health, and food industries. The theme of sustainable fuel and chemical production through microalgae-based processes has compelling broad societal impacts, and these topics are studied through academic and civic engagement activities that are integrated with the proposed research.
Safe Ultrasonic Transmission Lines for MRI Catheters	National Science Foundation (NSF) – Exploratory Developmental Grants	01 July 2015-30 June 2017	In this project, it is aimed to develop a clinical-grade active catheter device that does not need long conductor transmission lines for active device visualization under MRI.
Cellular and Molecular Characterization of Non-model Microalgae for Maximized Lipid Synthesis	The Royal Society, Newton Fund	01 March 2015-31 March 2018	The study investigated the use of fat accumulation in microalgae for the production of biofuel at cellular and molecular levels.

B.Ongoing R&D Projects

Project name	Funded under	Start-end date	Project Objectives
GRAFIN: GRAphene-based Flexible neural Interfaces for the control of Neuroprosthetic devices	TUBITAK (Flag-Era, Under the Joint Transnational Call 2017)	2018 (Duration: 36 Months)	This project aims at exploring the potential of graphene-based technologies in neural interfaces for motor neuroprostheses. Taking advantage of intrinsic properties of graphene, such as biocompatibility, electronic performance, and easy integration within flexible substrates, we will develop graphene flexible devices to record and stimulate in the nervous system. Efficient stimulation will be based on novel highly porous reduced graphene thin films exhibiting extreme charge injection capacity.
Understanding the Risk of Bat-Borne Zoonotic Disease Emergence in Western Asia	EcoHealth Alliance, United States (Funder: Defense Threat Reduction Agency (DTRA)	2 October 2017-1 October 2022	The project proposes a multi-disciplinary research project to identify key factors correlated with the risk of bat viral zoonoses from sites across. The research focuses on characterizing bat coronavirus diversity and the risk of bat-borne zoonotic disease. This includes extensive nonlethal field sampling of bats, screening and characterization of viruses from bat specimens with select partner laboratories currently operating within the region and modeling emerging disease risk by combining viral data with host, geographic, and ecological data. Data for risk modeling will be collated across a larger region than our field sampling will allow through the creation of a collaborative Western Asia Bat Research Network (WAB-Net) – including key researchers and public health representatives from 12 countries.
European University of Brain and Technology - Research and Innovation	H2020-EU.5.	1 October 2021-30 Sept 2024	Neurotech Research and Innovation (NeurotechRI) brings together eight research-intensive universities in Europe to transform cooperation in research and innovation in the European University for Brain and Technology (NeurotechEU). We propose an actionable and sustainable plan to develop a pan European, inter-institutional and inter-sectoral strategy to help Europe realize its full potential in the global knowledge economy. Pushing the boundaries of fundamental research and applied science will mobilize innovation ecosystems, including the NeurotechEU ecosystem we are forming while actively engaging citizens to transform how we innovate, educate and impact the society at large.
Brain-inspired technologies for intelligent navigation and mobility	H2020-EU.1.3.3	1 Dec 2019-31 May 2025	The project brings together scientists and engineers in academic, private and NGO enterprises. Its goal is to promote international and intersectoral cooperation for the next generation, brain-inspired technologies to facilitate the development of intelligent navigation and autonomous mobility solutions. The consortium exploits the complementary competencies of its members while creating synergy through research, innovation, staff exchange and transfer of knowledge. It actively promotes networking, knowledge utilization and dissemination through summer schools, workshops, conferences, and facilitates new skill acquisition and career development in research, innovation and commercialization.

C.Successfully Completed Infrastructure Projects

Project Title	Project Coordinator	Year of the Project	Funded By
Center for Life Sciences and Technologies	Boğaziçi University Rectorate	2009	The Ministry of Development
Inovita - Istanbul Cooperation Platform for Life Sciences and Technologies	Cengizhan Öztürk	2010	Istanbul Development Agency
Inovita - Health Technologies Incubator Center	Mehmed Özkan	2012	Istanbul Development Agency
Researchers for Life Science Industries Program	Rana Sanyal	2012	Ministry of Development
R&D and Innovation Capacity Building of the Istanbul Health Industry	Cengizhan Öztürk	2015	Istanbul Development Agency
Accreditation of Life Sciences Industry Service Laboratories	Rana Sanyal	2015	Istanbul Development Agency
Health Industry Cluster of Istanbul	Cengizhan Öztürk	2014	The Ministry of Science, Industry and Technology

*D.**Some of the recent publications***

Please visit ***https://lifesci.boun.edu.tr/en/publications*** for more information LifeSci and LifeSci contributed publications. More than 100 publications have been made including but not limited to the following journals:

-Journal of Polymer Science Part A Polymer Chemistry
-ACS Applied Materials & Interfaces -Bioconjugate Chemistry
-Photodiagnosis and photodynamic therapy
-American Journal of Medical Genetics Part B-Neuropsychiatric Genetics
-European Polymer Journal
-Lasers in Medical Science
-International Journal of Hydrogen Energy
-IEEE Transactions on Haptics
-Sensors and Actuators A – Physical
-Journal of Molecular Graphics&Modelling
-Lasers in Medical Science
-IEEE Journal of Biomedical and Health Informatics -Journal of Biotechnology
-Journal of Applied Polymer Science
-Computers in Biology and Medicine
-Journal of the Mechanical Behavior of Biomedical Materials
-Lancet Neurology
-Journal of Biomedical Semantics
-International Journal of Computer Assisted Radiology and Surgery

4. Other

BULifeSci has been also focusing on university-industry cooperation since its inauguration. Major regional projects carried out within this context are **"Inovita, Life Sciences and Technologies Istanbul Collaboration Platform"** and **"Inovita Health Technologies Hatching Center"** which are supported by the Istanbul Development Agency, **"Life Sciences and Technologies University-Industry Researcher Training Program"** and "**ISEK – Health Industry Cluster of Istanbul"**, backed by the Turkish Ministry of Development. Through the Inovita projects, the Center has taken on the function of an interface between university, industry and state. Therefore, the center established strong links with the life sciences industry and ecosystem, such as Life Sector Cluster (ISEK). ISEK brings together more than 180 life sciences companies, more than 15 NGO's, more than 17 labs from different universities and various governmental institutions. The main focus of ISEK (which is currently operated under the body of Technopark Istanbul) is the regional development of the national health technology industry in collaboration with other sector clusters. The cluster has been funded by Industry and Technology, Clustering Support Program between 2017 and 2022 with the coordination of Technopark Istanbul. The planning activities are within the scope of work packages; Biodesign&Innovation Program Activities, University-Industry Collaboration, Pilot Manufacturing Plant, Sectoral Database, Accredited Test Laboratories, Corporate Capacity Building.