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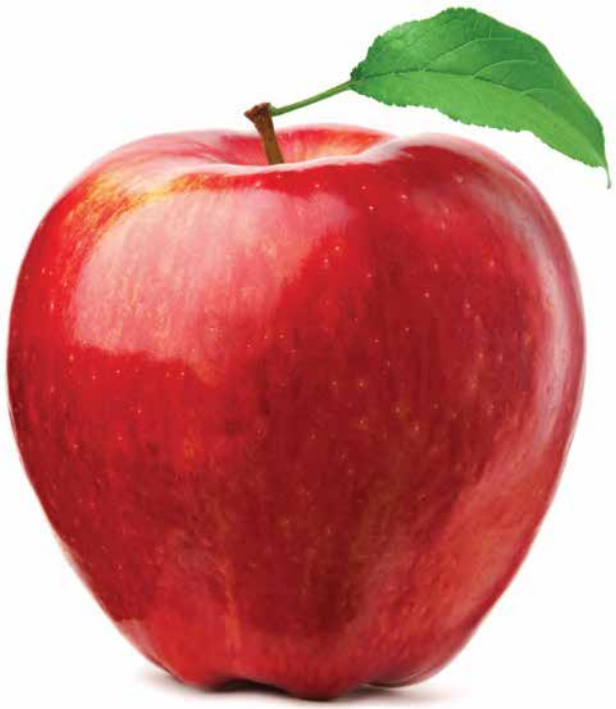
AdımODTÜ UNDERGRADUATE RESEARCH PROJECT



Examples of Undergraduate Research Projects supported by AdımODTÜ in 2018

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A joint project of the Corporate Communications Office and METU Development Foundation, AdımODTÜ is a communication-sharing-action platform where everyone can provide financial support to the scientific research and community service projects of our students and faculty members, contribute to the announcement of the projects and even take part in projects on a voluntary basis.

Research at METU starts in undergraduate years!

AdımODTÜ has created a fund to support the research efforts of undergraduate students through donations. In this booklet, examples of undergraduate projects that have applied to AdımODTÜ are presented. These projects are either fully or partially supported by AdımODTÜ.

To support AdımODTÜ Undergraduate Research Project please visit:
https://adimodtu.org.tr/proje/lisans-arastirmalari-projesi

Name of the Project: Construction of Ballbot

Field of Research: Robotics

Project Team Members: Canberk Sönmez, Denge Uzel, Eren Emre Aydın, Mustafa Kılınç, Oğuz Özdemir, Oğuzhan Karakaş, Onurcan Yılmaz

Project Advisor: Assoc. Prof. Uluç Saranlı

Abstract:

In this project, it is aimed to implement Ballbot robot, which is a research subject recently, on a real platform. Through the study of systems with high mobility self-balancing systems, it has been shown that scenarios where human robot interaction increases more can be made possible. With this project developed in interdisciplinary interaction, it has been our motivation for a comprehensive robotics project at the undergraduate level to set an example for academic resources in our country. Ballbot, whose mathematical model and mechanical structure is found out, is expected to become more autonomous with mapping and object avoidance techniques soon.

Construction of Ballbot

Name of the Project: Determination of Provenance of a White Archaeological Stone using Petrography, Whole-Rock and Sr Isotope Geochemistry

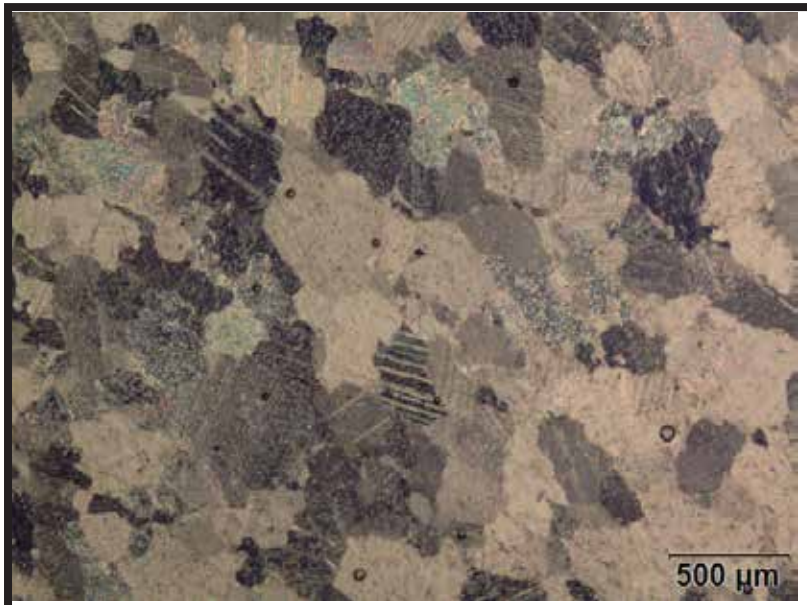
Field of Research: Earth Sciences, Archaeometry

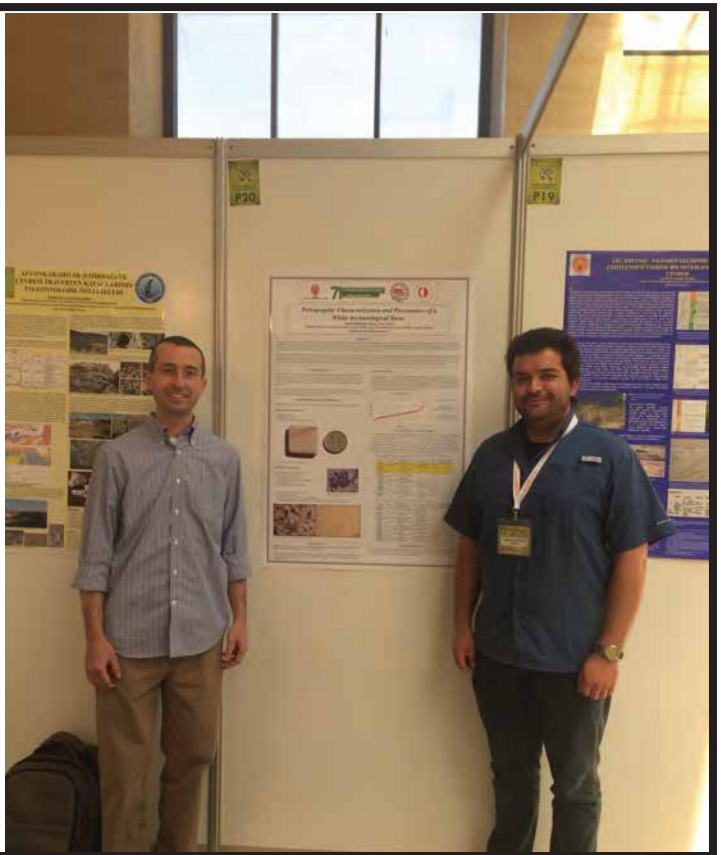
Project Team Member: İsmail Doğancan Yaşar

Project Supervisor: Assoc. Prof. Kaan Sayıt

Abstract:

In this study, a white archaeological sample was analyzed in terms of petrography, whole-rock and isotope geochemistry. Petrographic analysis, conducted on both hand-specimen and thinsection, was employed to reveal the mineralogical and textural features of the sample. Based on petrography, the sample appears to a marble that has formed by recrystalization of nearly pure limestone under high temperature. Whole-rock geochemical analysis of the sample were used to obtain the concentrations of major and trace elements (including REE), while the isotopic analysis were performed to measure the 87Sr/86Sr isotopic ratio. These geochemical data, along with petrographical features, were compared with the existing marble databases, and subsequently used to characterize the possible provenance of this marble sample.





Determination of Provenance of a White Archaeological Stone using Petrography, Whole-Rock and Sr Isotope Geochemistry

Name of the Project: Effects of Partner Support and Perceived Social Stigma on Psychosocial Adjustment to Traumatic Amputation

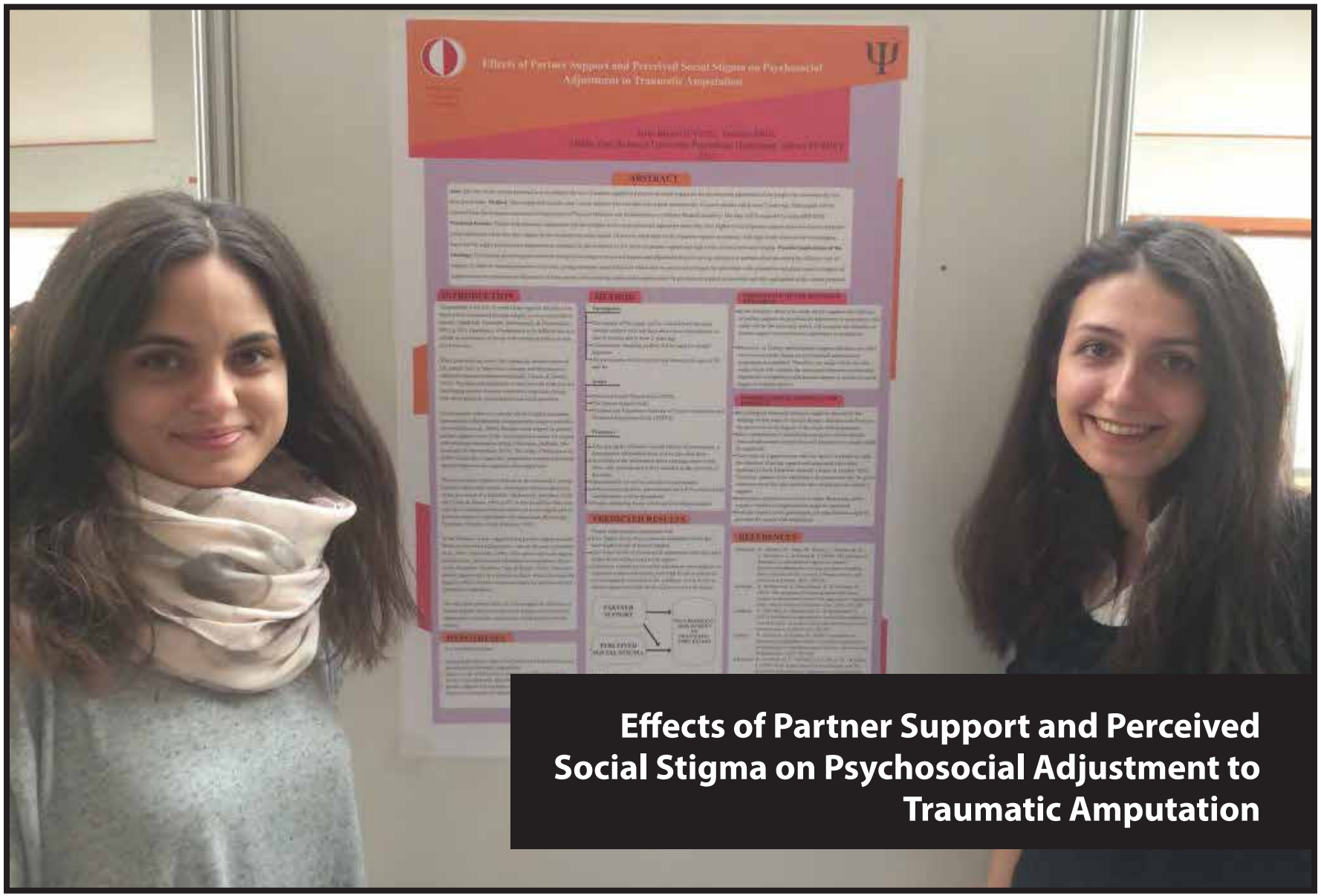
Field of Research: Psychology

Project Team Members: Yasemin Erol and İrem Berna Güvenç

Project Supervisor: Prof. Özlem Bozo Özen

Abstract:

The present study has the aim of investigating the role of partner support and perceived social stigma on the psychosocial adjustment of the veterans who traumatically lost some parts of their body. The first hypothesis is that having high partner support will predict a better psychosocial adjustment. The second hypothesis is that higher levels of perceived social stigma will predict lower levels of psychosocial adjustment. The third hypothesis is that partner support will moderate the effect of perceived social stigma on psychosocial adjustment. Partner support will be measured with Spouse Support Scale. Perceived social stigma will be assessed with Perceived Social Stigma Scale. Trinity Amputation and Prosthesis Experience Scale will be used to assess psychosocial adjustment. Developing special psychological treatment strategies; giving education to partners about providing support; to increase awareness of society and increasing employment opportunities by government support are possible real life implications of the current study.



Effects of Partner Support and Perceived Social Stigma on Psychosocial Adjustment to Traumatic Amputation

Name of the Project: Extracellular Human Growth Hormone Production Under 43 Promoter (P43) by Recombinant Bacillus subtilis

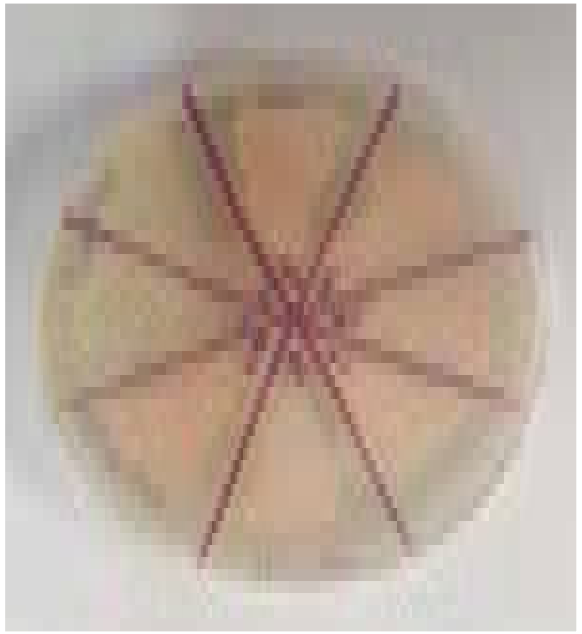
Field of Research: Industrial Biotechnology

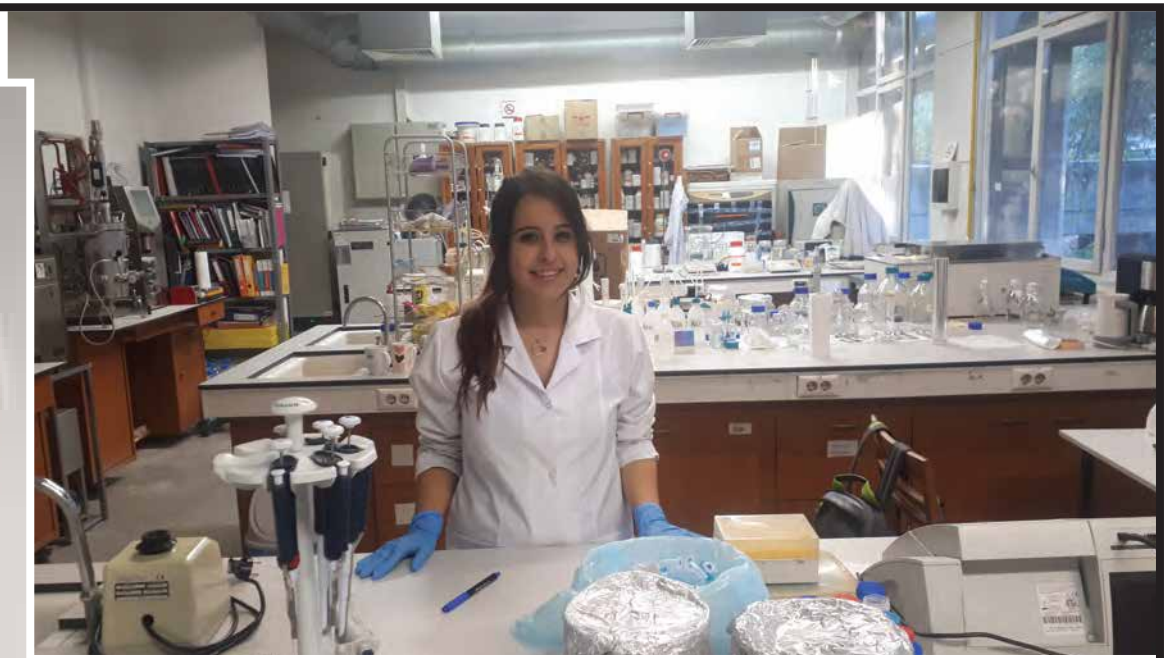
Project Team Members: Nazlı Ekin Artan

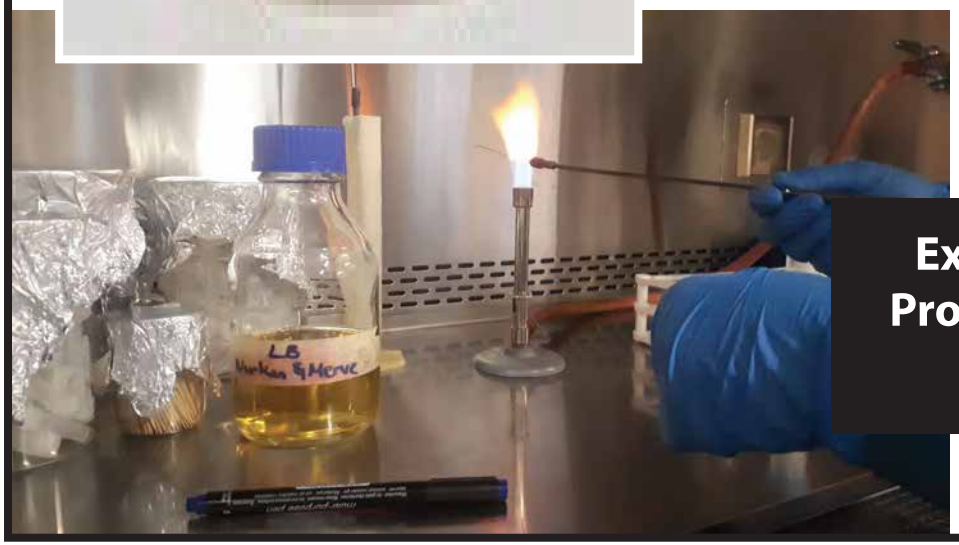
Project Supervisor: Prof. Pınar Çalık, Sibel Öztürk

Abstract:

Therapeutic protein production via microorganisms is a widely used method in large-scale industrial processes. Production capacity of microorganism can be improved by genetic modifications. The aim of this study was to develop a recombinant *Bacillus subtilis* 168 strain being able to produce human growth hormone extracellularly under the control of the strong cdd promoter (P43). At first, the base plasmid pDL::P43::*bgaB* was constructed by inserting P43 to the pDL plasmid and transformed to *B. subtilis* 168 cells. Expression capacity of P43 was investigated using heat-stable β-galactosidase as the reporter protein. Thereafter, the constructed plasmid was isolated from the recombinant *E.coli* DH5α cells and sequentially digested with the appropriate restriction enzymes. For extracellular hGH production, the insert was amplified from *B. subtilis* 1A178 *scoC*- strain carrying pMK4::*pre(subC)*::*hGH* plasmid. Finally, ligation was applied and the plasmid of interest pDL::P43::*pre(subC)*::*hGH* was constructed. After construction, the plasmid was transformed to *B. subtilis* 168.







Extracellular Human Growth Hormone Production Under 43 Promoter (P43) by Recombinant Bacillus subtilis

Name of the Project: In Vitro Biocompatibility of Nanotopographical Oxide Layer Grown on Nitinol Surface by Anodization for Intravascular Applications

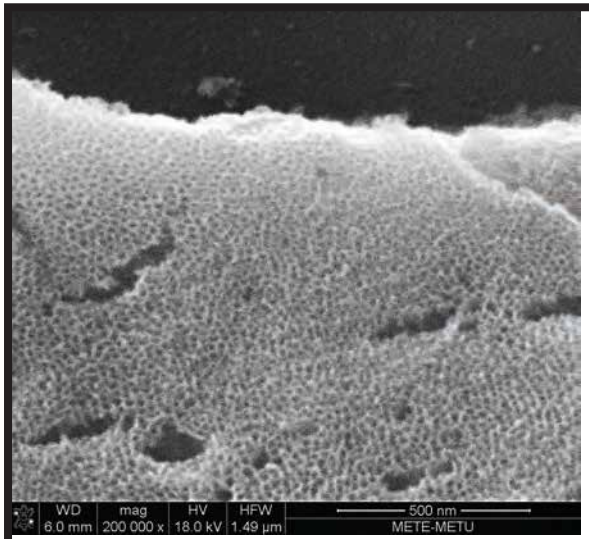
Field of Research: Biomaterials

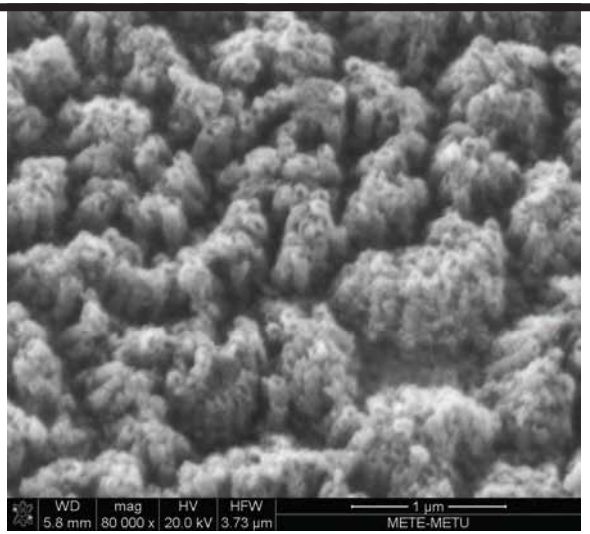
Project Team Members: Çağla Berberoğlu and Tuncay Erdil

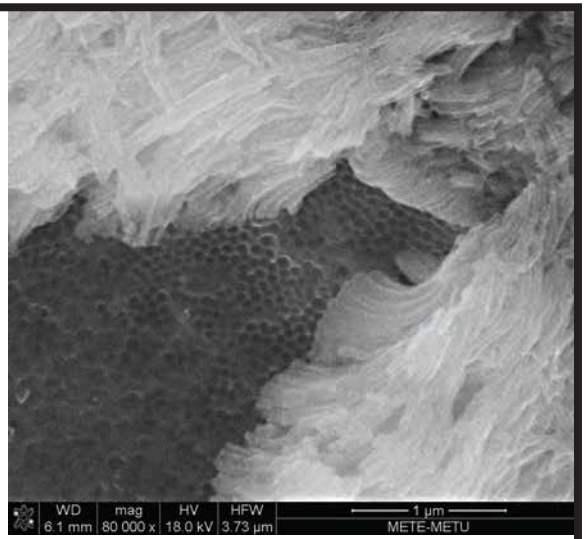
Project Supervisor: Assist. Prof. Batur Ercan

Abstract:

Electrochemical surface modification of shape memory alloy nitinol via anodization to obtain nanotubular surface features is a promising method to enhance adhesion, proliferation and functions of endothelial cells on stent surfaces. The bioactivity of nitinol is expected to improve by fabricating a nanotubular oxide layer on its surfaces through anodization process. From a fabrication stand point, anodization time and voltage, electrolyte composition and electrolyte temperature are critical parameters that affect growth of nanotubular oxide layer on nitinol. Thus, in this research, aforementioned anodization variables were systematically altered to fabricate nanotubular oxide layers having different feature sizes on nitinol to harbor calcium phosphate aggregates upon interaction with simulated body fluid (SBF). The response of anodized nitinol alloy possessing nanotubes with different sizes to SBF will provide insight for further research and can potentially be a candidate for cardiovascular applications.







In Vitro Biocompatibility of Nanotopographical Oxide Layer Grown on Nitinol Surface by Anodization for Intravascular Applications

Name of the Project: LibTimer

Field of Research: Electronic

Project Team Members: Sarp Erdönmez, Alptuğ Öztaşkın, Bora Doğan, Arda Özarslan and Furkan Hayri Özkan

Project Supervisor: Assoc. Prof. Y. Eren Kalay

Abstract:

The main aim of the project LibTimer is to prevent the unfair occupation of the study places in the library. Although there is a rule of 30 minutes to leave an empty place occupied, management lacks a proper system to enforce desired behavior. What we were doing so far was designing a device to indicate places that stayed occupied without a user for a long time. By integrating the project LibTimer into the desks placed in our library, we are aiming to increase the circulation of the usage of the places so that the limited amount of space can be used more efficiently.

LibTimer

Name of the Project: Monitoring a predator and a super predator in the METU campus : The case of wolf spider Hogna radiata (Latreille, 1817) and Eurasian Scops Owl Otus scops (Linnaeus, 1758)

Field of Research: Biology / Community ecology

Project Team Members: Batuhan Karapınar, Belfu Çetinkaya, Elif Göçer, Mert Elverici, Nil Demir and Tanya Nil Tanyolu

Project Supervisor: Prof. C. Can Bilgin

Abstract:

The aim of this project is to assess the impact of Eurasian Scops Owl (Otus scops) on the abundance of one of its main prey species, a wolf spider (Hogna radiata) in the METU campus. Both species were monitored by field surveys during their peak of activity in summer. Scops Owl territories were chosen among occupied wooden nest-boxes placed on appropriately sized pine trees in the forest. Spider activity density (as a proxy for abundance) was measured around nesting sites (within the territories) and their controls (unoccupied forest) in a distance gradient of 10 meters up to 100 meters on line transects. Results indicate a significant effect by the owls' predation on wolf spider activity inside their territories, but the magnitude of this effect changes with particular pairs of owls, indicating a degree of individuality in prey choice. Our findings may constitute a rare example of a cascading effect that involves an avian predator and its invertebrate prey.

Monitoring a predator and a super predator in the METU campus : The case of wolf spider Hogna radiata (Latreille, 1817) and Eurasian Scops Owl

Name of the Project: ORDOT II

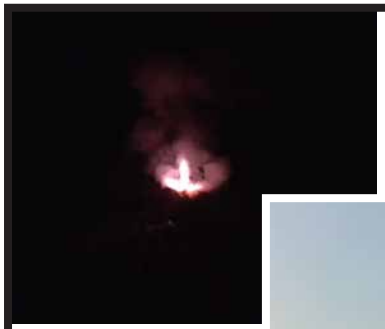
Field of Research: Aerospace and Rocketry

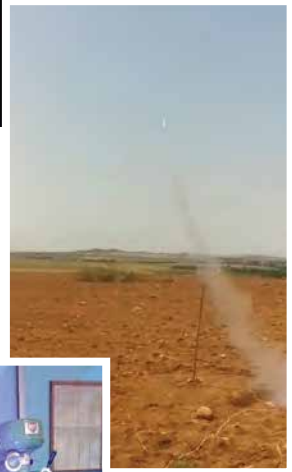
Project Team Members: Alpcan Tunç, Mehmet Safa Aysan, Ali Levent Çınar, Murat Özüm Duru and Çağatay Yıldırım

Project Supervisor: Prof. Ahmet Oral

Abstract:

Exploring the space is an interdisciplinary field that cannot be held by huge companies, even the universities should have their own space programs. The purpose of this project is to design and construct a reusable, liquid rocket with using the local and university resources and leaving a legacy about rocketry to this university. In order to be able to construct the rocket, connections are made with departments, companies and individuals. 1-D flow analysis through the nozzle is integrated with the performance and design. Simulations are performed and engine is designed after iterations. A ground test platform is designed and constructed using local resources. Three different engines are designed in case of the different conditions (from 8 to 15 bars and 30 to 60 kgs). Ignition system is being made by the team's future members. Gaseous fuel and oxidizers are selected to lower the budget significantly. A lot of steps are taken in order to create a consistent, rigid and permanent environment for rocket enthusiasts and solid moves are made to prove ourselves.



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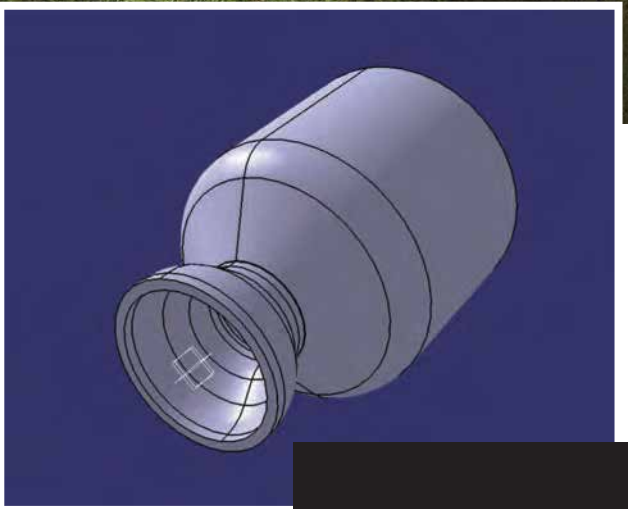
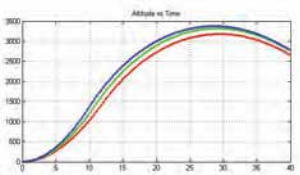
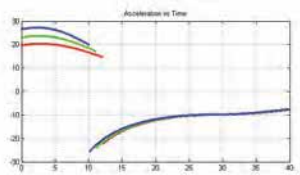
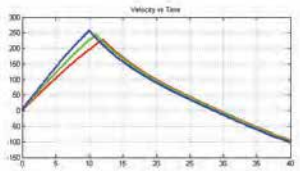
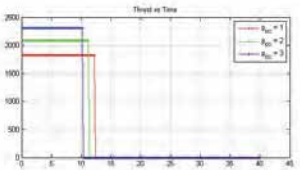










ORDOT II

Name of the Project: Quality Control of Plastics with Terahertz Spectroscopy

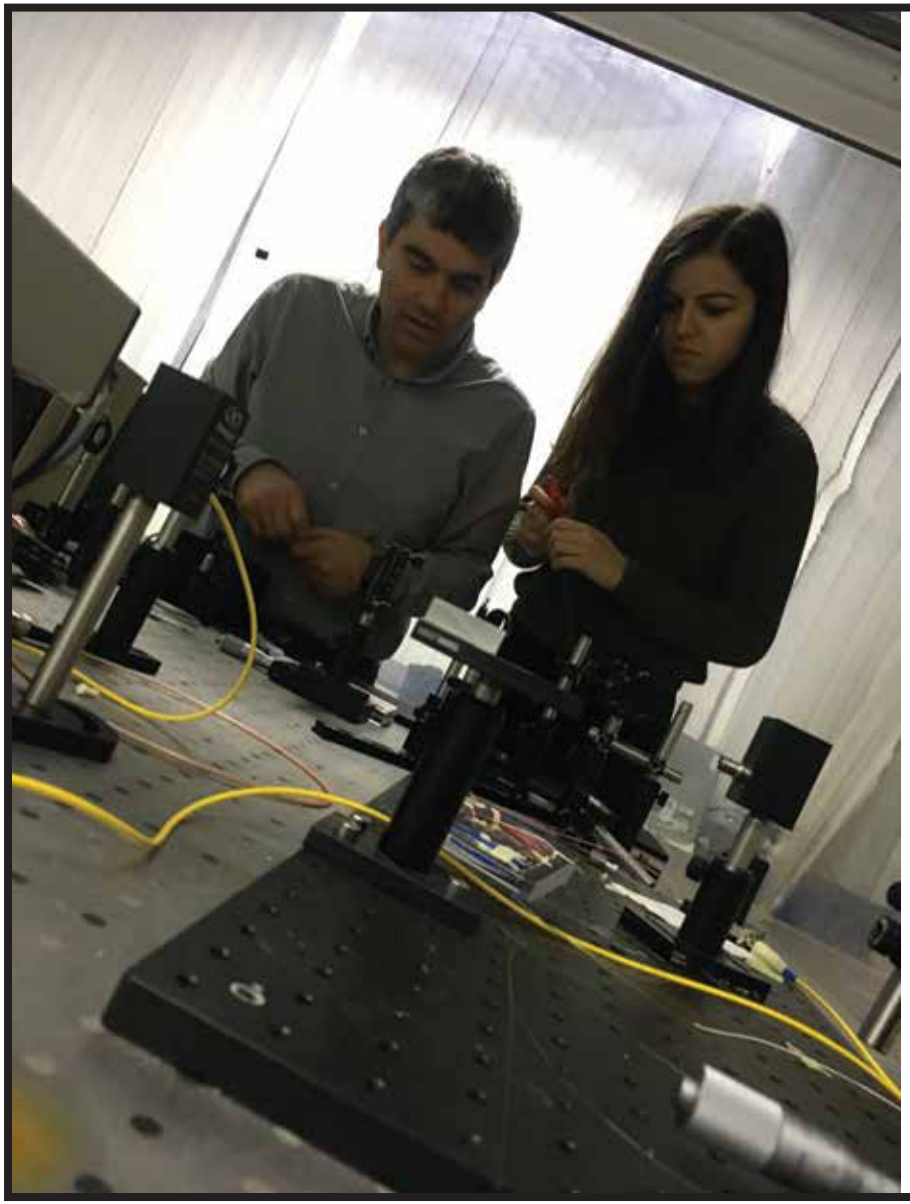
Field of Research: Physical Chemistry, Polymer Chemistry, Spectroscopy

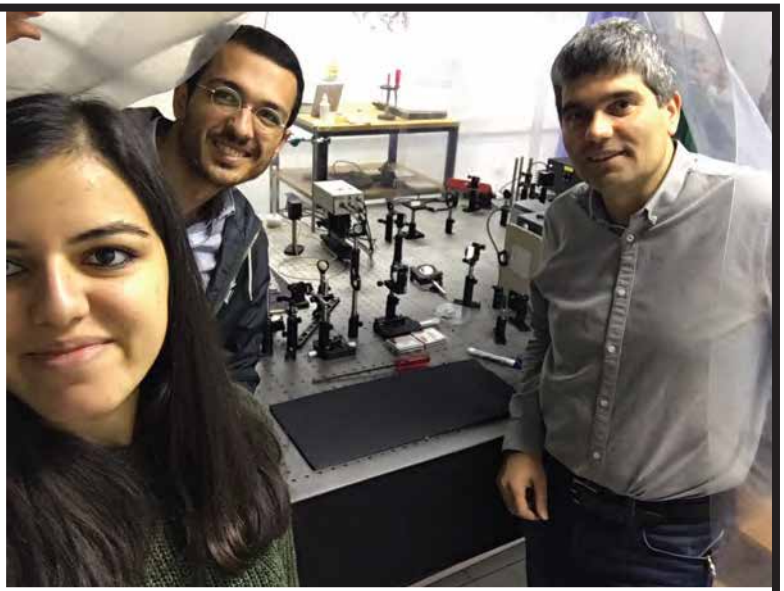
Project Team Members: Bahar Atik

Project Supervisor: Assoc. Prof. Okan Esentürk

Abstract:

Plastics are being used in wide variety of applications and have become the material of choice replacing metals, wood, glass and more. According to American Chemistry Council (ACC), yearly production reached 64.5 billion pounds, showing a 9.1 percent increase compared to 2017. Therefore, quality control of plastics is a crucial process for all industries before serving them as products. In our study we are trying to develop a nondestructive, fast and reliable method for the quality control of plastics using Terahertz Spectroscopy. By using this method, we will be able to analyze various plastic samples, see the contaminants, air bubbles and the poor welding joints which simply reduce the product's strength and quality.





Quality Control of Plastics with Terahertz Spectroscopy

Name of the Project: Simulation and Fabrication of Multi-Colored Solar Cells

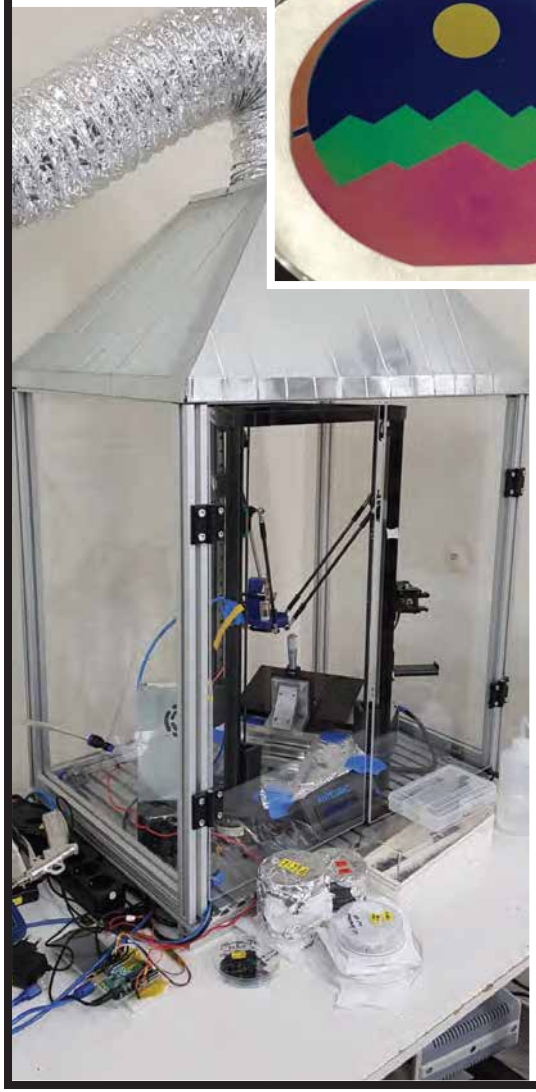
Field of Research: Solar Cell

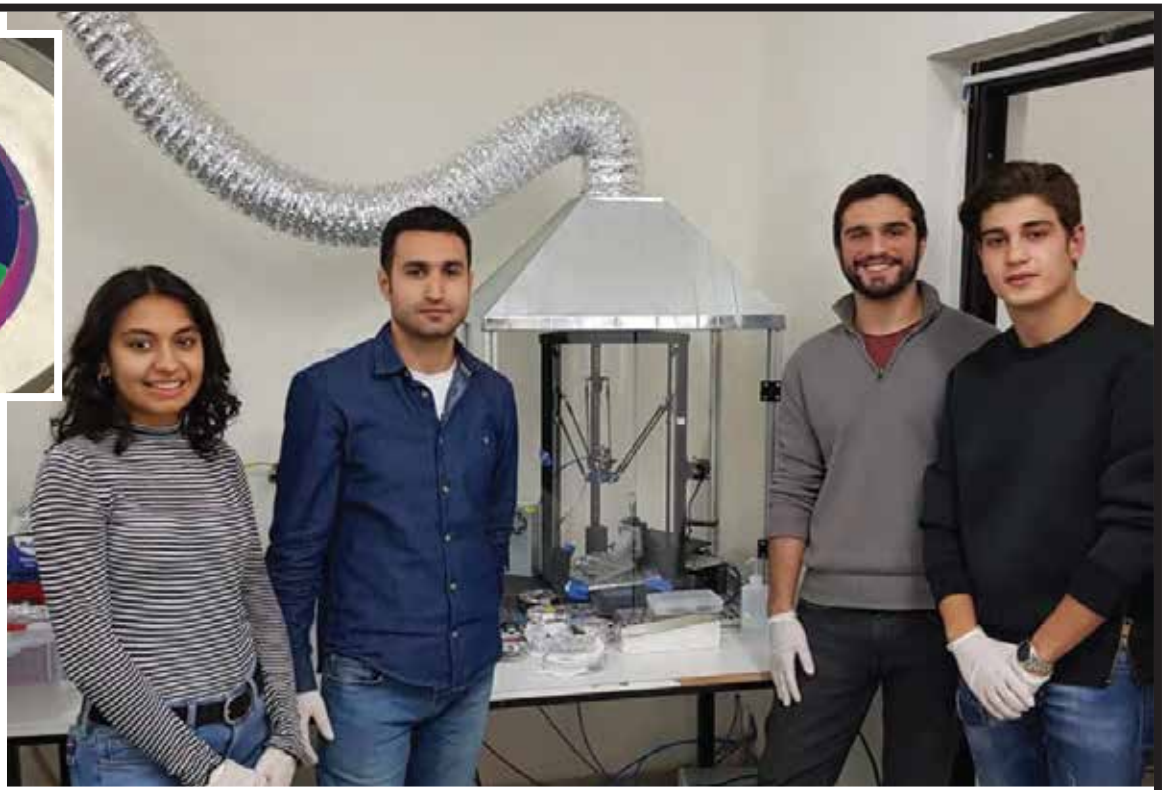
Project Team Members: Elif Cüce, Kerem Artuk, Deniz Türkay and Milad Ghasemi

Supervisor: Asst. Prof. Selçuk Yerci

Abstract:

The solar cell industry is dominated by silicon solar cells. The efficiency of the solar cells is prominent however, as the daily implementation of these devices increase aesthetic aspects also become crucial. The color of a solar cell depends on the optical interference occurring due to the Anti-Reflection Coating (ARC) layer deposited on the front surface of the solar cell. In order to coat solar cells with desired ARC layers and thicknesses there are several techniques. We have chosen spray coating as our coating technique and worked on constructing our Automated Airbrush System. After finishing optimization of spray coating parameters of several layers, we will start the fabrication of DASH/IBC solar cells which all the contacts are interdigitated at the rear surface. As soon as we achieve the expected efficiencies, we will start coloring and patterning these solar cells using the results we have obtained in our simulations.





Simulation and Fabrication of Multi-Colored Solar Cells

Name of the Project: Targeting fused fluorescent proteins to different organelles to observe FRET efficiencies

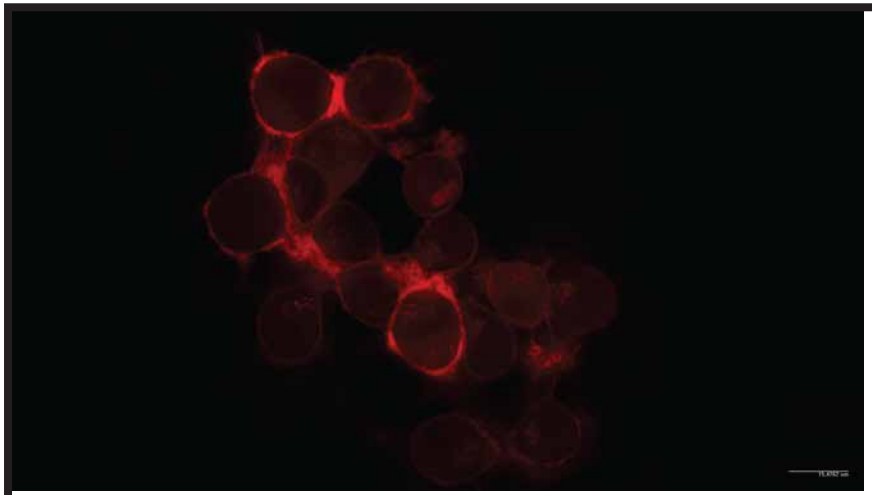
Field of Research: Cell Biology and Biophysics

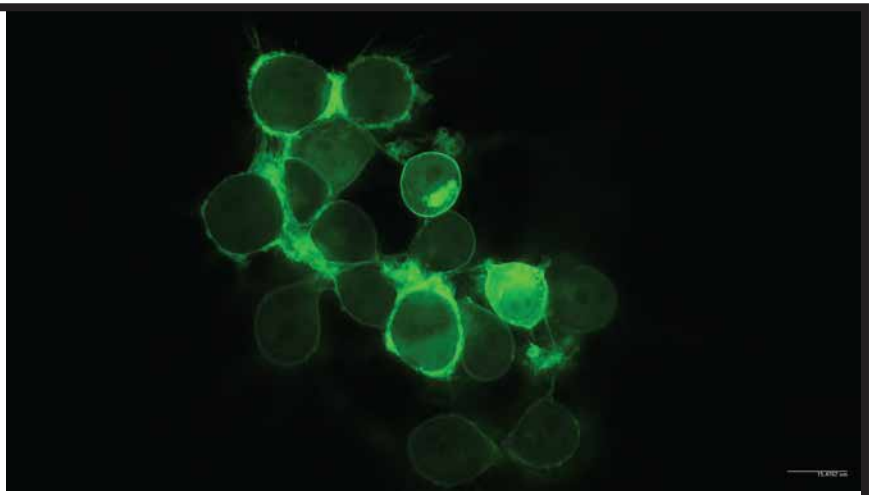
Project Team Members: Damla Temel and Aiturgan Zheenbekova

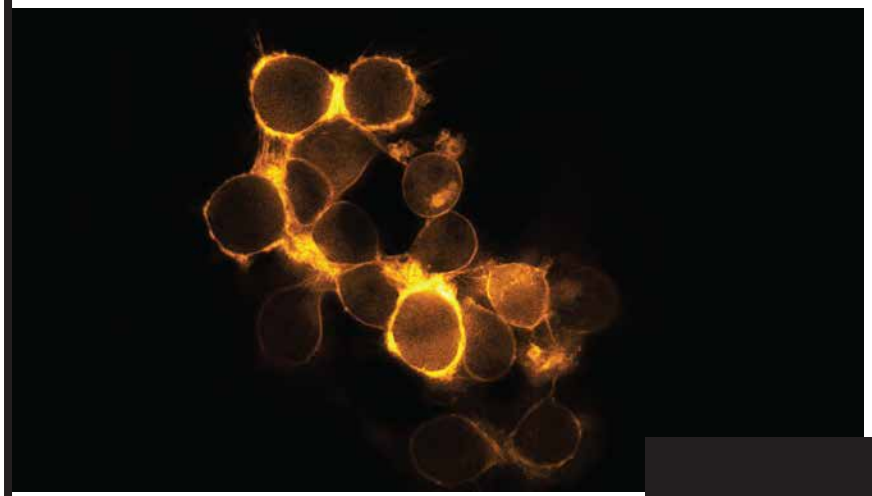
Project Supervisor: Assoc. Prof. Çağdaş Devrim Son

Abstract:

Our main goal is to localize fused fluorescent proteins (EGFP and mCherry) to different cellular locations using short signal sequences. Visualization of N2a cells transfected with fused proteins has been made in confocal microscope. FRET (Förster Resonance Energy Transfer) efficiencies of this couple also calculated and compared, to see effects of environmental conditions on the conformation of proteins. The signal sequences taken from different proteins for Plasma membrane and ER, proved to be sufficient for localization of fused protein pair. Our findings suggest that there is a significant difference between the FRET measures of proteins in plasma membrane and ER lumen. Further localizations to nucleus, peroxisome and Golgi apparatus will be performed to finalize our results.







Targeting fused fluorescent proteins to different organelles to observe FRET efficiencies

Name of the Project: Test apparatus for biaxial testing of soft tissues

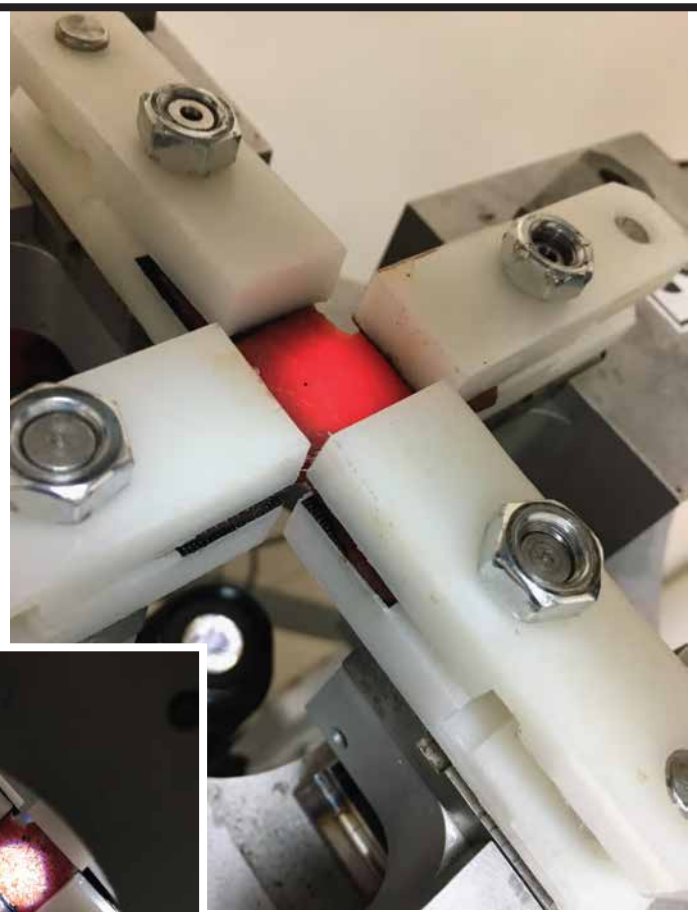
Field of Research: Solid mechanics, experimental mechanics

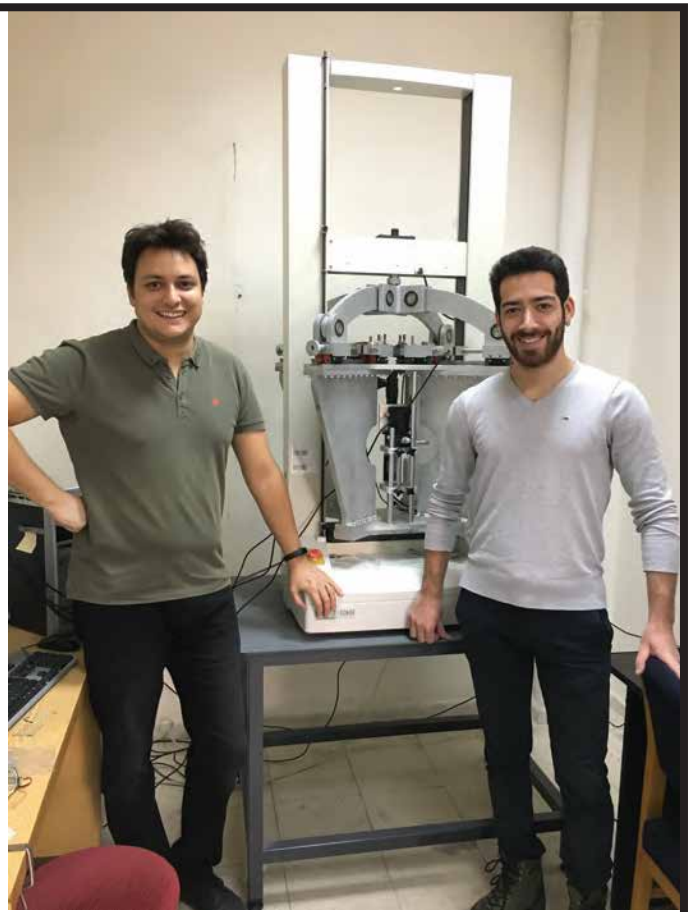
Project Team Member: Yılmaz Hasan Akın

Research Advisor: Assist. Prof. Mert Efe

Abstract:

Biaxial testing of soft tissues is important because in most cases organ tissues withstand biaxial stresses (heart, kidney etc.). In the literature mostly, uniaxial tests are described and the biaxial tests are conducted using sophisticated and expensive test machines made just for the biaxial testing of soft tissues. Our aim is to develop an apparatus, which is easily attachable to a common universal testing device. We will also design an easy-to-manufacture specimen geometry for the according apparatus. Furthermore, this will prove that we don't have to buy specialized machines for every different type of project.





Test apparatus for biaxial testing of soft tissues

Name of the Project: The Effect of Leishmania RNA Virus on the Infectivity of Leishmania major

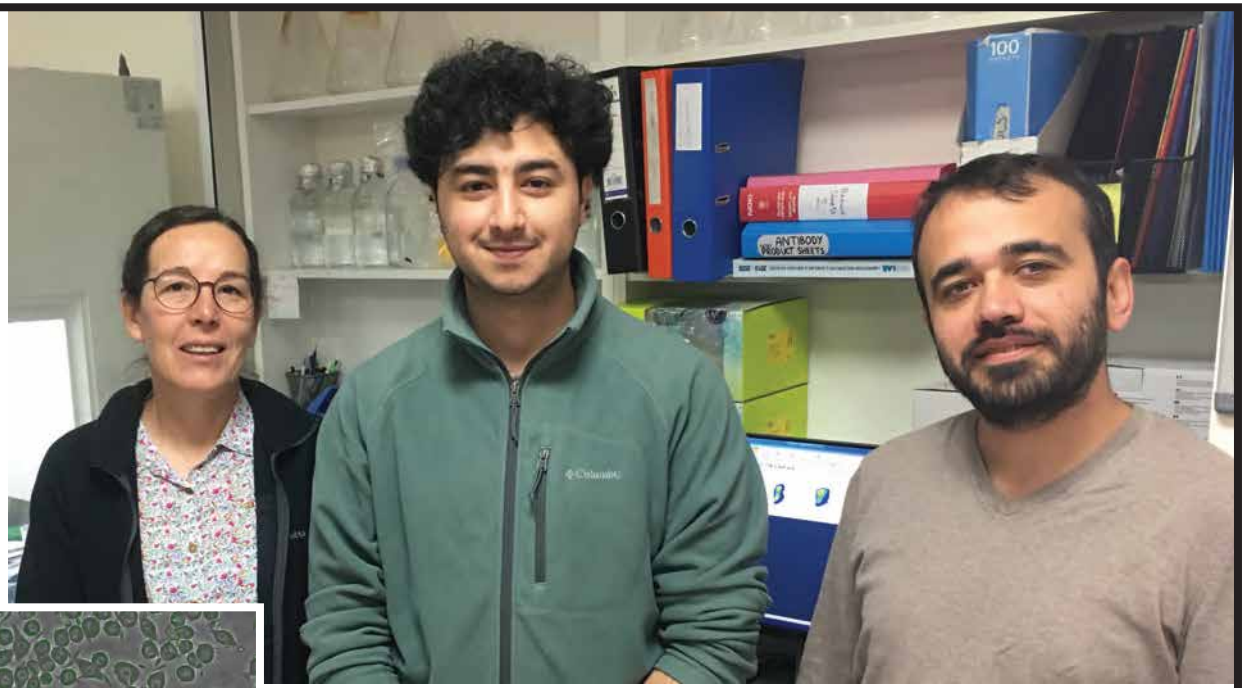
Field of Research: Immunology

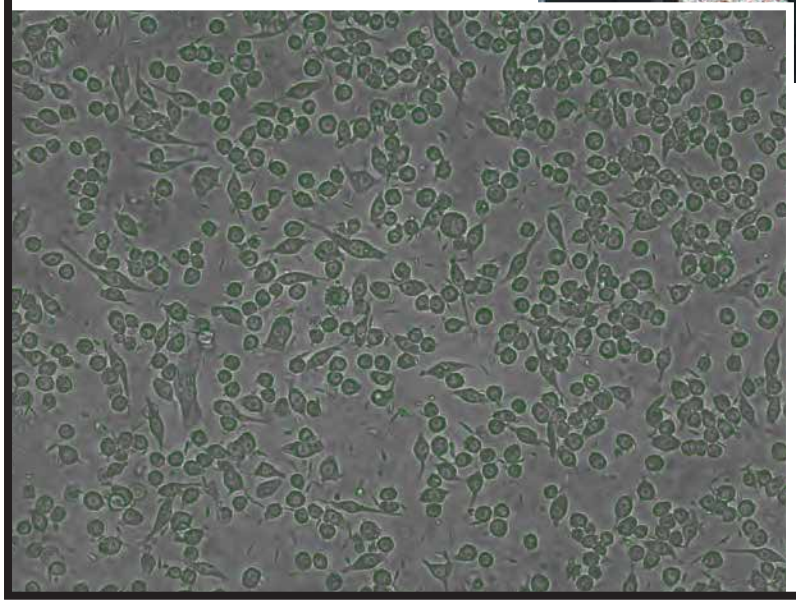
Project Team Members: Emre Mert İpekoğlu and İhsan Cihan Ayanoğlu

Project Supervisor: Prof. Mayda Gürsel

Abstract:

Leishmania parasites that are naturally transmitted to the humans by the sand-fly vectors are responsible for various types of Leishmaniasis worldwide. Previous research indicates that parasites infected by the Totiviridae family of Leishmania RNA viruses (LRV) display increased infectivity in vitro as well as exacerbate disease in patients infected with the new world species. Herein, we hypothesized that RNA virus-infected Leishmania major-an old world species- results in a significant increase in infectivity of the parasites in vitro. To test this hypothesis, we infected THP-1 human leukemic monocytic cell line and RAW mouse macrophages with LRV positive and negative parasites. Preliminary results suggest that LRV positive parasites display increased infection rate compared to LRV negative parasites in both cell types.





The Effect of Leishmania RNA Virus on the Infectivity of Leishmania major

Name of the Project: THINK

Field of Research: Embedded Systems

Project Team Members: Tahir Miriyev, Fidan Ismiyeva and Mustafa Ali Akcay

Project Supervisor: Refik Toksöz

Abstract:

The product we are developing is aimed to be a prototype of the first fully-computerized chessboard. It is designed in a way that it incorporates the largest set of capabilities ever seen in a single chessboard, such as: thousands of exercises (for any level player) picked from hundreds of chess books, tactics and strategies for developing players, educational courses for beginners, with supporting lighting effect, Analysis of matches and explanations of moves, Sharing your game through the Cloud with anyone at any location on the planet, Playing against real person, computer or virtual person, Personal progress tracking and a lot more. The global aim of creating such a product is, in essence, to help children to learn to play chess for free and more systematically, without relying on expensive personal tutoring or books. Moreover, in order to protect their health and to prevent an addiction to the digital gadgets from early years, we decided to design a wooden electronic chessboard which will remind a traditional one and will bring back the sense of playing on a wooden board, meanwhile, against a real opponent. The product is planned also to support some options useful for professional players, or simply for those who are trying to improve/advance their playing skills.

THINK

We would like to express our deep gratitude for all METU alumni and friends for their valuable support.

https://adimodtu.org.tr/projeler

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