

Biomedical Technologies and Innovation Doctoral Programme (BIOTIN)



Title of the PhD Project	An example for democratization of biomedical instrumentation: Make your own cell/culture monitoring/sorting device
Acronym	FrugalCellTech
Research Fields of the Project	1) Biomedical Engineering, specifically in vitro Diagnostic Technologies 2) Medical Biotechnology, specifically Cell-Based Targeted Therapy Technologies
Keywords	Targeted Therapy, Cell-based Therapies, POC in vitro Diagnostics, Frugal Science and Biotechnology Devices
Host Institution, Department and Campus Location	Boğaziçi University, Institute of Biomedical Engineering, Kandilli Campus, Çengelköy, İstanbul
PhD Awarding Institution and Graduate Programme	Boğaziçi University, Institute of Biomedical Engineering, PhD in Biomedical Engineering
Name and Affiliation of Main Supervisor	Prof. Cengizhan Ozturk (BOUN)
Name and Affiliation of Cosupervisor(s)	Prof. Cengizhan Ozturk (BOUN) Prof. Rana Sanyal (BOUN) Assoc. Prof. Hüseyin Cumhuri Tekin (IZTECH)
Research Environment and Infrastructure	Boğaziçi University one of the top public universities in Turkey. It has excellent research facilities to conduct cutting-edge projects in Life Sciences. The researcher will have access to all the relevant labs at the Center for Life Sciences and Technologies (https://lifesci.boun.edu.tr/en) and at the Institute of Biomedical Engineering (https://bme.boun.edu.tr/). The current laboratory of Prof. Ozturk is XLAB (https://xlab.boun.edu.tr/), which was established in 2010 as a spinout Lab from BUMIL - Boğaziçi University Medical Imaging Laboratories. The main research focus is democratization of biomedical instrumentation; it has been working mainly on novel but affordable/accessible medical imaging instrumentation systems. This project will be its first venture into the medical biotechnology instrumentation technologies. XLAB is located in Feza Gürsey Building of Boğaziçi University's Kandilli Campus and has a nationally (NDK) accredited X-ray research room and a full biomedical electronics infrastructure.
Scientific Context of the Project	Novel microfluidic technologies are becoming more and more useful in single-cell manipulation, sorting and analysis. There are specific microfluidic systems to track and trap single cells inside specific chambers, monitor their growth and even division and extract them for downstream advanced molecular biological analysis. Our aim will be to develop a novel "high-throughput real-time cytometer (variant)"

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	comprising a microfluidic device with complementary biosensor-based detection and sorting system.
Brief Workplan	Identification of unmet needs at clinical targeted cellular therapy, synthesis of optoelectronics components for cell tracking, design of microfluidic systems, system development of the complete biomedical instrument, preparation various cell cultures, in vitro evaluation of cell tracking/sorting activity, validation of the cell tracking/sorting technology.
Innovative Aspects of the Project	Our main novelty will be democratization of this instrumentation (affordability, scalability, open access platform in all aspects): off-the-shelf components, developing an open hardware developmental platform for R&D in this field including its software.
Training Opportunities of the Project	The researcher will be trained in the area of biomedical devices, with a special focus on affordable and scalable instrumentation to be used in cell-based targeted therapy technologies. The technology will be first targeted for diagnostics but the real impact is expected in the field of cell-based therapeutics.
Interdisciplinary Aspects	This highly multidisciplinary project involves biomedical instrumentation, microfluidics, biosensors, microsystem based in vitro diagnostic devices with POC focus, as well as several medical biotechnology techniques, since it involves preparation, growth and handling of cells.
Intersectoral Mobility <input checked="" type="checkbox"/> Short Visit <input type="checkbox"/> Secondment	<i>Host: Siemens Healthineers (TR)</i> <i>Context of Mobility: Innovation management, Entrepreneurship, Prototyping, IP rights, 3D modelling</i>
Intersectoral Mobility <input checked="" type="checkbox"/> Short Visit <input type="checkbox"/> Secondment	<i>Host: Istanbul Health Industry Cluster (ISEK)</i> <i>Context of Mobility: Entrepreneurship Training, Thematic Pre-incubation Program</i>
International Academic Secondment	<i>Host Institution: Radboud Medical Center, Nijmegen, Netherlands</i> <i>Duration: 6 months</i> <i>Estimated Time of Mobility: Month 24</i> <i>Duration: 6 months (estimate)</i>

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Main Supervisor:													
Brief CV	<p>Prof. Cengizhan Öztürk E-mail: cozturk@boun.edu.tr</p> <p>ACADEMIC DEGREES</p> <table><tr><td>Ph.D.</td><td>Biomedical Engineering</td><td>Drexel University, USA</td><td>1997</td></tr><tr><td>Spec.</td><td>Physiology</td><td>Istanbul University, Cerrahpaşa Medical Faculty</td><td>1994</td></tr><tr><td>M.D.</td><td>Medicine</td><td>Marmara University, Turkey</td><td>1990</td></tr></table> <p>Google Scholar: https://scholar.google.com/citations?user=ldHoVggAAAAJ&hl=tr&oi=ao https://orcid.org/0000-0002-6966-0774</p>	Ph.D.	Biomedical Engineering	Drexel University, USA	1997	Spec.	Physiology	Istanbul University, Cerrahpaşa Medical Faculty	1994	M.D.	Medicine	Marmara University, Turkey	1990
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Co-supervisors:													
Brief CV	<p>Prof. Rana Sanyal E-mail: rana.sanyal@boun.edu.tr</p> <p>ACADEMIC DEGREES</p> <table><tr><td>Ph.D.</td><td>Chemistry</td><td>Boston University, USA</td><td>2001</td></tr><tr><td>B.Sc.</td><td>Chemical Engineering</td><td>Boğaziçi University, Turkey</td><td>1994</td></tr></table> <p>Google Scholar: https://scholar.google.com/citations?hl=en&user=sFTumloAAAAJ https://orcid.org/0000-0003-4803-5811</p>	Ph.D.	Chemistry	Boston University, USA	2001	B.Sc.	Chemical Engineering	Boğaziçi University, Turkey	1994				
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Brief CV	<p>Assoc. Prof. H. Cumhuri Tekin E-mail: cumhurtekin@iyte.edu.tr</p> <p>ACADEMIC DEGREES</p> <table><tr><td>Ph.D.</td><td>Microsystems and Microelectronics</td><td>Ecole Polytechnique Fédérale de Lausanne</td><td>2012</td></tr><tr><td>M.Sc.</td><td>Electrical and Electronics Engineering</td><td>Middle East Technical University, Turkey</td><td>2007</td></tr><tr><td>B.Sc.</td><td>Electrical and Electronics Engineering</td><td>Middle East Technical University, Turkey</td><td>2005</td></tr></table> <p>Google Scholar: https://scholar.google.com/citations?hl=en&user=ml9NbuQAAAAJ https://orcid.org/0000-0002-5758-5439</p>	Ph.D.	Microsystems and Microelectronics	Ecole Polytechnique Fédérale de Lausanne	2012	M.Sc.	Electrical and Electronics Engineering	Middle East Technical University, Turkey	2007	B.Sc.	Electrical and Electronics Engineering	Middle East Technical University, Turkey	2005
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