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KU Frontier

Koç University's Research Magazine

Koç University's
Quantum Cryptology Laboratory



Cover Story

Single photons can be used in quantum cryptography systems for secure key distribution. Details are given in the article Quantum Cryptology Laboratory in this issue.



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**From the Provost**

KU Frontier's mission has been to promote research excellence by sharing the research contributions of our faculty with on and off-campus interested readers like you. Research excellence entails exploration of new scientific frontiers that shift paradigms. It requires interdisciplinary scientific inquiry which crosses the boundaries of traditional disciplines. Universities act as the engines of research excellence by creating new knowledge and developing the necessary human resources for a knowledge-based society.

Excellence in education, research and service has always been the driving force behind Koç University's mission which is "to produce the most capable graduates by providing a world-class education, to advance the frontiers of knowledge, and to contribute to the benefit of Turkey and humanity at large".

Universities can play a significant role in building, promoting and nurturing research excellence. First and foremost, we must recognize that people are the seeds of excellence. In this fourth issue of Frontier you will read the recent achievements, and research contributions of KU faculty members who are leading their fields. Regular research articles present interesting developments in the areas of nano-structured materials for energy, haptics, quantum cryptology, migration, and archaeology. In addition to the regular research articles this issue also includes descriptions of two recent chairs and one research center. The holder of the newly established MIGROS Professor of Marketing Prof. Zeynep Gürhan Canlı describes her research and the chair professorship. Prof. Bahar Rumelili has been awarded a Jean Monnet Chair in 2008. In her article she talks about her research in general and the Chair. Finally Dean Prof. Tankut Centel presents the mission, and activities of Dr. Nüsret & Mrs. Semahat Arsel International Business Law Research Center.

This past year four faculty members Seda Ertaç, Seda Kızılel, Barış Coşkunüzler and Kazım Büyükboduk received the competitive Marie Curie Reintegration grants. We share with you the future research plans of these faculty members.

Koç University was selected as the hosting institution of the Scientific Council Meeting of the European Research Council (ERC). It was the first time the delegation, led by the President of the ERC, Prof. Fotis Kafatos, convened in Turkey. During their stay on March 11-13, KU faculty members had the opportunity to meet the council members. Inside the issue you will see more details under Research News.

I hope that you will enjoy reading KU Frontier, and continue sending us your comments.

Yaman Arkun
Provost

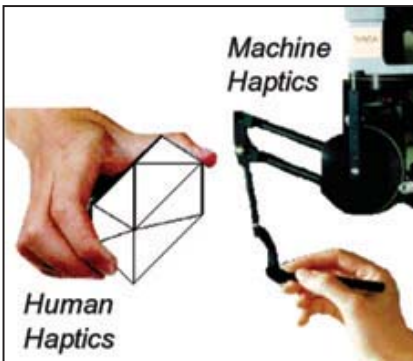
Haptics: Sense of Touch

The research activities in Robotics and Mechatronics Laboratory (RML) are mainly focused on investigating multi-modal sensory interactions between humans and machines. In particular, we are interested in human and machine haptics for real, virtual, and teleoperated worlds.

Çağatay Başdoğan

Although the other sensory modalities such as vision and audition have been investigated in detail, our most intimate sense, touch, has been somehow neglected until the last decade. However, the sense of touch (haptics) is a modality that we use so often in our daily lives. Can you image a day pass in your life without touching, exploring, or manipulating something using your hands? What strategies do you follow when you search for your office or car keys in your pocket using your fingers? Is it really possible to communicate with others without using hand gestures? When you purchase a fabric, why do feel a need to touch its surface? Can a surgeon operate on you without the sense of touch? Have you tempted to touch a Van Gogh painting to deeply understand how he created those sharp edges and contours?

With the recent advances in hardware and software technologies in haptics, it is now possible to find better answers to some of these questions. The number of research studies on haptics has grown exponentially over the last decade. As a result, there are now three major conferences on haptics in the world: IEEE Haptics Symposium, EuroHaptics, and World Haptics (this is the largest haptics conference in the world and will be held in Istanbul in 2011). There is also a new journal, published by IEEE, dedicated to haptics only.

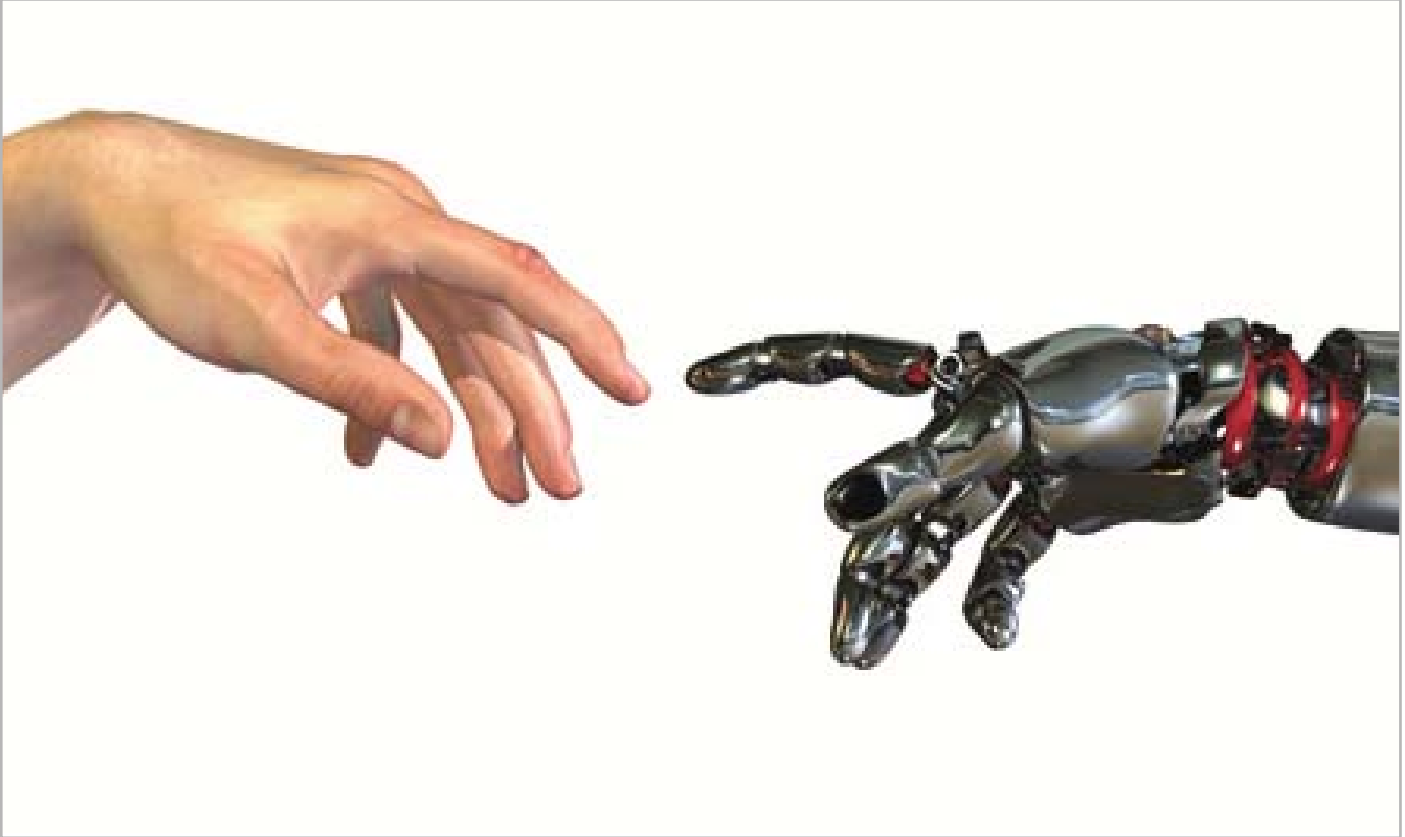


Robotics and Mechatronics Laboratory (RML) at Koç University is focused on investigating haptic (touch) interactions between humans and machines.



The group picture showing the members of RML (April 2009). The current graduate students are Bilal Orun (M.S.), Sina Ocal (M.S.), Umut Ozcan (M.S.), Gulay Ergul (M.S.), Selman Cebeci (M.S.), Can Gokgol (M.S.), Yunus Emre Has (M.S.), Baybora Bektas (Ph.D.), and Ayse Kucukyilmaz (Ph.D.). The alumni (not shown in the picture) are Mert Sedef (at UNC), Aydin Varol (at EPFL Lausanne), Nesra Yannier (at Stanford), Evren Samur (at EPFL Lausanne), Erk Subasi (at ETH Zurich), Ihsan Guney (at Ford Motor Company R&D Division), Ibrahim Bukusoglu (at Ford Motor Company R&D Division), Ali Sengul (at ETH Zurich), A. Cengiz Oztireli (at ETH Zurich), Sertac Karaman (at MIT).

The research activities in Robotics and Mechatronics Laboratory (RML) are mainly focused on investigating multi-modal sensory interactions between humans and machines. In particular, we are interested in human and machine haptics for real, virtual, and teleoperated worlds. For this purpose, we conduct highly interdisciplinary research at the intersection of mechanical engineering and computer science with applications to different fields. The students working in the RML accumulate knowledge and hands-on experience in the areas of electro-mechanical systems, control engineering, mechanical design, biomechanics, robotics, physics-based modeling and simulation, computer graphics, and virtual environments technology.



The number of research studies on haptics has grown exponentially over the last decade. As a result, there are now three major conferences on haptics in the world.

Below are the short summaries of the ongoing research projects at RML.

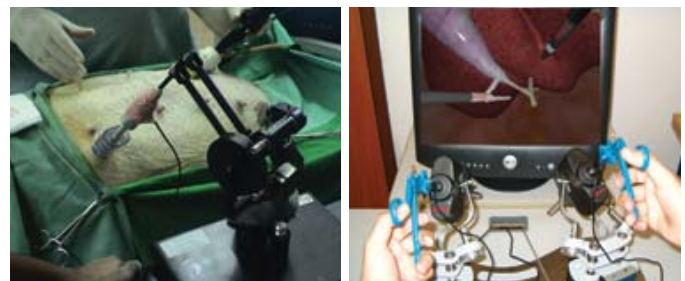
Research Projects at RML

A) Biomedical Robotics and Simulation

A1) Virtual Surgery: Visual and Haptic Simulation of Soft Organ Tissue Behavior: Surgical training has been based traditionally on the “apprenticeship” model, in which the novice surgeon is trained with small groups of peers and superiors, over time, in the course of patient care. However, it is known that this approach has several shortcomings. As an alternative to this traditional approach, we are currently developing a laparoscopic surgical simulator to train medical personnel in virtual environments. Our laparoscopic surgical trainer displays 3D graphical models of virtual organs on the computer screen as well as the interaction forces between the surgical instruments and organs to the user through the force-reflecting haptic devices.

A2) Haptic Recording and Characterization of Soft Tissue

Properties: The lack of experimental data in current literature on material properties of soft organ tissues in living condition has been a significant obstacle in the development of realistic soft tissue models for virtual reality based surgical simulators used in medical training. However, collecting data from live organ tissues in situ is a highly challenging task for several reasons. We developed a robotic indenter to measure soft tissue properties in abdominal region during a laparoscopic surgery. Using the robotic indenter, force versus displacement and force versus time responses of pig liver under static and dynamic loading conditions were successfully measured in collaboration with medical staff from Istanbul University Medical School to characterize its material properties.



Robotics and Mechatronics Laboratory (RML) at Koç University develops a surgical simulator to be used in medical training. a) First, a robotic indenter is developed to record and characterize mechanical properties of soft organ tissues. b) These properties are then integrated into our surgical simulator to display deformation and force response of the organs to a trainee through a visual and haptic display (force reflecting robotic arm) respectively.

PUBLICATIONS:

1. Sedef, M., Samur, E., Basdogan, C., 2006. "Visual and Haptic Simulation of Linear Viscoelastic Tissue Behavior Based on Experimental Data", *Proceedings of the 14 th IEEE Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, pp. 201-208, March 25-27, Washington D.C (nominated to the best paper award).
2. Sedef, M., Samur, E., Basdogan, C., 2006, "Real-time Finite-Element Simulation of Linear Viscoelastic Tissue Behavior Based on Experimental Data", *IEEE Computer Graphics and Applications*, Vol. 26, No. 5, pp. 58-68.
3. Basdogan, C., Sedef, M., Harders, M., Wesarg, S., 2007, "Virtual Reality Supported Simulators for Training in Minimally Invasive Surgery", *IEEE Computer Graphics and Applications*, Vol. 27, No.2, pp. 54-66.
4. Samur, E., Sedef, M., Basdogan, C., Avtan, L., Duzgun, O., 2005. "A Robotic Indenter for Minimally Invasive Characterization of Soft Tissues". *Proceedings of the 19th International Conference on Computer Assisted Radiology and Surgery*, Vol. 1281, pp. 713-718, June, Berlin.
5. Samur, E., Sedef, M., Basdogan, C., Avtan, L., Duzgun, O., 2006, "A Robotic Indenter for Minimally Invasive Measurement and Characterization of Soft Tissue Response", *Medical Image Analysis*, Vol. 11, No.4, pp. 361-373.

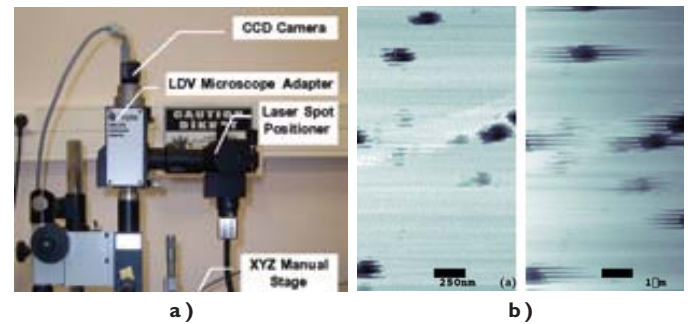
B) Micro/Nano-Mechatronics and Robotics

B1) Manipulation of Nano Particles Using Haptic Feedback:

Nano-manipulation refers to controlled movement of nano-scale objects with high precision. Fully automated nano-manipulation systems have not been realized yet due to the lack of online visual feedback during manipulations and the uncertainties during the contact interactions at nano scale. However one can better appreciate the potential role that the fully automated nano manipulation systems will play in the future if we consider the fact that fully automated robotic systems and assembly lines have started a new industrial revolution in 1980's. We have developed an Atomic Force Microscopy (AFM) set-up and a virtual reality tool-kit for tele-manipulating nano-scale particles with haptic feedback to the user to provide better guidance and control. The set-up includes a self-actuated piezoelectric probe for pushing nano-scale particles, a Laser Doppler Vibrometer (LDV) for sensing the deflection of the probe, a piezo-actuated nano-stage for Z-positioning of the particles with respect to the probe, and a haptic device for displaying the contact forces between the probe and the particles to the user. Using the proposed set-up, gold nano-particles, 200 nm in diameter (approximately, one-thousandth the diameter of human hair) were manipulated successfully.

B2) Nano Scanning Using a Piezo-actuated Bimorph Probe:

To be able to manipulate nano-scale objects lying on a surface, their location and shape must be determined accurately via scanning. For this purpose, a new scanning approach, called Adaptive Q-control, for tapping-mode AFM is introduced and implemented on the experimental set-up discussed above. In the standard Q-control, the effective Q-factor of the scanning probe is adjusted prior to the scanning nano-scale surfaces. However, there is a trade-off in setting the effective Q-factor of an AFM probe: the Q-factor is either increased to reduce the tapping forces or decreased to increase the maximum achievable scan speed. Realizing these two benefits simultaneously using the standard Q-control is not possible. In adaptive Q-control, the Q-factor of the probe is set to an initial value as in standard Q-control, but then modified on the fly during scanning when necessary to achieve those two benefits at the same time.

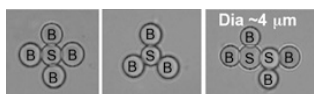
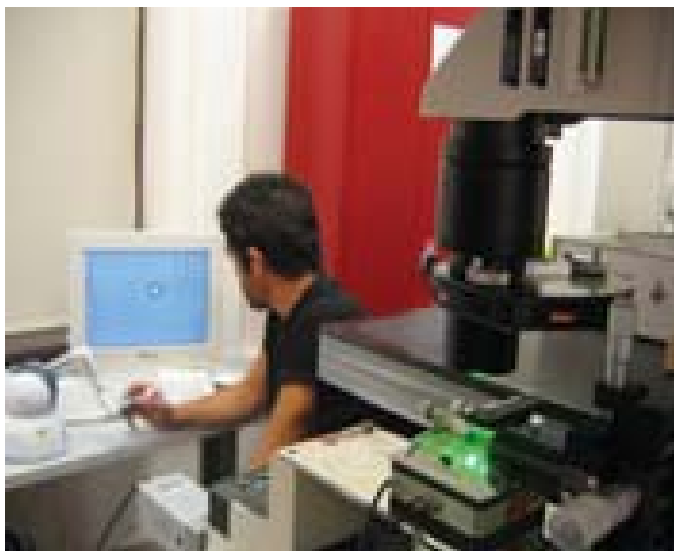


Robotics and Mechatronics Laboratory (RML) at Koc University develops hardware and software solutions for better nano scanning and nano-manipulation: **a)** New control algorithms are developed to scan nano-size particles and surfaces faster and more accurately. **b)** Gold particles having 200 nm diameter (approximately, one-thousandth the diameter of human hair) are manipulated using the tip of an AFM probe and a haptic device providing force feedback to the user during manipulations.

B3) Micro Manipulation Using Optical Tweezers and Haptic Feedback:

In collaboration with Prof. Kiraz at Physics Department of Koç University, we tele-manipulated microspheres having diameters of 3-4 μm and floating in a fluid solution using optical tweezers and a haptic device to form various patterns of coupled optical microsphere resonators. For this purpose, biotin-coated microspheres (labeled as "B" in the figure) trapped by a laser beam are steered and chemically bound to a streptavidin-coated sphere (labeled as "S" in the figure) one by one using a XYZ piezo scanner controlled by the haptic device. Initially, the positions of all spheres in the scene are detected using a CCD camera. A collision-free path for the manipulated sphere is then generated by the artificial potential field approach used for path planning in robotics. During manipulations, the forces acting on the sphere due to the viscosity of the fluid and the artificial potential field are scaled and displayed to the user through the haptic device for better guidance and control.

We are currently developing a laparoscopic surgical simulator to train medical personnel in virtual environments



We successfully manipulated micro-spheres in a fluid solution using a haptic device connected to an optical tweezers to form patterns of coupled optical micro-resonators. To our knowledge, this is one of the first studies showing the benefits of haptic feedback in optical manipulation

PUBLICATIONS:

1. Gunev, I., Varol, A., Karaman, S., Basdogan, C., 2007, "Adaptive Q -control for Tapping-mode Nano-scanning Using a Piezo-actuated Bimorph Probe", *Review of Scientific Instruments*, Vol. 78, No. 4.
2. Varol, A., Gunev, I., Orun, B., Basdogan, C., 2008, "Numerical Simulation of Nano-Scanning in Intermittent Contact-mode AFM under Q -control", *Nanotechnology*, 19, 075503.
3. Varol, A., Gunev, I., Basdogan, C., 2006. "A Virtual Reality Toolkit for Path Planning and Manipulation at Nano-Scale", *Proceedings of the 14th IEEE Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, pp. 485-489, March 25-27, Washington D.C.
4. Bukusoglu, I., Basdogan, C., Kiraz, A., Kurt, A., 2006. "Haptic Manipulation of Microspheres with Optical Tweezers", *Proceedings of the 14th IEEE Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, pp. 361-

365, March 25-27, Washington D.C.

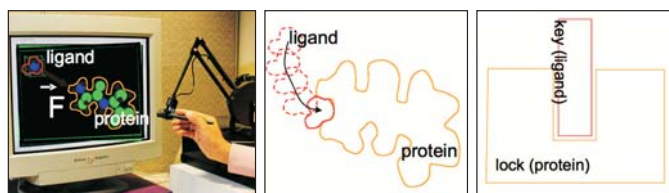
5. Bukusoglu, I., Basdogan, C., Kiraz, A., Kurt, A., 2008. "Haptic Manipulation of Microspheres Using Optical Tweezers Under the Guidance of Artificial Force Fields", *Presence: Teleoperators and Virtual Environments*, MIT Press, Vol. 17, No. 4, pp. 344-364.

6. Basdogan, C., Kiraz, A., Bukusoglu, I., Varol, A., Doganay, S., 2007, "Haptic Guidance for Improved Task Performance in Steering Microparticles with Optical Tweezers", *Optics Express*, Vol. 15, No. 18, pp. 11616-11621.

C) Graphical and Haptic Visualization

C1) A New Haptic Interaction and Visualization Approach for Rigid Molecular Docking in Virtual Environments:

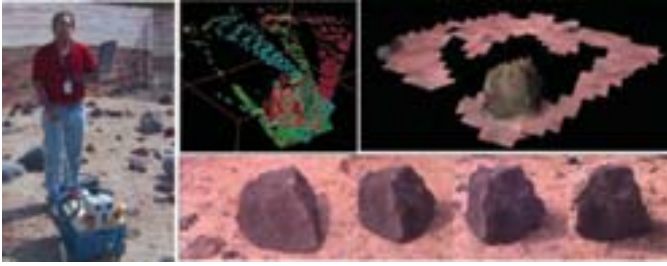
Many biological activities take place through the physicochemical interaction of two molecules. This interaction occurs when one of the molecules finds a suitable location on the surface of the other for binding. This process is known as molecular docking and has applications to drug design. If we can determine which molecule binds to a particular protein molecule and how the protein interacts with the bonded molecule, we can possibly enhance or inhibit its activities. This information, in turn, can be used to develop new drugs that are more effective against diseases. We propose a new approach for the solution of rigid-body molecular docking problem based on haptic interaction. In our approach, a drug molecule is manipulated by the user in virtual environments and inserted into the cavities of a rigid protein molecule one by one to search for true binding cavity while the molecular interaction forces between the drug and protein atoms are scaled and conveyed to the user via a haptic device for guidance.



The visual and haptic interactions between a ligand and a protein molecule are simulated in virtual environments to help the user discover the binding site and binding configuration more intuitively in molecular docking.

C2) Graphical and Haptic Rendering of 3D Virtual Objects and Point Clouds:

We have developed computationally efficient methods for reconstruction of 3D graphical models of an object from multiple range images acquired by stereo cameras from different angles. These models can then be transmitted to a remote site progressively over the internet for graphical and haptic visualization. This technology has applications to cell phones, remote sensing, mobile robotics, medical imaging,



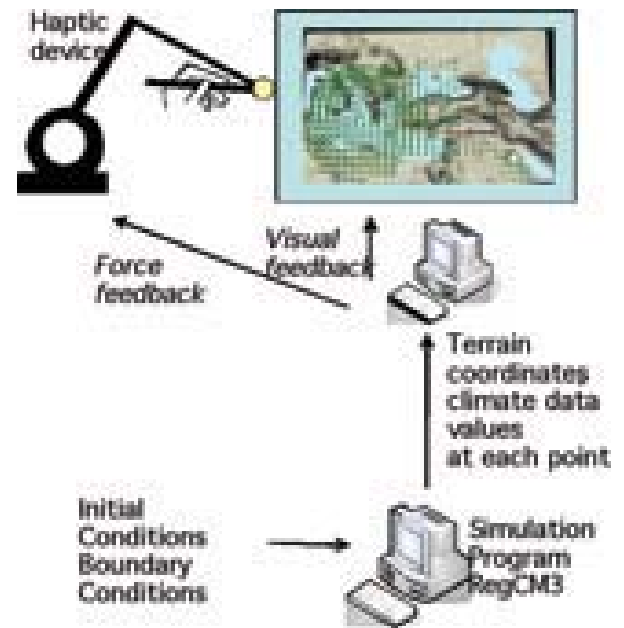
Using a mobile platform, we acquired 2D stereo images of a rock from different angles. Multi-resolution and three-dimensional models of the rock are reconstructed from these images using the 3D reconstruction and registration techniques. These models are then transmitted to a remote site progressively over the internet for graphical and haptic visualization.

We have developed computationally efficient methods for reconstruction of 3D graphical models of an object from multiple range images acquired by stereo cameras from different angles.

architectural reconstruction, and many more. Our approach involves four main steps: a) data acquisition: point clouds (PCs) are generated from stereo images captured by the cameras, b) registration: the PCs are correctly positioned and oriented with respect to each other and fused to construct a 3D volumetric representation of the object being reconstructed, c) transmission: the volumetric data is encoded and progressively transmitted to the remote site over the internet, d) visualization: a surface model is reconstructed from the transmitted data at the remote site and displayed to a user.

C3) Using Haptics to Convey Cause and Effect Relations in Climate Visualization In collaboration with Prof. Serdar Taşiran of Koç University and Prof. Ömer Şen of Istanbul Technical University, we investigated the potential role of haptics in climate visualization. In existing approaches to climate visualization, different dimensions of climate data such as temperature, humidity, wind, precipitation, and cloud water are typically represented using different visual markers and dimensions such as color, size, intensity, and orientation. However, since the number of dimensions in climate data is large and climate data needs to be represented in connection with the topography, purely visual representations overwhelm users. Rather than overloading the visual channel, we propose an alternative approach in which some of the climate information is displayed through the haptic channel in order to alleviate the perceptual and cognitive load of the user. In

this approach, haptic feedback is further used to provide guidance while exploring climate data in order to enable natural and intuitive learning of cause and effect relationships between climate variables. Our experiments with 33 human subjects showed that haptic feedback significantly improves the understanding of climate data and the cause and effect relations between climate variables as well as the interpretation of the variations in climate due to changes in topography.

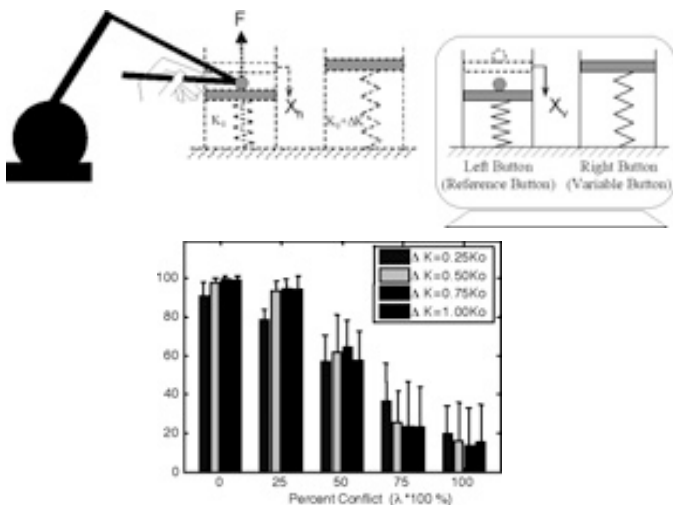


Using haptic devices, we investigated the cause and effect relations between the variables in climate visualization in virtual environments. To our knowledge, this is one of the first studies showing the benefits of haptics in climate visualization. The news about our work appeared in popular science magazine New-Scientist Tech, several internet-based news portals, and also in local newspapers and TV channels.

C4) Visual and Haptic Perception of Object Softness in Virtual Environments: For virtual environments (VEs) to be interactive and immersive, sensory modalities have to be integrated into virtual reality (VR) systems in an effective and efficient manner. One of the goals of our research is to augment the effectiveness of a VE by displaying these sensory modalities in an ordered or altered manner to a human operator. To achieve this goal, we need a better understanding of human perceptual, cognitive, and motor control skills in a multimodal VE. With this goal in our mind, we designed and conducted human experiments to investigate the influence of visual and haptic information on perception of object softness in a multimodal VE. The results of our experiments show that visual position information is preferred over haptic hand position information in the perception of object softness and a single variable named Apparent Stiffness Difference can predict the pattern of human

We have developed an AFM set-up and a virtual reality tool-kit for tele-manipulating nano-scale particles with haptic feedback to the user to provide better guidance and control.

stiffness perception under manipulated conflict. The results also show that perspective cues are important in human softness perception and our perceptual system compensates for the deficiencies of each modality such that the sensory information coming from visual and haptic channels is fused in an optimal manner.



We designed and conducted human experiments to investigate the influence of visual and haptic information on perception of object softness in a multimodal VE: a) A pair of soft virtual buttons was displayed to the subjects during the experiments. Subjects could view the visual deformation of each button on a computer monitor and/or feel its stiffness through a stylus connected to the end-effector of a haptic interface device when it is pressed. b) The results of the experiments show that visual position information is preferred over haptic hand position information in the perception of object stiffness under manipulated conflict.

PUBLICATIONS:

1. Subasi, E., Basdogan, C., 2006, "A New Approach to Molecular Docking in Virtual Environments with Haptic Feedback", *Proceedings of EuroHaptics Conference*, pp. 141-145, July 3-6, Paris.
2. Subasi, E., Basdogan, C., 2008, "A New Haptic Interaction and Visualization Approach for Rigid Molecular Docking in Virtual Environments", *Presence: Teleoperators and Virtual Environments*, MIT Press, Vol. 17, No.1, pp. 73-90.
3. Basdogan, C., 2007, "From 2D images to 3D Tangible

Models: Autostereoscopic and Haptic Visualization of Martian Rocks in Virtual Environments", *Presence: Teleoperators and Virtual Environments*, MIT Press, Vol. 16, No. 1, pp. 1-15 (some pictures from the paper appeared in the front cover of the journal and the paper is listed 5th in the top 25 most-downloaded articles of the journal for all times).

4. Oztireli, C., Basdogan C., 2008. "A New Feature-Based Registration Method for Robust and Efficient Rigid-Body Registration of Point Clouds", *Visual Computer*, Vol. 24, pp. 679-688.

5. Yannier, N., Basdogan, C., Tasiran, S., Sen, O.L., 2008, "Using Haptics to Convey Cause and Effect Relations in Climate Visualization", "Using Haptics to Convey Cause and Effect Relations in Climate Visualization", *IEEE Transactions on Haptics*, Vol. 1, No. 2, pp. 130-141.



Çagatay Başdoğan is a member of faculty in College of Engineering at Koç University. Before joining to Koç University, he was a senior member of technical staff at NASA-Jet Propulsion Laboratory of California Institute of Technology from 1999 to 2002. He moved to JPL from Massachusetts Institute of Technology where he was a research scientist from 1996 to 1999. Dr. Başdoğan received his Ph.D. degree from Southern Methodist University in 1994 and worked for a company at Northwestern University Research Park for two years before moving to MIT. Dr. Başdoğan conducts research in the areas of human-machine interfaces, biomechanics, control systems, robotics, mechatronics, computer graphics, and virtual reality technology.

First Industry-Sponsored Named Chair in Turkey: Migros Professor of Marketing

Prof. Zeynep Gürhan-Canlı has been appointed as Migros Professor of Marketing at Koç University, the first industry supported named chair position in Turkey. Prof. Gürhan-Canlı will hold this position for 5 years.

Zeynep Gürhan-Canlı

Named chair professor (e.g., Migros Professor of Marketing) is generally a senior full professor who is awarded a specific, endowed chair that has been sponsored by a fund, a person, or the like. Chaired professorship is very common in the US, and an increasingly popular practice in Europe. The objective of this position is to support scientific research through established and internationally acknowledged scholars, increasing their expendable resources. In some universities, named chair positions can be awarded to younger faculty for shorter periods of time, to support development of promising researchers. In practice, persons or institutions that wish to support the university can grant a fund bearing their name to the university, under the authority and supervision of the named professor. The funds may be allocated both in the form of research expenditures and a direct addition to the professor's income. However, financial gains are less significant compared to the prestige and the honor of being identified as a distinctive scholar.

For the first time in Turkey, Migros and Koç University has partnered to create such chair, which will support the ongoing research in the marketing field. This practice will also tighten the bonds between academia and business, accelerating the diffusion of most updated marketing knowledge and recent practices between the involved parties. Creating named chairs is an important way by which companies can contribute to universities. Migros Chair has been a first and is already operational in facilitating specific research projects conducted by Prof. Gürhan-Canlı.

About Prof. Zeynep Gürhan-Canlı

Prof. Zeynep Gürhan-Canlı completed her Ph.D. in marketing



at New York University Stern School of Business. Prior to joining Koç University, she was a tenured Associate Professor at University of Michigan. Her research appeared in leading scientific journals such as Journal of Consumer Research and Journal of Marketing Research. In recognition of her expertise in the area of consumer behavior, she serves on the Editorial Review Boards of Journal of Consumer Research, Journal of Marketing and Journal of International Marketing. She is the area editor for Journal of Consumer Psychology and International Journal of Research in Marketing. She has been invited to several doctoral consortia as a faculty representative, and is currently the Ph.D. Program Director in Business Administration at Koç University. She is also actively working with doctoral students interested in consumer behavior.

Prof. Gürhan-Canlı has received several awards for her research. A recent study published in the *Journal of Marketing* cited her among the top 50 most prolific scholars in the leading marketing journals during 1982-2006 by adjusted publication rate. Her research on consumer behavior primarily focused on consumer information processing in relation to brand image, corporate image, and country-of-origin information.

In today's economy, the importance of branding has increased as a result of the proliferation of brand extensions and efforts to focus on a few master brands to improve efficiency and competitiveness. In addition, consumers utilize brand names as cues in evaluating individual products and sometimes rely on such cues at the expense of attribute cues. Prof. Gürhan-Canlı's research focused on understanding how consumers evaluate family brand names (e.g., Sony, Samsung) on the basis of information about its individual products (Ahluwalia and Gürhan-Canlı 2000; Gürhan-Canlı 2003; Gürhan-Canlı and Maheswaran 1998). For example, her research suggests that motivation to process information and accessibility of information about brand extensions are important moderators that influence the extent to which family brand names are likely to be diluted or enhanced. When motivation or accessibility of information is high, negative information about individual products leads to dilution and positive information leads to enhancement of family brand names. However, when motivation or accessibility is low, dilution and enhancement occurs as a function of information diagnosticity or typicality of the brand extension.

Prof. Gürhan-Canlı's current research projects are also in the general area of branding but utilize new theoretical perspectives.

Corporate image (CI) refers to the overall perceptions about a company (i.e., not its individual products) in terms of evaluation/liking, as well as beliefs about its specific dimensions (e.g., innovation, trustworthiness, social responsibility). For example, BP positions itself as an environmentally responsible company and 3M has been known for innovation. Companies spend significant amounts of money and effort to build their CI and consumer's cynicism and negative sentiment toward companies have been on the rise. Prof. Gürhan-Canlı's research identified when and how CI affects product evaluations and

purchase intentions (Gürhan-Canlı and Batra 2004; Sen, Gürhan-Canlı, and Morwitz 2001; Yoon, Gürhan-Canlı, and Schwarz 2006) and inferences about consumers on the basis of their connections to companies (Yoon, Gürhan-Canlı, and Bozok 2006). For example, her research shows that consumers are more likely to rely on corporate image when they perceive risk. Her research on corporate social responsibility (CSR) suggests that CSR activities improve a company's image when consumers attribute sincere motives, are ineffective when sincerity of motives is ambiguous, and hurt the company's image when motives are perceived as insincere. Variables affecting perceived sincerity include the congruence of the supported cause with what is known about the company, the source through which consumers learn about CSR, and the ratio of CSR contributions and CSR related advertising. Supporting incongruent causes hurts the company, in particular when consumers learn about it from a company source. This backfire effect can be overcome by spending more on CSR than advertising. Conversely, spending more on advertising than CSR hurts a company even when it has a positive reputation and supports a congruent cause.

Another important cue that consumers rely on is country-of-origin. Prof. Gürhan-Canlı's research addressed the determinants of country-of-origin evaluations (Gürhan-Canlı and Maheswaran 2000b) and cross-cultural differences in the use of country-of-origin information (Gürhan-Canlı and Maheswaran 2000a). In a recent paper (Swaminathan, Page, and Gürhan-Canlı 2007), she and her colleagues propose that consumers form relationships with brands at the individual- (i.e., self-concept connection) or group-level (i.e., country-of-origin). Self-construal determines which connection would be more salient at a time and influence the extent to which consumers resist negative information about brands.

Prof. Gürhan-Canlı's current research projects are also in the general area of branding but utilize new theoretical perspectives. Some selected findings from her on-going research are as follow:

Swaminathan and Gürhan-Canlı (2009) examine consumers' reactions to two alternative co-branding strategies: complementary co-branding (which involves brands with dissimilar brand benefits) and supplementary co-branding (which involves brands with similar brand benefits), both of which are widely used by practitioners to build brand equity. This research suggests that consumers evaluate a co-brand consistent with concept combination literature.

Swaminathan, Loughran, and Gürhan-Canlı (2009) investigate the impact of interpersonal attachment styles on consumers' reactions to negative brand information. The results across three studies suggest that attachment styles (based on dimensions of anxiety and avoidance) play a significant role in consumers' reactions to negative information regarding a brand. For example, when high anxiety-high avoidance (fearful) and low anxiety-low avoidance (secure) attachment styles are salient, consumers change their brand evaluations following exposure to negative information. In contrast, when high anxiety-low avoidance (preoccupied) and low anxiety-low avoidance (dismissing) attachment styles are salient, brand evaluations do not change in response to negative information.

Monga and Gürhan-Canlı (2009) propose that romantic mindsets can influence brand extension evaluations, particularly for males. Specifically, they find that romantic mindsets (e.g., thinking about a mate) induce male consumers to engage in relational processing, increasing fit perceptions and evaluations for dissimilar brand extensions. These differences are more likely to emerge for extensions of narrow brands (versus broad brands), and when cognitive resources are available (versus unavailable).

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Recent Excavations at Bronze Age Tell Atchana, Alalakh

The newly affiliated Koç University excavations at Alalakh have presented an opportunity to examine the various dimensions of these traditions in this culturally rich, and historically significant region.

K. Aslıhan Yener

The newly affiliated Koç University excavations at Tell Atchana (ancient Alalakh) represent long-range, broadly-based archaeological investigations in Hatay, southern Turkey. The city mound (or höyük) is located at the south center of the valley close to the bend of the Orontes (Asi) river and represents the capital of a small Bronze Age regional state called Mukish dating from 2200-1300 BC. Finds such as the multi-lingual tablet archives in Hurrian, Akkadian, Hittite and Sumerian, as well as a sequence of palaces and temples, elevated Alalakh to legendary status when first excavated by Sir Leonard Woolley in the 1930's. This consideration was augmented by exotic material finds and palatial architecture found during our own excavations which began in 2003. These archaeological finds represent aspects of a Bronze Age capital indicative of its lively international discourse, if not shared artistic styles with far-flung areas such as Cyprus, Crete, Mesopotamia, Hittite Anatolia and Egypt. The field projects at Alalakh have now presented an opportunity to examine the various dimensions of these traditions in this culturally rich and historically significant region. The excavations are conducted under the auspices of the Turkish Ministry of Culture and Tourism.

A bewildering variety of materials were found that include silver, obsidian, rock crystal, gold, carnelian, glass, lapis lazuli, and alabaster, many of which reflected the artistic expression of Alalakh.

The archaeological research at Alalakh is designed as three tiers of investigation. The first tier is the on-going exploration of regional and interregional transformations. To that end, we have returned to the Amuq valley sites originally surveyed by Robert Braidwood in the 1930's and our own survey continuing this

work from 1995-to the present. Our present aim is to reconstruct the changing environment, ecology, and surrounding human landscape of this capital city and its satellite villages.

The second aspect of our work is to continue refining the chronologies of early second millennium BC levels represented at Alalakh. By so doing, we hope a more nuanced understanding will emerge of the site level of research. That is, defining household economies and the management practices of the palace as a complement to textual information.

The third arm of our research aims at sparking dialogue about the nature of evidence, interpretive modes, and practices within disciplines such as archaeology, art history, instrumental analysis and history. The comparisons at the heart of this conversation concern the varying roles of artifacts and cuneiform texts at Alalakh. I hope to emphasize the notion that objects and the technical knowledge of making them magnify relationships deeply embedded in the social order. The production of fine artifacts such as sophisticated sculpture, metallurgy, glass, faience, and ivory carving were under palace patronage. Trade, diplomacy, warfare, and interregional networks facilitated the transport of materials across great distances in the ancient Near East. Several analytical techniques have aided in the reconstruction of these trans-regional activities. In particular, lead isotope ratios (ICP-MS), the use of scanning electron microscopy (SEM) and polarizing light microscopy, which have elucidated the artistic expression of Alalakh and the production of artifacts of power and prestige. I look forward to building collaborative partnerships with the Chemistry and Physics departments of Koç University in furthering the use of instrumental analysis in archaeology.

I. I would like to give heartfelt thanks to the Mustafa Kemal University in Antakya for their stewardship of this project in the past. The excavation was generously funded by the Ministry of Culture, Institute for Aegean Prehistory and Fund for Amuq Valley Archaeological Excavations Foundation (FAVAE).

Our new archaeology laboratory to be built soon in the Archaeology and Art History Department will be the first step in the expansion of material analysis of excavated samples at Koç University.

Figure 1 represents excavation squares at Alalakh which is superimposed on the remote sensing magnetometry results accomplished last year. It presents a fascinating glimpse into the underground (thus invisible) Late Bronze Age (c. 1300 BC) city with its complex web of streets, buildings, and pyrotechnological installations. Especially intriguing is a large rectangular building which is situated opposite the previously excavated temple sequence to Ishtar which we hope to test in 2009.

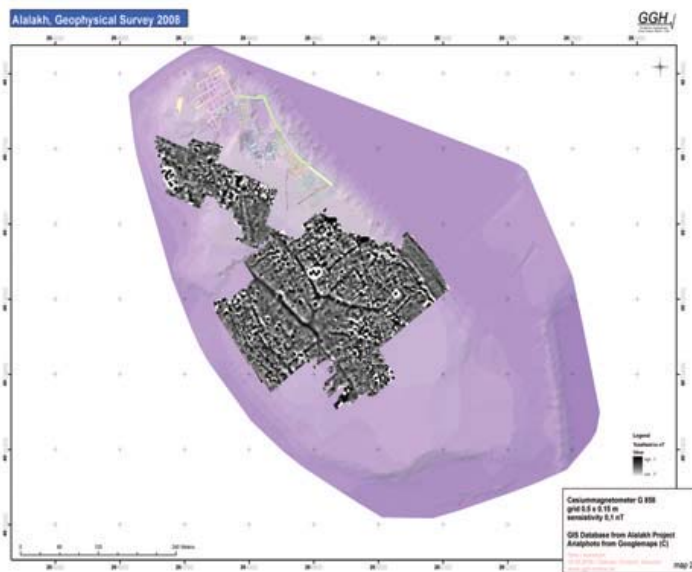


Figure 1. Geophysical survey.

During the 2008 season nine 10 m x 10 m squares were opened for an exposure of approximately 900 meters square. The earliest phase was found in the sounding placed in the courtyard of the Level VII Palace. This palace, ruled by King Yarim-Lim was made famous by its archives of tablets dating to the Middle Bronze Age, spanning the 19-17th centuries BC. Giving the palace even more renown were early frescoes in the style of Minoan Crete. Alalakh was the first of the now many sites in the eastern Mediterranean which have yielded public buildings decorated with polychrome frescoes in the Aegean style.

During its heyday Alalakh yielded material evidence reflecting specialized skills not only to make high status items, but to organize strategic production and control technical knowledge. This is a strategy of rulers and other elites to assert control over the display and consumption of wealth, frequently in the form of fine artifacts. Indeed, the alliances between cities were forged

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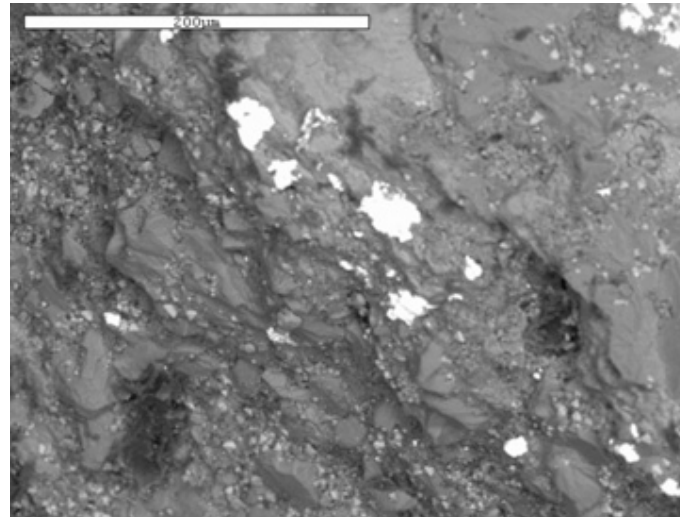


Figure 2. Bone's electron microscope image.

by marriages and gift exchanges in the form of presents shared among the ruling families and frequently given as offerings to temples. A bewildering variety of materials were found that include silver, obsidian, rock crystal, gold, carnelian, glass, lapis lazuli, and alabaster, many of which reflected the artistic expression of Alalakh. Several samples of painted bone and ivory inlay were subjected to technical analysis.

When analyzed with a binocular microscope and scanning electron microscope (fig. 2), the bone sample revealed several fragments of silver foil caught in the incised grooves; XRF spectrographic analysis identified it as 58.57% silver. Bone is readily available but painting it with pigments and overlaying or plating it with silver foil would elevate the decorated furnishing to a prestige item. The technique of coloring and inlaying of furniture would reflect local preferences for textures, plating with foil, and mixing bright colors. Thus a myriad of pigments, mother of pearl, and silver plating on bone inlays were played off each other and juxtaposed with the brilliant white ivory materials. These polychrome traditions constituted the visual hyperbole of indigenous MB Alalakh furniture styles. The silver for the Alalakh foil would no doubt come from the central Taurus silver mines, although analyses have not been conducted on the inclusions. But results of lead isotope analysis on a number of copper finds from Alalakh demonstrated that the site was supplied from the Taurus Mountains. Given the extraction and supply of



silver, gold, copper and tin from the Taurus Mountain mines to the Amuq sites going back to the 4th millennium BC, the network was well-established and well-traveled for thousands of years.

Figure 3. Clay tablet.

Hittites were not only burning down palaces at Alalakh but they were leaving their technologies and weapons at the site. It is not coincidental that some of the bronze weapons found at Alalakh reflects the traditions of their more dangerous neighbors.

One exciting artifact was a clay tablet (fig. 3) with the signatures of several individuals written in cuneiform. The tablet was burned on one side and fused to its envelope and only one side could be read. Although we attempted to penetrate the opposite side with a whole array of instruments from x-ray, MRI and even mammograms at the Mustafa Kemal University Hospital, we were unsuccessful in reading one side. The legible side identified it as a Level VII legal document witnessed by several individuals. The Level VII Palace had gone through a massive burning episode (probably at the hands of Hittite king Hattusili I), even the basalt basin and stone orthostats lining the walls had melted. The floor was a mass of frozen turtle backed blobs indicating a boiling point of a very high temperature, which even vitrified the mud brick walls. This is not surprising given the large amount of timber used in the architecture; even many floors were wood.

Hittites were not only burning down palaces at Alalakh but they were leaving their technologies and weapons at the site. It is not coincidental that some of the bronze weapons found at Alalakh reflects the traditions of their more dangerous neighbors. This is best exemplified by a three-spiked shaft hole hammer/ax (fig. 4) found in the LBII mudbrick “southern fortress.” This weapon fits into the general category of the special, numinous weapons of the Hittite Gods such as this elaborately decorated, three-spiked Hittite ax from Şarkışla. Indeed, these weapons appear to be suffused with sacred powers and were depicted with deities in fantastic, and for us today, difficult to understand imagery.

In conclusion, the excavations at Alalakh provide a unique laboratory to integrate three levels of research, the region, the site and the artifact. The finds, that constituted the palace patronage of crafting luxury items, came from all over the Near East, and demonstrate Alalakh's central location along far-reaching routes. Thus, the artifacts and techniques of manufacture do not just reflect culture, they are embedded in culture, and enact cultural transmission. Beginning in the early second millennium BC, Alalakh appears to have been a regional kingdom which witnessed an increase in complex social relationships with the Aegean, Anatolia and Cyprus while maintaining its impressive local idioms during the Late Bronze Age.



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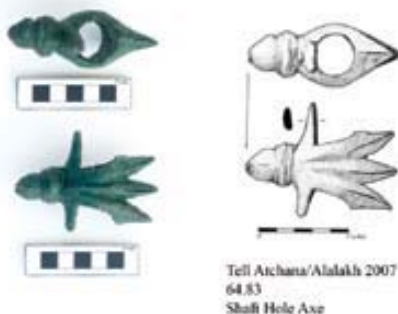


Figure 4. Three-spiked shaft hole hammer/ax

A Hub for Migration Research in Turkey:

The Migration Research Program at Koç University, MiReKoc

MiReKoc today is a fully functioning program providing an institutionalized hub for Turkey-related migration research in Turkey and elsewhere.

Ahmet İçduygu, Deniz Sert, Ayşem Biriz Karaçay

The twentieth century stands out as an era of massive human mobility both within and across national boundaries. Significant political and economic global trends of the last century have led to the migration of people: the demise of empires and the consequential rise of ethnically, linguistically and religiously homogenous nation-states, the transformation of the base of national economies from rural agriculture to urban industrial production, and finally, the emergence of the welfare state and the challenges it faces against a globalized and privatized economy. Whether by coercive force or voluntary will, people have left the places they once called “home.” Migration certainly continues to be one of the defining issues of the twenty-first century. As the world today is widening, deepening, and speeding up, i.e., globalizing, as two well-known scholars, Castles and Miller (2003) note, people are on the move more than ever. This era of globalization is known as “the age of migration”, an age of unprecedented and explosive migration. During this time, Turkey emerges as a primary actor -especially in the Eurasian migration scene- both as a country of origin, and then as one of destination, and finally, transit. Realizing the importance of migration studies, the Migration Research Program at Koç University (MiReKoc) was established in 2004, by a joint initiation of the Koç University and the Foundation for Population, Migration and Environment in Zurich (PME). MiReKoc today is a fully functioning program providing an institutionalized hub for Turkey-related migration research in Turkey and elsewhere.

MiReKoc pursues the following aims: developing a higher standard for research capacity on migration issues in Turkey; providing collaboration among researchers and strengthening Turkish research capacities in these fields; connecting the migration issues in Turkey and in places “near abroad” such as neighboring countries in Europe, Asia, and Africa; improving the translation of scholarly migration research findings for policy-making processes; providing a better understanding on how migration issues are interrelated to various social, economic, cultural, and political issues of both domestic and international, or local and global settings.

Data from recent studies demonstrate the importance of migration in Turkey. It has been discovered that since the late 2000s, there

are over three million Turkish citizens in Europe, more than 100 thousand workers in the countries of the Middle East and North Africa, and some 40 thousand workers in the Commonwealth of independent states. In addition to these expatriates, about 400 thousand Turkish citizens have been reported as present in other countries of the globe, with approximately three-fourths residing in the traditional immigration countries such as Australia, Canada, and the United States. Considering that the total number of expatriate Turks amounts to over four million people, five per cent of the nation's total population is abroad. Conversely, during the last two decades, Turkey has faced increasingly large-scale inflows of foreign nationals. The nature of this new phenomenon is of a varied character. There are four main types of immigration: transit migration flows, illegal labor migration, movements of asylum seekers and refugees, and the registered migration of foreigners. It is estimated that in the early 2000s over 250 thousand foreign nationals came to Turkey annually as migrants within the context of the aforementioned four types of movements. While the flows of emigration and immigration are underway, Turkey also has been witness to massive internal migration, usually coming from rural areas to urban ones. This type of movement continues since the 1950s, although its volume and nature has evolved over time. Internal and external migratory movements are often synchronized.

There are some shortcomings concerning migration research in Turkey. While extensive research has been conducted on covering certain periods of migration history, some other critical periods remain understudied. Various topics and aspects of migration receive little or no attention while others become the objects of repetitive studies. Some studies lack sound research methodologies, while others suffer either from narrow-angled disciplinary perspectives or from loose multi-disciplinary approaches. An overview of the general state of migration studies on the global level reveals that the discourses and practices of researchers in Turkey are usually dominated by approaches that have been developed from the perspective of a receiving country; therefore, Turkish migration research has limited agency in international academic and policy debates.

Given its importance as a site of internal migration, emigration, and immigration, Turkey provides an excellent setting in which multi-dimensional characteristics of various migration streams can be examined. Turkey also provides an opportunity for migration research to eliminate at least some of the receiving-country bias. Thus, MiReKoc aims at supporting research on migration issues in Turkey, dealing with both international migration and internal migration movements, and focusing on the six major areas of migration studies: origins of migratory flows; determinants of their stability over time; uses of migrant labor in the labor market; adaptation of migrants in the receiving societies; governmental migration regime aimed at managing migratory flows; and transformation of the receiving society and culture in the wake of large-scale immigration and immigrant incorporation. Generally speaking, the causes of migration are the central focus in the former two areas, while the consequences of migration are the primary consideration in the latter four.

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A Comprehensive and Inclusive Program

MiReKoc is comprehensive and inclusive enough to cover the most important migration issues. The aim of the program is to provide opportunities for researchers from different disciplinary backgrounds. The main disciplines are anthropology, demography, economics, education, geography, history, international relations, law, political science, psychology, sociology, and urban studies. The program promotes multidisciplinary and interdisciplinary research practices. Projects with a clear focus on empirical questions and new data are especially encouraged. Whereas both quantitative and qualitative studies are considered equally important, the program advises the employment of diverse research methods such as survey research, ethnographic research, and archival research.

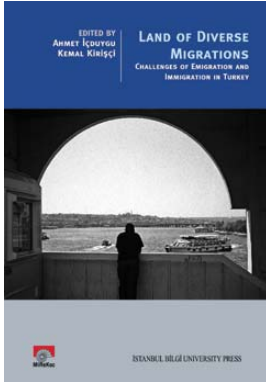
The program intends to further research on emerging topics lacking research: the role of labor markets in generating flows versus states in regulating them, and how they operate through the Turkey-related migratory regime; the social and political consequences of the transformation of Turkey into a new country of immigration and transit; the impact of globalization on migration; the link between migration issues and the Turkey-EU accession debate; labor market aspects of immigrant integration in Turkey; the politics of migration policy; the brain-drain debate from a sending-country perspective; the flow asylum-seekers and refugees through Turkey; demographic dimensions of migration issues.

MiReKoc's Aims

- Developing a higher standard for research capacity on migration issues in Turkey, and providing collaboration among researchers
- Strengthening Turkish research capacities in these fields
- Connecting the migration issues in Turkey and in places “near abroad” such as neighboring countries in Europe, Asia, and Africa
- Improving the translation of scholarly migration research findings for policy-making processes
- Providing a better understanding on how migration issues are interrelated to various social, economic, cultural, and political issues of both domestic and international, or local and global settings

MiReKoc has received eighty-five research proposals since its establishment in 2004. As a grant-giving program, MiReKoc has funded thirty-one of these proposals. Twenty-one of the research projects have been completed, and the remaining ten are expected to be concluded by mid-2009. The applicants of both the proposed research projects and the funded ones were diverse in terms of their individual characteristics, their academic backgrounds, and their institutions: male and female researchers; junior and senior scholars; Turkish and non-Turkish persons; sociologists, anthropologists, demographers, economists, historians, and psychologists; researchers from different institutions both from Turkey and abroad (for instance, principal researchers of the funded projects were from twenty-five different institutions, fourteen from Turkey and eleven from abroad). The research continuum of the funded MiReKoc projects also varied: from causes and consequences of international migration and transnationalism to the integration of migrants in various receiving settings; from brain drain to forced migration and migration-citizenship nexus; and from census data on international migration to the analysis of census data on internal migration.

The first eight of the completed projects are compiled in an edited volume by Ahmet İçduygu and Kemal Kirişçi entitled *Land of Diverse Migrations: Challenges of Emigration and Immigration in Turkey* published by Istanbul Bilgi University Press in February 2009. This first book of MiReKoc Migration Research Series aims to address in detail some of the issues that arise because of Turkey becoming a “migration transition” country by a new generation of promising Turkish researchers working on migration issues. The book is divided into two main parts, emigration from Turkey and immigration into Turkey. While Part I considers both historical and contemporary migratory flows from Turkey covering cases ranging from early twentieth century emigration of “Karamanlis” from Anatolia to Greece as well as the brain drain of Turkish professionals to the United States, and the so-called



guest-worker experience of Turks in Germany; Part II covers a range of different categories and examples of recent immigration flows into Turkey, such as the movements of Africans and the cases of Moldovan female domestic workers, and focuses thematically on their growing importance over the past two decades.

In Part I, Renk Özdemir in her chapter draws attention to the continuous re-

definition of identity borders involving the Karamanlis, the members of the Greek Orthodox community in Anatolia who spoke Turkish, and were included among the people that were exchanged with the Muslims of Greece because of the mandatory population exchange stipulated in the 1923 Lausanne Convention. In the following chapter, Şebnem Koser Akçapar, looks at the dynamics of the “brain drain” from Turkey to the United States- traditionally the key recipient of Turkish professionals, scientists, graduate and post-graduate students- since a significant number of which tend not to return to Turkey. A particular strength of this chapter is that it relies on on-site observation and analysis in both the destination country and country of origin. In the next chapter, Levent Soysal focuses on the way in which the changing meaning and constitution of public events in Berlin, which can be considered the host city of the longest-standing Turkish emigrant community abroad, interacts with the identity of migrants. By subjecting public spectacles to anthropological analysis, Soysal aims to delineate the limits of identity as a concept and praxis, as well as trying to understand the changes in cultural production and civic participation in a world now imagined as increasingly “transnational and global.” Considering that a comparison of migrants and non-migrants often makes a powerful case for a better understanding of the impact that migratory context has over individuals, Bilge Yağmurlu investigates the role of education in long-term socialization goals of Turkish mothers. Results indicate that all mothers endorse goals that enhance both autonomy and relatedness revealing similarities between socialization goals of the low-educated and high-educated Turkish mothers regardless of whether these mothers are migrants or non-migrants. In what follows, Yadigar Coşkun, and Sinan A. Türkyılmaz try to demonstrate that it is possible to make indirect estimations on the size of international migration into Turkey by using the 2000 census data as well as presenting figures on the migratory flows considering the differentiations between the traditional five regions of Demographic and Health Surveys and for all three NUTS (The Nomenclature Units for Territorial Statistics) levels constructed by the State Planning Organization and State Institute of Statistics as part of the efforts of statistical adaptations to the European Union. In Part II, the case studies point to some specific features that help explain the dynamics and mechanisms of immigration in Turkey. A. Didem Daniş, Cherie Taraghi and Jean-François Pérouse refer to the period in which Turkey has acquired a central position in the international irregular migrations systems in the last decades

and thus has become a crossing point on a regional and international scale where migrants are involved in informal reception mechanisms. They elaborate the “unofficial integration” models of four specific migrant groups in Istanbul: Iraqi, Afghan, Maghrebi, and Iranian migrants. In the next chapter, Brewer and Yüксеker present a survey of the African migrants and asylum seekers in Istanbul presenting their demographic characteristics, their reasons for migration, as well as their living conditions and problems with a number of conclusions: there is an increase in the number of Africans who arrive in Turkey as transit migrants and asylum seekers, which are a heterogeneous group engaging in a variety of survival strategies. In her chapter, Selmin Kaşka focuses on the gender dimension of migration exploring the new trends in the globalization of household work in the Turkish context by focusing on female Moldovan domestic workers as well as contributing to a better understanding of how, in an informal economy, supply and demand for domestic work operates.

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Meetings and Activities

Although MiReKoc was founded as a grant-giving program for Turkey-related migration research, it has also taken part in a series of international and national meetings and activities involving a range of collaborating partners such as the Organization for Economic Cooperation and Development (OECD), the Euro-Mediterranean Consortium for Applied Research on International Migration (CARIM), and the Network of Excellence on International Migration, Integration and Social Cohesion (IMISCOE). Thus, MiReKoc has become a hub in Turkey for migration research, has created the possibility for networking among Turkish researchers, and between them and the international scene. In 2008-2009, the German Marshall Fund of the United States declared MiReKoc as a “Key Institution on Immigration and Integration”, for a project on “irregular border-crossings at two borderlands, Mexico-USA and Turkey-Greece”. Moreover, 2008 onwards, concomitant to very competitive selection processes, the European Union funded two different projects MiReKoc is associated with: a three-year FP7 project on “trans-nationalism” involving eight project partners (Estonia, Finland, France, Germany, India, Morocco, Turkey, and the UK), and an 18-month project on “migration management in urban areas” in which MiReKoc is the coordinator of a research consortium of Turkish, Italian and Spanish universities. MiReKoc has been actively working on providing a platform for academic research as well as for dialogue and action to share knowledge and understanding in Turkey-related migration issues. Under the light of this concern, MiReKoc is involved with a series of high-quality and innovative academic

research efforts and initiates a succession of conferences, workshops, and seminars aimed at mobilizing academics, bureaucrats, policy makers, stakeholders, and civil society organizations.

Accordingly, on 18-20 April 2008 MiReKoc, collaborating with the Centre on Migration, Policy and Society (COMPAS), the University of Oxford organized a remarkable conference that took place in Turkey on migration, entitled (Irregular) Transit Migration in Europe: Theory, Politics, Research Methodology and Ethics. The conference attracted more than 30 scholars from the Russian, French and English speaking scientific community and PhD students from over ten countries -the US, the UK, the Netherlands, Germany, Sweden, France, Italy, Turkey, Libya, and Estonia. Presenters focused on the cases of Azerbaijan, Russia, Ukraine, Moldova, Hungary, Turkey, Cyprus, Egypt, Malta, Mali, Burkina Faso, Senegal, Morocco, Spain and Portugal. Issues discussed were on the notion of “transit migration” referring to the related concepts and definitions, constructions and discourses, EU migration and asylum politics, migrants' strategies and smuggling, methods and research ethics. Various perspectives were taken, notably from sending countries (Moldova, Senegal), stage posts (Mali, Malta), transit countries (Ukraine, Turkey, Morocco), and receiving countries (Portugal). Drawing attention to the fact that transit migration causes considerable political concerns in Europe, members of the Conference Organizing Committee who were among the main speakers of the meeting, Franck Düvell (University of Oxford), Ahmet İçduygu (Koc University), Hein de Haas (University of Oxford), Ferruccio Pastore (CeSPI), Irina Molodikova (Central European University), Ilse van Liempt (Amsterdam University), and Michael Collyer (University of Sussex) arrived to the following conclusions: “Theoretically, the concept of transit migration is rather problematic. Practically, the issue of irregular transit migration is indeed at the centre of politics identified with the externalization and internationalization of EU migration control. On the one hand, it is a political concept that was introduced with a purpose and as such, it has developed considerable political power. Moreover, it reflects a certain level of discomfort with people and populations that are mobile and who are criss-crossing Europe and its neighborhood in search of a viable new home. It also reflects unease with journeys and trajectories that are considered unusual. Thus, normative beliefs of how migration should be (straight, limited, and managed) and how people should travel (regular, with a visa, and by straight pre-booked packages) seem to inform the discourse. On the other hand, it is a sociological concept that aims to cover a specific, though complex set of types of migration. The problem lies in the tension between the two applications and its very different purposes. What remains clear though is that there are migrants who travel through various countries, intended or unintended, and stay there for some length of time before they reach a final destination or return to their country of origin.”

MiReKoc continues its activities at an accelerating pace. In October 2009, with funding received from the PME, MiReKoc

will be organizing another international conference entitled Critical Reflections in Migration Research: Views from the South and the East where researchers around the globe will meet at Koç University once again. The conference aims at analyzing, questioning, and reconsidering the migration research experiences in various countries of the South and the East. It compares and contrasts these experiences with those in the countries of the North and the West. The hegemonic position of research agendas of the North and the West are questioned; and new research directions in migration research are discussed. The second round of MiReKoc projects is currently being edited and will be published under the heading of Migration around Turkey: Old Phenomena, New Research. Further information on MiReKoc's activities can be accessed from its website at <http://www.mirekoc.com> that also provides comprehensive statistics, documents, reports, and policy briefs regarding Turkey-related migration phenomena.



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Deniz Sert, who is an alumnus of Koç University, holds a Ph.D. in Political Science from the City University of New York Graduate Center and is a post-doctoral fellow at the Migration Research Program at Koç University, where she conducts research on transnational migrant networks between Germany and Turkey. Her research and teaching interests include forced migration, post-conflict reconstruction, policies and practices of international migration, civil society, introduction to political science and political theory. Her articles have recently been accepted by *International Migration* and *Journal of Mediterranean Studies*.



Ayşem Biriz Karaçay, who is a Ph.D. candidate at Marmara University, is currently working as a project administrator at the Migration Research Program at Koç University. Having a background in International Relations, she is preparing a dissertation on the migration regime between Turkey and Russia.

Nanostructured Materials for Energy

Synthesis of materials by controlling their structures at the nano scale leads to new technologies that consume less energy.

Can Erkey

One way for the governments to force efficient utilization of energy sources is through regulations. In the white goods sector, regulations require production of goods that have low energy consumption. Therefore, it is necessary to develop technologies to decrease energy consumption rates in white goods including refrigerators, ovens, dish washing and laundry machines. Insulation materials and their thermal characteristics play an important role in achieving low energy consumption goals. Thermal conductivities of currently used insulation materials in white goods range from 25 to 250 mW/mK. There is also a need to decrease energy consumption rates in buildings and in the transport sector. Thermal conductivities of materials used in construction of buildings are around 35 mW/mK and materials used in the transport sector are around 30 mW/mK. As one considers the thermal insulation requirements in all these sectors, it is necessary to develop insulation materials that have low thermal conductivity, low density and low heat capacity and materials that are able to withstand the extreme cold and/or hot temperatures that exist in some of these systems. Development of such materials will result in reduction of energy consumption and increase in energy efficiency, in reduction of environmental effects and in reduction of foreign energy dependency of the country. It will be possible to produce white goods and buildings with reduced energy consumption.

Nanostructured Silica Aerogel

A promising material for thermal insulation is nanostructured silica aerogel which has a thermal conductivity of around 10 mW/mK. Therefore, this material can lead to a reduction in thermal conductivities by a factor of 2-25. Furthermore, it has additional advantages including a low heat capacity and a low density and it is able to withstand extreme temperatures. Efforts are underway in my laboratory to develop monolithic aerogel panels for use as insulation material in ovens and to develop aerogel powder for use as insulation material in refrigerators.

Aerogels as Superior Insulation Materials

We are synthesizing aerogels by the sol-gel method and investigating the effects of reaction conditions on the properties of the aerogels to develop superior insulation materials. For example, it is possible to change the transparency of the aerogels by changing the tetraethyortosilicate concentration in the reaction mixture from 10 to 70%. This change is a result of the change in the average pore size of the materials. Recently, we were able to synthesize monolithic composites of silica aerogels with carbon black with enhanced thermal insulation properties at high temperatures due to a reduction of the radiative component of heat transfer [2].

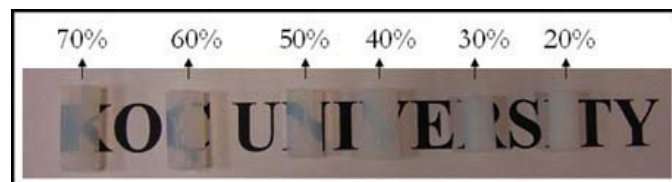


Figure 1. Effect of reactant concentrations on transparencies of monolithic silica aerogels [2]

Another project on efficient utilization of energy sources is on development of fuel cells as alternative power sources [3]. A fuel cell is an electrochemical device that continuously converts chemical energy into electric energy (and heat) with a much higher efficiency than an internal combustion engine and has low pollutant emissions. The conversion virtually continues for as long as fuel and oxidant are supplied. An essential component of a proton exchange membrane fuel cell is a membrane electrode assembly (MEA) which is typically prepared by sandwiching an ionically conducting polymeric membrane (usually Nafion®) between two electrically conductive electrodes (anode and cathode). The membrane must be highly proton conductive, must present an adequate barrier to mixing of fuel and reactant gases, and must be chemically and mechanically stable. In the electrodes, there exist catalytic particles (usually carbon supported platinum)

which are essential to catalyze the electrochemical reactions (oxidation of H_2 at the anode and the reduction of O_2 at the cathode). The MEA has a few hundred microns of thickness can generate electric power at cell voltages around 0.7 V and power densities of up to about 1 W/cm² electrode area. The electrodes are currently very expensive because of the large amounts of Pt that is used and their costs need to be reduced. The DOE's target for Pt utilization is 0.3 gPt / kW by 2010 and 0.2 gPt / kW by 2015. We are currently working on developing catalysts which can meet these targets. We are developing a novel technique called supercritical deposition to synthesize such catalysts [4,5,6]. Supercritical deposition involves the dissolution of a metallic precursor in a supercritical fluid (SCF) and the exposure of a substrate to the solution. After incorporation of the precursor with the substrate, the metallic precursor is reduced to its metal form by a wide variety of methods resulting in particles or films. Several reduction techniques are available in the literature, which include chemical reduction in the SCF with a reducing agent, such as hydrogen and alcohols, thermal reduction in the SCF and thermal decomposition in an inert atmosphere or chemical conversion with hydrogen or air. An image of such a catalyst prepared by supercritical deposition in our laboratory is given in Figure 2 [7].

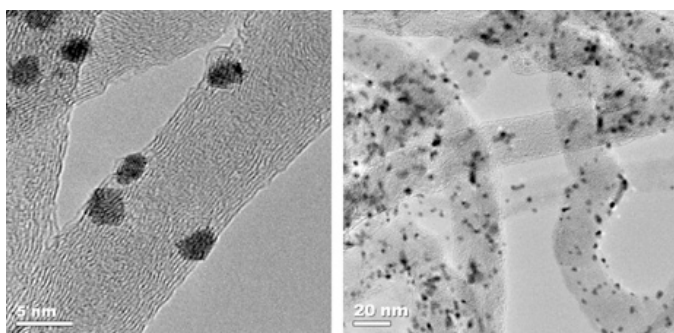


Figure 2. Carbon nanotube supported platinum nanoparticles prepared by supercritical deposition [7]

The platinum nanoparticles are very small with an average size around 2 nm and are very uniformly distributed on the external surface of the carbon nanotubes. We found that the electrocatalytic activity of these catalysts was superior to the commercial catalysts. Our efforts are now concentrated on developing bimetallic catalysts to further decrease the amount of platinum [8].

Direct Methanol Fuel Cells

PEMFCs which work with methanol rather than hydrogen as the fuel are called Direct Methanol Fuel Cells (DMFCs) and are attracting a lot of interest since there is currently no hydrogen infrastructure. One problem in such fuel cells is decreased performance due to methanol permeation through the Nafion

Efforts are underway in my laboratory to develop monolithic aerogel panels for use as insulation material in ovens and to develop aerogel powder for use as insulation material in refrigerators.

membrane. We developed novel membranes in our laboratory by incorporating palladium into Nafion® membranes using supercritical fluid deposition technology [9]. The resulting Pd-Nafion® membranes had Pd loadings of 1.19 and 2.65 mg/cm². According to SEM analysis, the membrane had a uniform surface morphology and no cracks could be observed. As shown in Figure 3, TEM image of the cross section of the Pd-Nafion® membrane indicated a thin (0.3 μm) film of Pd around the membrane surface and a significant number of isolated Pd particles deeper in the membrane. The number density of particles decreased as did the particle size with increasing distance from the surface. The particle size of the Pd particles ranged from 5 to 10 nm. Membrane-electrode assemblies with palladinized Nafion® membranes were prepared and evaluated in direct methanol fuel cells (DMFCs) to determine methanol crossover, proton conductivity as well as DMFC performance. The Pd-impregnated Nafion® membranes showed reduced methanol crossover and gave higher cell performance than that of pure Nafion® membrane, although the proton conductivity was decreased with the impregnation of palladium.

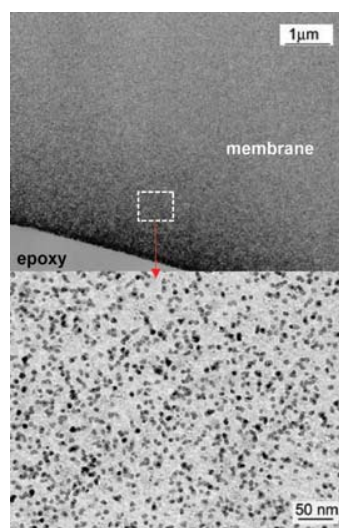


Figure 3. TEM images of palladinized nafion membranes [9]

Efforts are also underway in my laboratory to develop charge storage devices including composites of nano powders of barium titanate with silica and monolithic carbon aerogels [10]. We are currently investigating the effects of the synthesis conditions on the electrical properties of these materials in order to be able to create superior devices by controlling the nanoscale architecture.

Within the context of the projects mentioned above, we are collaborating with Prof. Alper Kiraz from the Physics Department on studying the diffusion phenomena in silica aerogels by fluorescence spectroscopy to be able to understand the structure of the channels, with Prof. Alaca from the Mechanical Engineering Department and Prof. Ürey from the Electrical Engineering department on developing novel MEMS based measurement devices to determine the precursor uptake of various substrates in high pressure environments and with Prof. Demirel from the Chemistry department on probing the hydrophobicity of the silica aerogel surfaces.

Since development is closely related to energy consumption per capita, the energy use is projected to increase in the world in the coming decades. This will keep energy an important focus area in research and will enable the development of novel technologies. Materials aspects of energy technologies are very important and major breakthroughs will come through development of new materials. I hope that we will be able to continue to contribute to such developments in the energy field.

A fuel cell is an electrochemical device that continuously converts chemical energy into electric energy (and heat) with a much higher efficiency than an internal combustion engine and has low pollutant emissions.



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Identity and Security in the Broader Europe

While the EU cannot be expected to expand forever, stability and security in the European periphery is best served by an EU that does not build fixed distinctions of 'self' and 'other'.

Bahar Rumelili

As the daily media reporting focuses on the never-ending squabbles among European leaders over how to respond to the global financial crisis, it is easy for the contemporary observer to lose sight of the most precious achievement of European integration: stable peace since the end of the Second World War. In light of European history, the durability of the post-WW2 peace in Europe continues to bewilder many International Relations scholars, disproving short-term explanations based on alliance patterns and power balances. As the 'back to the future' scenario of a return to power politics after the end of the Cold War failed to materialize¹, International Relations scholars increasingly converged around the argument that interstate relations in Europe have been fundamentally and irrevocably transformed. What we have at hand is not a simple absence of war, but as eminent scholar Karl W. Deutsch foresaw in 1957, a transformation of state identities and interests to the extent that states come to neither expect nor prepare for war against one another². According to some contemporary scholars, what cements this European security community is a process of collective identity formation around shared norms and principles, as a result of which European states come to perceive of one another as part-of-self rather than as other³.

Yet, to this rosy picture, a critical observer is tempted to respond with a long list of counter-examples from the European periphery: the unresolved Cyprus conflict, tensions between Russia and Baltic republics, the Russian invasion of Georgian break-away republic South Ossetia this summer, the unresolved Greek-Turkish disputes, the precarious status quo in the Balkans, and the list goes on. Can, and if so, how do, the logic of security community and the process of collective identity formation travel to the European periphery? In fact, a careful analysis of interstate relations on the European periphery shows that the expansion of the European security community takes time and is conditional on many factors.

European Identity

First of all, if the expansion of the European security community,

as argued above, is predicated on the expansion of the sense of a collective identity, then the process is inevitably complicated by the identity debates that underlie the institutional expansion of the European Union. EU enlargement functions as a double-edged sword, it sets new borders as it removes others, it excludes as it includes. When the identity discourses surrounding the EU enlargement debates are analyzed, one notices that the practices of inclusion and exclusion are colored in different hues. When the European Community turned down Morocco's membership application in 1987 on the grounds that it is not a 'European' country, it set a fixed and hard Mediterranean border, where self and other are strongly differentiated. In comparison, after the Berlin wall came down in 1989 and the Cold War in Europe ended, the formerly communist East European countries were framed as 'European by history, geography, culture, etc.', but subjected to a strict conditionality and surveillance process regarding their economic and political transformation. In other words, they were not non-European, but less European. In contrast, Turkey was placed and continues to remain in an in-between position of ambiguity, which reflects an uneasy compromise between conflicting representations of Turkey as non-European, and as less-European⁴.

Going beyond, spaces of ambiguous identity and belonging are reproduced along the new Eastern borders set by the 2004/2007 enlargement. The bordering countries of Moldova and Ukraine, as well as Georgia, openly express aspirations for EU membership, but the EU has at least so far refrained from granting them a

¹ Mearscheimer, J. (1990), "Back to the Future: Instability in Europe After the Cold War", *International Security*, 15, 5-6.

² Deutsch, K., Burrell, S., Kann, R., Lee, M., Lichterman, M., Lindgren, R., Loewenheim, F. and R. van Wagenen (1957), *Political Community and the North Atlantic Area: International Organization in the Light of Historical Experience*, Princeton: Princeton University Press.

³ Wendt, A. (1994), "Collective Identity Formation and the International State", *American Political Science Review*, 88 (2), 384-396.

⁴ For a detailed comparison of discourses, see Rumelili, B. (2004) "Constructing Identity and Relating to Difference: Understanding the EU's Mode of Differentiation" *Review of International Studies*, 30 (1), 27-47.



membership perspective. In fact, the European Neighborhood Policy, which is directed towards South Mediterranean countries as well as to Moldova, Ukraine, and Belarus (not implemented because of authoritarian regime), explicitly names them as 'neighbors'. In the Western Balkans, all successor states of former Yugoslavia (including Serbia) have been granted membership perspectives, conditional on their political and economic transformation as well as cooperation with international tribunals on the persecution of war criminals. Apart from Slovenia, which distinguished itself by becoming a member in 2004, Croatia is the only country conducting accession negotiations with the EU.

Conflicts in the European Periphery

This hierarchical gradation of identities in the European periphery has important repercussions for stability, security, and peaceful resolution of conflicts. In this respect, it is apt to consider how both the EU's capacity for conflict resolution, and the conflict parties' willingness to pursue conciliatory policies are affected by the reconstruction of identities in the European periphery.

The literature has noted that the EU can potentially impact conflicts in its periphery simultaneously through four pathways⁵. It can coerce or induce conflict parties to resolve their conflicts through the promise to offer or threat to withdraw membership perspective or other forms of privileged relations. This is referred to as the compulsory impact. Alternatively, the EU can socialize and indirectly affect the conflict parties' approaches to the resolution of their disputes, by domestically legitimizing alternative policies (enabling impact). Thirdly, it can build domestic support for resolution in conflict societies, through civil society links and increasing interdependence (connective impact). Finally, close relations with the EU can generate a discursive change in conflict societies and generate alternative narratives of the conflict and the 'other' (discursive impact).

Each of these pathways are affected by the hierarchical gradation of institutional relations and consequently of identities in the European periphery⁶. First of all, the compulsory influence is inevitably wielded in an asymmetric and uneven fashion: The EU can only coerce or induce countries that strongly aspire for membership or enhanced institutional relations. It cannot coerce or induce member state parties to conflicts. That is why, following Greek membership in 1981 and Republic of Cyprus' membership in 2004 as the de jure representative of the entire island, the EU can only wield the compulsory influence on Turkey for the resolution of Greek-Turkish disputes and the 'normalization' of relations between Turkey and the Republic of Cyprus. Similarly, on the border conflict over the Bay of Piran between Slovenia and Croatia, the EU has partially suspended accession negotiations with Croatia, as a result of the Slovenian veto. On the other hand, the EU cannot coerce or induce a state like Russia, which insists on an equal relationship with the EU and as a result does not accept the terms of conditionality set by the European Neighborhood Policy. Likewise, the EU's influence in the South Mediterranean is fairly limited because the EU does not put the attractive carrot of membership perspective on the table.

When the identity discourses surrounding the EU enlargement debates are analyzed, one notices that the practices of inclusion and exclusion are colored in different hues.

The enabling and socializing influence of the EU, on the other hand, while, by definition, not impeded by institutional boundaries, tends to be stronger on the member states, as they tend to be the ones more intensely subjected to the process of collective identity formation over shared norms and principles. One can observe that over the medium to long-run, the EU socializes countries away from using the EU as leverage against their rivals towards using the EU as a medium that facilitates their transformation. Naturally, the time span of this socialization process varies from state to state and interacts with various domestic conditions. As examples, we can mention how the reunified Germany chose not to use Poland's EU membership aspirations as a leverage to obtain concessions on the post World War 2 boundary, but instead became the strongest advocate of Polish accession to the EU⁷. Similarly, after using the EC/EU as an arena of leverage politics against Turkey, Greece after 1999 began to seek its security not through

⁵ Diez, T., Stetter, S. and M. Albert (2006) "The European Union and Border Conflicts: The Transformative Power of Integration" *International Organization*, 60 (3), 563-93.

⁶ Rumelili, B. (2007) "Transforming Conflicts on EU Borders: The Case of Greek-Turkish Relations", *Journal of Common Market Studies*, 45 (1), 105-126.

⁷ Rumelili, B. (2008) "Avrupa Birliği ve Bölgesel İhtilafların Çözümü" *Uluslararası İlişkiler*, 4, 51-76.

the exclusion of Turkey from European institutions but through its Europeanization⁸. It would therefore be reasonable to expect such a transformation in the Republic of Cyprus' policies towards Turkey in the medium term even if the Cyprus conflict remains unresolved. However, whether EU-Turkey relations can withstand the short-term pressures is an open question.

In case of conflicts between member and non-member states in the European periphery, the pursuit of leverage politics inevitably remains an attractive option for the member state. However, the EU can enhance or undermine the legitimacy of this policy choice through its policy towards the non-member state. If the EU constructs fixed and hard borders in relation to the non-member state, and represents it as non-European, then it enhances the legitimacy of leverage politics. Conversely, however, if the EU discourse represents the non-member state as a potential part of self, then leverage politics is progressively delegitimized. Thus, in the context of both German-Polish and Greek-Turkish relations, we see that the shift toward transformative politics was made possible by, and reinforced through the EU's inclusive approach towards the non-member states of Poland and Turkey⁹. In this context, it would be reasonable to expect that Slovenia will also make a rapid transition to transformative politics in its relations with Croatia.

The connective and transformative influences of the EU, also, while not dependent on institutional membership are facilitated through the inclusive approach of the EU in its periphery. In addition to providing material resources, when the EU represents peripheral states as a potential 'part of self', it legitimizes civil society cooperation between conflict societies. When we trace the evolution of civil society cooperation between Turkey and Greece, we see that previous short-lived and vulnerable initiatives become consolidated following Turkey's EU candidacy in 1999, and acquire a larger following and acceptance in both countries as a result of their legitimization by reference to Europeanization¹⁰.

In short, the experiences on the European periphery indicate both the potential and limitations of the EU in diffusing its security community. While the EU's zone of influence extends beyond its membership, its efficacy is often circumscribed by the hierarchical gradation of institutional and identity relations. Perhaps, in this context, it is worthwhile to note that identity borders need not be coterminous with institutional boundaries. While the EU cannot be expected to expand forever, stability and security in the European periphery is best served by an EU that does not build fixed distinctions of 'self' and 'other'.

⁸ Rumelili, "Transforming Conflicts on EU Borders".

⁹ Rumelili, "Avrupa Birliği ve Bölgesel İhtilafların Çözümü".

¹⁰ Rumelili, B. (2005) "Civil Society and the Europeanization of Greek-Turkish Cooperation" *South European Society and Politics*, 10 (1), 43-54.

Jean Monnet Chair and European Studies at Koç University

Based upon Dr. Bahar Rumelili's application, Koç University has been awarded a Jean Monnet Chair by the European Union's Education, Audiovisual and Culture Executive Agency in 2008. As the Jean Monnet Chair for 2008-2013, Dr. Bahar Rumelili has already initiated a number of research and teaching activities to strengthen the study of Europe at Koç University.

The activities organized under the Jean Monnet Chair are publicized on the regularly updated web-site of www.kocjeanmonnet.com. In February 2009, Jean Monnet Chair helped sponsor a two-day symposium on 'Turkey on the European Stage' organized by Koç University International Relations Club. In addition to the distinguished academics and intellectuals who participated in the panels on EU-Turkey relations, Turkish economy, Turkish foreign policy and Democratization and Human Rights, the symposium's keynote speech was delivered by the Secretary General for EU Affairs, Ambassador Oğuz Demiralp. The symposium was attended by over 100 students from ten different universities in Turkey.

In May 2009, the Jean Monnet Chair is organizing a Graduate Student Workshop on European Studies. The workshop is bringing together roughly sixteen graduate students who specialize in European studies from universities in Istanbul, Izmir, and Ankara. Academics from several institutions in Istanbul and Ankara have kindly agreed to serve as discussants. In addition to providing invaluable experience to graduate students, this workshop will also contribute to the development of original research on European studies in Turkey.



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2002. Her research focuses on international relations theory, processes of European identity construction, and EU impact on Turkish domestic reform and Greek-Turkish relations. She is the author of *Constructing Regional Community and Order in Europe and Southeast Asia* (Palgrave, 2007). Among her other recent publications are 'Liminality and Perpetuation of Conflicts: Turkey/Greece and the EU' (*European Journal of International Relations*, June 2003); 'Identity, Difference and the EU' (*Review of International Studies*, January 2004); 'Transforming Conflicts on EU Borders' (*Journal of Common Market Studies*, March 2007). She is the 2009 recipient of Turkish Academy of Sciences' Distinguished Young Scientist Award.

Dr. Nüsret & Mrs. Semahat Arsel International Business Law Research Center

The main purpose in establishing the Center was to research and study the issues that are relevant to international trade law.

Tankut Centel

With their significant financial contribution in 2005, Dr. Nüsret Arsel and Mrs. Semahat Arsel have made it possible to establish the International Business Law Research Center at Koç University Law School. The main purpose in establishing the Center was to research and study within the auspices of Koç University issues that are relevant to international trade law. Indeed, it is crucial to provide guidance to Turkish companies that compete in international markets and ensure that they are not left behind, given developments in the global financial markets. Accordingly, the ability to succeed in the global economy depends primarily on the capacity to compete. In fact, companies that are unable to compete efficiently are destined to eventually become obsolete. On the other hand, institutions that further develop their ability to compete have the chance to succeed. Consequently, the research and development of international trade standards is of great importance to our country.

Main Events

The International Business Law Research Center has hosted three main events so far: The first was an international seminar on the civil and procedural law systems of Southeastern European countries that was held in partnership with the Hamburg-based Max Planck Institute on Comparative and International Private Law between May 9-10, 2008. The legal systems of countries including Greece, Bulgaria, Romania, Ukraine, and Turkey were discussed in depth, especially with respect to private law [for the papers presented, see Ansay/Basedow, Structures of Civil and Procedural Law in South Eastern European Countries, Berlin 2008, p. 7 et seq].

The International Business Law Research Center has also organized scientific events focused on recent legislation. First, the Center hosted a seminar on July 7, 2008 on European private international law and Turkey's Law no. 5718 concerning Private International

Law and International Civil Procedure. The main goal of the seminar was to better understand the situation in European countries and the newly passed Law no. 5718. With the participation of international legal experts, the laws of France, Germany and Switzerland were first discussed; then, the provisions of Law no. 5718 were explained by Turkish legal experts. It was determined that Law no. 5718 constitutes a rather significant step.



In fact, until 1982, problems of private international law in Turkey were dealt with through a provisional law that was passed during the Ottoman Empire and consists of a few sections. However, the 1982 Act on Private International Law and International Civil Procedure no. 2675, included rather detailed rules on international conventions and trade law. In addition, it was determined during the seminar that new regulations that were created by directly translating international texts will help develop uniform legal applications with foreign states (European countries) in the future. [see for details Tuğrul Ansay, The New Turkish International Private Law and Civil Procedure, in: Güncel Hukuk, Issue: 10-58 (October 2008), p. 37].

The Center, which closely follows developments in trade law in our country, recently decided to study the Draft Turkish Commercial Code. Accordingly, a seminar was held on March 19, 2009 on “The Draft Turkish Commercial Code and Business Associations”, meant to provide a general introduction to the draft commercial code. The seminar featured as its speaker Dr. Ünal Tekinalp, who has presided over the Draft Turkish Trade Law Commission since the outset.

In the first part of the seminar, Dr. Tekinalp outlined the draft's main goals and most important sections. In particular, he discussed differences between applications in European Union countries and the United States, as well as those sections adopted by the Draft. As for the second part of the seminar, Dr. Tekinalp discussed developments in business associations. Among them, Dr. Tekinalp particularly focused on the “sole partner corporation” that is being considered. Under current law, an entrepreneur with capital who wants to own a corporation must allot small shares to other people in order to establish the corporation. The “sole partner corporation” would eliminate this requirement.

Research and development of international trade standards is of great importance to our country.

Official discussions on the Draft Turkish Commercial Code have begun, and it is expected to become effective after the March local elections. During the lengthy enactment process, the views and criticism of different interests have been considered [for the main comments, see Erdoğan Moroğlu, *Türk Ticaret Kanunu Tasarısı ile Yürürlük ve Uygulama Kanunu Tasarısı Taslağı* (The Draft Turkish Commercial Code and the Draft Law of Enactment), Ankara 2006, p. 5 et seq]. Accordingly, the amendments to the Code of Obligations that are currently on the parliamentary agenda must be compatible with the changes to the Turkish Commercial Code.

On the other hand, the Turkish Commercial Code has evolved in small yet important ways over time. However, those changes are not sufficient to meet the societal needs that have developed. Indeed, in its quest to become a European Union member, Turkey must consider EU standards. As a result, developments in the Draft Turkish Commercial Code are sure to continue to unfold in the near future. It is also obvious that the discussions will require

further changes to be introduced. Thus, the International Business Law Research Center will continue to conduct research and host seminars on this topic.

Furthermore, the International Business Law Research Center plans to work with the Istanbul Bar Association. The Center has already decided to arrange two important meetings. One of them will be on the application of EU law principles to non-member states, their validity and lawyers' free movement within EU countries. Given the recent Soysal case, the ability to provide services without being required to obtain visas has become a topic of current debate. According to the ruling, it might be possible for Turkish lawyers to extend their services within the European Union without being subject to visas.

As for the second project with the Istanbul Bar Association, developments in air law in Europe and Turkey will be discussed. This meeting will involve one of few scientific and detailed discussions on the problems of air transport.

Considering all these developments, the Dr. Nüsret & Mrs. Semahat Arsel International Business Law Research Center will focus on problems of trade law with respect to land and air transport, an area that has become increasingly important in recent years, as well as private law relationships.



Prof. Dr. Tankut Centel received his B.A. from the Faculty of Law, Istanbul University in 1974. He joined the same Faculty as a research assistant in 1976. Dr. Centel completed his graduate study at Istanbul University (Ph.D., 1980). He became an associate professor in 1986 and full professor in 1993 at the Faculty of Law, Istanbul University. Professor Centel was the Dean of the Faculty of Law, Istanbul University during 1999-2008. He has been acting since 1995 as advisor for the Turkish employers in the ILO's Conference Committee on the Application of Standards. Since September 2008, he is teaching at Koç University where he is currently the Dean of the Law School.

Quantum Cryptology Laboratory

We are aiming at the future's secure communication channels.

Tekin Dereli, Özgür Müstecaplıoğlu, Alper Kiraz

In the information age, data stored in computers and transferred through networks constitute the most valuable assets of individuals and countries. Some examples of such valuable data can be bank accounts, as well as other confidential information of governments and industrial and commercial organizations. Cryptology provides mathematical solutions that are used to protect the privacy of the information transferred between people and institutions. Asymmetric algorithms in particular have an important place in the key distribution. The recent developments in quantum computers research have shown that today's asymmetric algorithms can be vulnerable against attacks using these computers. This constitutes a great threat to the secure key distribution which is the basic trust element of the cryptology. Quantum key distribution suggests a solution to this threat. Although large scale quantum computers have not yet been demonstrated, there are successful working examples of quantum key distribution systems. The successful protection of confidential information is important for the social and economical life of a country. Today developed countries use high technology crypto-analysis methods to learn secret information of other countries. They also use quantum cryptology in private sectors applications such as banking.

Quantum cryptography is one of the today's critical technologies and there are many research centers on quantum cryptography in the world. In 2007, in the elections in the canton of Geneva in Switzerland, quantum cryptography was used for the safety of information transferred between the computers used for voting and the center where all data was collected. BBN in Boston, MagiQ in New York, IDQuantique in Geneva are currently the leading providers of quantum cryptology devices and software for various banks and financial institutions in the world. A variety of military and secret service agencies are also thought to benefit from quantum cryptography. Despite these, the Geneva Canton elections still remain as the only known government application of quantum cryptography.

Many countries in the world have established their own quantum information technology and especially their quantum cryptology centers. All countries in Europe, in the Far East including Singapore and Thailand, and many countries in North and South America, and Australia have their own specialized centers for quantum technologies. These centers were formed by universities and

governmental or commercial research and development institutions. The synergy between the universities and other research and development institutions is the key to the success of such centers. While for military applications quantum technologies are developed by collaboration between governmental R&D centers and universities, private companies have successfully collaborated with universities for applications targeting the private sector. Collaboration between the quantum technology centers of Toshiba and Fujitsu and various research groups working on quantum information at Tokyo University constitutes such a successful example.

In addition to many companies like IBM, NEC, Fujitsu, Toshiba, the governments have given priority especially to quantum information technologies. Therefore, even competing companies have set up joint R&D centers. Mitsubishi and NEC established a joint R&D center with Tokyo University. European Union has raised concerns on the Echelon system owned by five countries including the United States and United Kingdom, and expressed its intention to use quantum technologies. For this reason quantum communication has been given a high priority in various framework programs supported by the European Commission. Science ministries of Japan and China have also accepted quantum technologies as a priority area. In 2007, China declared that the quantum communication network between Beijing and Tianjin was made operational. The network has been operated since then by the Chinese Network Company. The United States has also increased its resources for the quantum technologies under the leadership of DARPA. For this purpose, the company BBN received funds reaching \$3.5 million only in 2008. With the total of \$15 million funds received from the government, this company is very active in quantum cryptography and quantum communication, collaborating with universities and national research centers. Other organizations such as the National Institute of Standards and Technology (NIST) are pursuing research on developing long-distance quantum communication networks.

Rightfully noticing the lack of R&D studies conducted on quantum cryptography in Turkey, the State Planning Organization (DPT) has funded the QUANTUM CRYPTOLOGY RESEARCH CENTER INFRASTRUCTURE PROJECT for a 3-year period starting from January 2009. The decision has been published in

the issue 27111 of the Official Gazette on 15/01/2009. It is worth to mention that while the R&D investments in 2009 suffered quite dramatic cutoffs in general due to the current economical crisis, this project has been funded with a high priority. Turkey's one of the first state-of-the-art quantum technologies research laboratories will be established at Koç University with the proposed infrastructure. In parallel with this, another quantum technologies research laboratory will be established in TUBITAK UEKAE. This way knowledge, infrastructure and synergy that will lead our country to future R&D studies in quantum information science will be established. With the proposed research laboratories, Turkey's competitiveness will be greatly increased in this vital area that promises communication lines with an ideal security and computers that are far faster than today's conventional computers.

Since 1980s, TUBITAK UEKAE has not only been a leader in Turkey for the studies in the field of cryptology, especially for developing crypto algorithms, device designs and analysis, it has also gained an international reputation. This progress is not restricted to development of prototype cryptosystems, but also spreads in a wide range by the published articles and the supported educational activities. TUBITAK UEKAE is already a pioneer in its field and employs a large number of highly qualified mathematicians, electronics and computer scientists specialized in crypto design and analysis. Although TUBITAK UEKAE has a voice in the world in the field of classical cryptography, the infrastructure required for quantum cryptography has not yet been established at the institute. TUBITAK UEKAE had been in constant search for support from universities since 2003 to meet this deficit and establish the required infrastructure.

Turkey's one of the first state-of-the-art quantum technologies research laboratories will be established at Koç University with the proposed infrastructure.

TUBITAK UEKAE will be able to fulfill the security needs of the country after the above mentioned quantum cryptology infrastructure is realized in collaboration with Koç University. This way the institute will play an important role in this exciting field together with other developed countries. With the infrastructure that will be established, new algorithms will be designed against threats to e-signature, internet banking and internet shopping systems posed by many algorithms like the RSA (Rivest, Shamir, Adleman) cryptosystem. The experience and knowledge that will be gained in quantum cryptography will be expanded towards the emerging field of quantum computation and thus will pave the way for many new applications.

Koç University is one of the main contributors to the project with its highly experienced faculty in the field of quantum information science. TUBITAK UEKAE is not only going to be one of the

main partners of the project and a part of the research group, but also play the role of a unifying center. Bilkent University will also support the project by designing high-tech advanced laser systems. The project partners have thus very complementary skills, encompassing all the basic needs of a quantum cryptology research center. The first aim of the project is to establish optical research laboratories dedicated to quantum cryptography research. During the first year of the project, the infrastructure necessary to perform quantum key distribution experiments will be mainly established. As an intermediate result, the infrastructure required for a random number generator will also be obtained. One of the essential parts for quantum key distribution systems is single photon sources. The emerging applications in this field are focused mainly to two options: Weak-pulsed lasers and triggered single photon sources. Primarily, weak-pulsed lasers will be used for the random number generator and quantum key distribution systems that will be developed during the project. A single photon source will also be demonstrated and the feasibility for use in the developed systems will be studied.

Tests of the protocols that are under consideration or suggested for these systems are of great importance in the context of system security and an optimum performance. In connection to this, studies of the possible attacks to these protocols and physical systems and countermeasures that should be taken against these attacks are also very important regarding to the efficient and secure use of these systems. For this reason, realizations of unique protocols and developing standard approaches for cryptographic security analysis of the systems constitute the expected results of the establishment of the infrastructure along with realizations of the physical systems.

Technical details of the demonstrations proposed in the project are summarized below:

Today, quantum cryptography based crypto key distribution systems are mainly realized in two different schemes: Fiber-optics communication systems and free-space communication systems. There are four different approaches that are either demonstrated or planned for these schemes:

- 1) Weak-pulsed laser systems: In this approach, weak pulses produced by lasers are transmitted to the receiver either by fibers or through air in free space. Fiber based weak-pulsed systems use single-mode fibers and operate around the wavelengths 1330 nm or 1550 nm, whereas atmosphere-based weak-pulsed systems use atmospheric communication systems.
- 2) Single-photon systems eliminate the possibility of information leakage through the use of single photons.
- 3) Systems based on entangled photons make use of the non-local quantum mechanical interaction between two quantum systems. These non-local interactions can be used to interchange keys.
- 4) In the systems that use continuous variables, keys are encoded via the small variations in the polarizations, phases or amplitudes of the intense optical pulses. This kind of coding may be in two steps or continuous.

Quantum Mechanical Random Number Generators

Quantum mechanical random number generators arise from the measurement axiom of quantum physics. According to the measurement axiom, when single photons are sent to a semi-transparent mirror, only one of the two detectors which are located either in the reflection port or in the transmission port will detect a photon at an instant. From this point of view, if the detections done in both detectors are coded with 0 or 1, series of detections will result in an ideal random number.

The experimental setup planned to demonstrate the quantum physical random number generator is shown in Figure 1. Intensity of a pulsed laser is highly reduced so that 0.05 photons are produced for every single pulse. The linear polarization of a laser beam attenuated by a $\lambda/2$ plate is rotated 45° . The beam at the output of the $\lambda/2$ plate is split into transmitting and reflecting arms by using a polarizing beam splitter (PBS). In the limit of a very weak pulse, at most one of the two detectors located at the outputs of the PBS will detect a photon for each pulse. Recordings of these detectors will then be coded by 0 and 1 finalizing the random number generation.

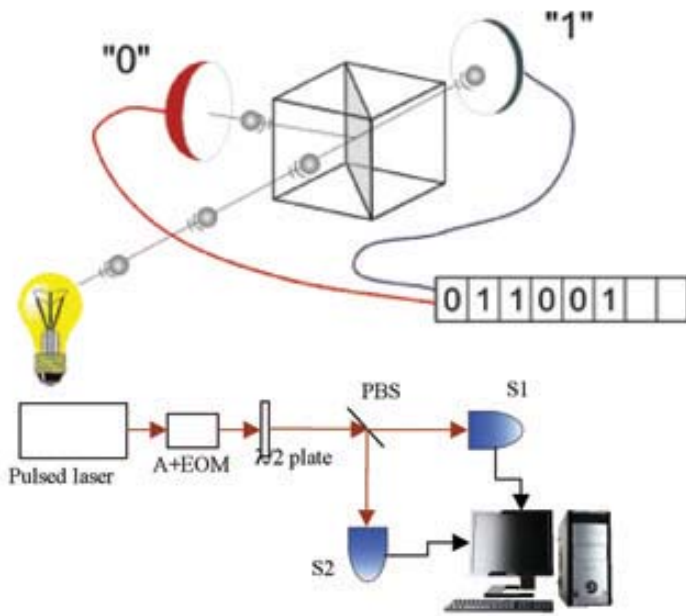


Figure 1. Experimental setup for random number generator. A, laser power attenuator; EOM, Electro-optical modulator; PBS, Polarizing beam splitter; S1, S2 single photon detectors

After the generation of single photons, performance of quantum cryptography systems also strongly depends on the performance of detectors that are capable of counting single photons. Single photon detectors are composed of devices that convert the optical signal to an electrical signal, fast circuits to amplify and measure the resultant signals. Today, avalanche photo-diodes, photo-multipliers, multi-channel plate and superconductor Josephson junctions are high quantum efficiency devices that convert optical signals to electrical signals.

An ideally secure information exchange can be performed in a single-photon based communication channel. In such a channel, information that is recorded by a third party, such as a spy, cannot reach the desired receiver.

Quantum Key Distribution

An ideally secure information exchange can be performed in a single-photon based communication channel. In such a channel, information that is recorded by a third party, such as a spy, cannot reach the desired receiver. Hence, it is not valuable as it will not be a part of the information exchanged between the sender and receiver. In addition to this, receiver and the sender would be sure that a third party did not steal any information, as long as the receiver received the original message. This property can be utilized in cryptography systems to realize an ideally secure key distribution. Such operations using single photons are called “quantum key distribution”.

The proposed experimental setup for quantum key distribution is shown in Figure 2. A pulsed laser, which is also planned to be used in the random number generator, capable of producing pulses with 40-50 MHz rate and time length of <1 nanosecond will be used. Power of the pulsed-laser will be reduced so that the limit in which a very low number of photons (~ 0.05) are produced for each pulse is reached. These photons are then coded in linear or circular polarizations using a fast electro-optical modulator. Bob will receive the photons in either linear or circular base with the help of a semi-transparent mirror, polarized semi-transparent mirrors and a $\lambda/4$ plate.

BB84 protocol is summarized in Table 1. “Alice” sends photons to “Bob” after randomly choosing one of the linear (D) or circular (C) bases. Left hand (L) side is coded as 0 and right hand (R)

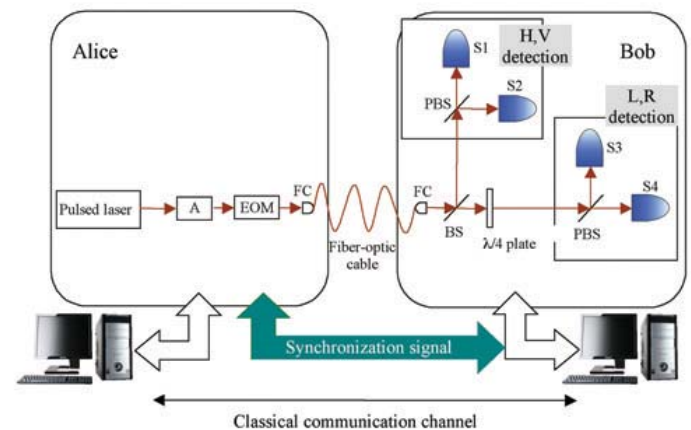


Figure 2. Experimental setup proposed for quantum key distribution. A, laser power attenuator; BS, beam splitter; PBS, polarizing beam splitter; EOM, Electro-optical modulator; S1, S2, S3, S4, single photon detectors; FC, fiber coupler.

Bit sent by Alice	0	1	1	0	0	1	0	1	1
Random base chosen by Alice	C	D	C	D	C	C	D	D	C
Polarization of the photon that is sent by Alice	L	V	R	H	L	R	H	V	R
Random base chosen by Bob	D	D	C	C	D	C	C	D	D
Result of Bob's measurement	H		R	L	H		L	V	H
Bases that are reported to Alice by Bob	D		C	C	D		C	D	D
Alice's respond	False		True		False		False		True
Distributed key			1						1

Table 1. Quantum key distribution via BB84 protocol.

side is coded as 1, whereas in the linear base horizontal direction (H) is coded as 0, and perpendicular direction (V) is coded as 0. “Bob” measures the polarizations of some of the photons in specific bases that he randomly chose for each photon. Then, he sends the information of the bases which were successfully measured to “Alice”. Finally, “Alice” gives “Bob” the information of the pairs which were successfully sent and received in the same base. Hence, quantum key distribution is realized between “Alice” and “Bob”.

Demonstration of Single Photon Sources

Triggered single photon sources are devices that ideally emit one and only one photon after an external trigger. Even though, in practice every emitted photon upon a trigger cannot be collected because of the collection efficiency limitations, it is possible to obtain 1 or 0 photon upon a trigger by these devices.

Triggered single photon sources are realized by exciting a two-level system with a pulsed laser. A third energy level is often used in order to be sure that the wavelength of the emitted photon is not equal to the wavelength of the laser as shown in Figure 3.

Every pulse of the pulsed laser causes the two-level system to make a transition to the excited ($|i\rangle$) state. This system then makes a fast transition to the state $|e\rangle$ and emits a single photon by spontaneous emission upon the $|e\rangle \rightarrow |g\rangle$ transition. It is then possible to make every pulse to trigger a single photon emission. In order to make every pulse to trigger a single photon emission, pulse time should be sufficiently smaller than the spontaneous emission time and pulse energy should be high enough to excite the system to the excited state $|i\rangle$. Up to now, this kind of experimental demonstrations were performed by using two-level single dye molecules, single InAs quantum dots, single CdSe quantum dots, single atoms, nitrogen vacancies in diamond or single carbon nanotubes in room temperature or liquid Helium temperatures. In this project, an appropriate two-level system will be chosen and a triggered single photon source will be demonstrated.

The experimental setup that will be used is shown in Figure 4. In this setup, a density sample containing two-level systems are put in a Helium cryostat. A specific region on the sample

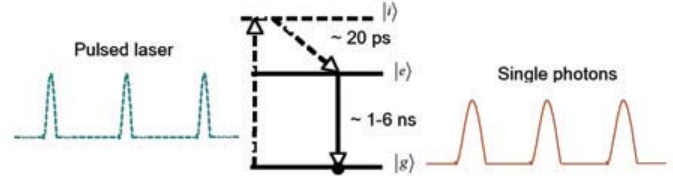


Figure 3. Principle of operation of a triggered single photon source based on a single dipolar emitter.

is excited with an optical resolution. A two-level system in this region is excited and the collected emission band is sent to a Hanbury-Brown and Twiss setup using a band-pass interference filter. Second coherence function of the emission is measured in this setup by using random detection electronics. Triggered single photon emission is demonstrated by measuring the second order coherence function.

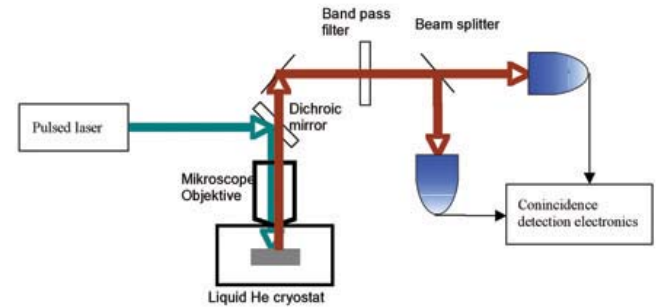


Figure 4. Experimental setup that will be used for the triggered single photon source demonstration.



Koç University Physics Department faculty members who take part in this project are Prof. Dr. Tekin Dereli, Assoc. Prof. Dr.

Turkey's one of the first "state-of-the-art" quantum technology laboratories will be founded at Koç University.



Özgür E. Müstecaplıoğlu and Asst. Prof. Dr. Alper Kiraz.

The responsibilities of the Koç University team in this project include

- 1) Establishment of the experimental setup required for the single photon demonstration at Koç University.
- 2) Development and tests of quantum key distribution protocols, modeling of experiments.
- 3) Education of students and coordination between the researchers invited from abroad.

3 M.S. students who were already registered to the M.S. Program in Physics at Koç University joined the project. Participation of other Ph.D. students and post-doctoral researchers to the project are also planned. New equipment related to the project will be acquired to the Nano-Optics Research Laboratory in 2009 by the DPT Supported Quantum Cryptography Infrastructure Project fund reserved for Koç University.

The following are the benefits we expect after the establishment of the quantum cryptology infrastructure:

- Turkey's acquirement of quantum cryptology and other advanced quantum computation technologies,
- Qualified researchers educated in the field.
- The opportunity to employ scientists working abroad who are active in the field; thus contributing to the reverse brain drain.
- Turkey's acquirement of scientific knowledge and technological independence in a critical field of research.
- Protection of state's and private sector's critical information.
- Benefit to the Turkish Armed Forces and other security units by this critical technology and products that will be developed during the course of the project.
- Contribution to the country's economy as well as its security units by increasing the competitive capabilities of Turkey with the U.S., Europe, and other developed countries. Similar products would cost around 80,000-100,000€ if they are purchased from abroad.



Prof. Dr. Tekin Dereli is a theoretical physicist who published over 100 articles on the different aspects of gravitation and quantum physics. He has worked in universities both in Turkey and abroad, then joined Koç University in 2001. He received many national and international scientific awards including the 1996 TUBITAK Science Prize. He is currently a member of the TUBA Council. An expanded edition of his two-volume Quantum Mechanics book (METU Press, 1998) which originated from his undergraduate and graduate lectures at METU, Ankara University and Koç University will be published as a single volume by TUBA Press this year.

Assoc. Prof. Dr. Özgür Müstecaplıoğlu

did his M.S. and Ph.D. studies on quantum optics at Bilkent University. He continued to work at the intersection of ultra-cold atomic systems and optics during his post-doc studies at Georgia Tech. A project he completed within the 2006 TUBA-GEBIP award he won was again on quantum information processing. This project resulted in 22 articles in international journals, 4 conference proceeding, an M.S. thesis and a Ph.D. thesis. He has been with Koç University since 2002. He was awarded the TUBITAK Encouragement Award in 2007.



Asst. Prof. Dr. Alper Kiraz worked on experimental characterization of single photon sources during his Ph.D. and post-doctoral studies. He did his Ph.D. at the University of California at Santa Barbara where he was in the group that demonstrated photon anti-bunching phenomenon and single photon emission using single InAs quantum dots. These results were among the earliest single photon source demonstrations and were a source of inspiration for single photon studies that followed. Dr. Kiraz has experimentally demonstrated the interference of two photons that are emitted by single molecules during his post-doc studies in Germany. This work was one of the first demonstrations to produce entangled photons with the help of single photon sources. He was awarded TUBA GEBIP Award and 2008 TUBITAK Encouragement Award after joining Koç University in 2004.

Annual Faculty Awards and Honors



BAHAR RUMELİLİ received a Jean Monnet Chair by European Commission.

BAHAR RUMELİLİ received 2009 Distinguished Young Scholar Award of Turkish Academy of Sciences (TÜBA-GEBİP).

HAKAN ÜREY received The Ten Outstanding Young Person (TOYP) Award in Science and Technology category from Junior Chamber International (JCI), 2008.

SEDA KIZILEL was the recipient of 2009 L'OREAL Turkey National Fellowship for Young Women in Science.

BARİŞ COŞKUNUZER received 2009 Distinguished Young Scholar Award of Turkish Academy of Sciences (TÜBA-GEBİP).

ERDEM ALACA received 2009 Distinguished Young Scholar Award of Turkish Academy of Sciences (TÜBA-GEBİP).

METİN MURADOĞLU received 2009 Distinguished Young Scholar Award of Turkish Academy of Sciences (TÜBA-GEBİP).

BURAK ÖZBAĞCI received Masatoshi Gündüz İkedâ research award given by The Mathematics Foundation.

TOLGA ETGÜ received Masatoshi Gündüz İkedâ research award given by The Mathematics Foundation.

ALPER KİRAZ was the recipient of 2008 TÜBİTAK Encouragement Award.

SELVA DEMİRALP CUDA was the recipient of 2008 TÜBİTAK Encouragement Award.

İSMAİL LAZOĞLU was elected as the Associate Member of the International Academy for Production Engineering (CIRP).

HALİL KAVAKLI received Feyzi Akkaya Research Fund for Scientific Activities (FABED) Outstanding Achievement Award for Young Scientists.

ZEYNEP AYCAN was elected as Outstanding Young Scholar, World Economic Forum Inter-Academy Panel.

YÜCEL YEMEZ and his student S. C. Bilir received third place in Best Student

Paper Award, for the article “Time Varying Surface Reconstruction from Multiview Video”, in IEEE 16th Signal Processing and Communications Applications (SIU), Didim, April 2008.

DİLEK BARLAS was appointed to European Science Foundation (ESF), Turkish Representative, Standing Committee for the Humanities.

AYLİN KÜNTAY was elected to the Executive Committee for the International Association for the Study of Child Language.

SAMİ GÜLGÖZ was elected as European Research Council Advanced Research Grant Panel Member.

MURAT TEKALP was elected as European Research Council Advanced Research Grant Panel Member.

ÇAĞATAY BAŞDOĞAN became Associate Editor, IEEE Transactions on Haptics.

METİN MURADOĞLU was elected to Turkish National Committee on Theoretical and Applied Mechanics.

Turkish Academy of Sciences (TÜBA) Members

PRINCIPAL MEMBERS

- Ali Mostafazadeh (Mathematics)
- Ali Ülger (Mathematics)
- Attila Aşkar (Applied Mathematics)
- Burak Erman (Chemistry)
- Çiğdem Kağıtçıbaşı (Psychology)
- Ersin Yurtsever (Chemistry)
- Murat Tekalp (Electrical & Electronics Engineering)
- Nihat Berker (Physics)
- Tekin Dereli (Physics)
- Yaman Arkun (Chemical Engineering)

ASSOCIATE MEMBERS

- Alphan Sennaroğlu (Physics)
- Levent Demirel (Chemistry)
- Sami Gülgöz (Psychology)



Koç University Profile

Koç University is a private, nonprofit institution, founded in 1993 and located in Istanbul. The University is supported by the financial resources of the Vehbi Koç Foundation. The University's mission is to produce the most capable graduates by providing a world-class education, to advance the frontiers of knowledge by excellence in research and to contribute to the benefit of Turkey and humanity at large. The medium of instruction at Koç University is English. The enrollment in 2009 is 3,834, of which 3,383 are undergraduate and 451 are graduate students. Number of full-time equivalent faculty is 283.

The educational philosophy of Koç University is based on the principle of "creative teaching/participatory learning". Since its foundation, Koç University has encouraged the search for truth through research, criticism, and creativity. Cooperation with international institutions,

as well as lectures by internationally renowned academics and business leaders, also contribute to the quality of education at Koç University. The University has exchange programs with selected universities abroad. It is also involved in Erasmus programs.

The University is composed of the College Sciences, the College of Social Sciences and Humanities, the College of Administrative Sciences and Economics, the College of Engineering, the Law School, the School of Health Sciences, the Graduate School of Business, the Graduate School of Sciences & Engineering, the Graduate School of Social Sciences & Humanities, and the English Language Center.

Graduates of the four-year undergraduate programs in History, Philosophy, Art History and Archeology, English Language and Comparative Literature, Sociology,

Psychology, Economics, Business Administration, International Relations, and Law are awarded BA degrees. Those in Chemical and Biological Engineering, Computer Engineering, Electrical and Electronics Engineering, Industrial Engineering, Mechanical Engineering, Mathematics, Physics, Chemistry, Molecular Biology and Genetics and Nursing receive BS degrees. The Graduate Schools offer degrees in Ph.D, M.S., M.A., MBA and Executive MBA.

Koç University has an alumni body of 4,768, with 3,549 students from its undergraduate programs and 1,219 from its graduate programs. The rate of employment within six months of graduation is almost 100%. Over 400 of the graduates of Koç University were placed to top graduate programs worldwide and its graduates who join the work force were sought after by the most desirable national and multinational companies in Turkey as well as abroad.



Graduate Programs at Koç University

Quest for scientific knowledge and performing pioneering research requires high quality graduate education. With public and private sectors' growing interest in research,

development and innovation due to global competition and shortages of faculty members, the demand for graduate students who have the necessary specialization and academic

preparation is rapidly increasing. Our graduate programs recognize this need and aim to provide the best education and research support to high quality students.

1. GRADUATE SCHOOL OF BUSINESS

Masters Programs

MBA

Finance

Executive MBA

Ph.D. Programs

Business

2. GRADUATE SCHOOL OF SCIENCES AND ENGINEERING

Masters Programs

Chemical and Biological Engineering

Computational Sciences and Engineering

Electrical and Computer Engineering

Industrial Engineering

Materials Science and Engineering

Mathematics

Mechanical Engineering

Physics

Ph.D. Programs

Chemical and Biological Engineering

Computational Sciences and Engineering

Computer Engineering

Electrical & Electronics Engineering

Industrial Engineering and Operations Management

Materials Science and Engineering

Mathematics

Mechanical Engineering

Physics

3. GRADUATE SCHOOL OF SOCIAL SCIENCES AND HUMANITIES

Masters Programs

Anatolian Civilizations and Cultural Heritage Management

Comparative Study in History and Society

Economics

International Relations

Psychology

Ph.D. Programs

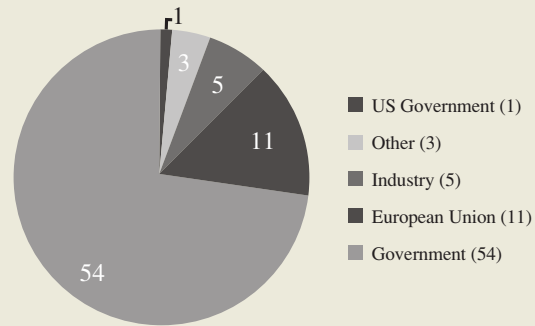
International Relations

Psychology



Research Funding

As of April 2009, the total number of ongoing projects is 74 with a present value of 13.5 million TL. The breakdown of these projects according to sources of funding is provided below.



Current Research Sponsors Include:

- Vehbi Koç Foundation
- Arçelik
- Aygaz
- Ford Otosan
- Koç System
- Otokar
- Tüpraş
- OSD (Automotive Industries Association)
- TÜBİTAK (Scientific and Technological Research Council of Turkey)
- TÜBA (Turkish Academy of Sciences)
- DPT (State Planning Organization, Turkey)
- IBM
- IBB (The Municipality of İstanbul)
- Aselsan
- Open Society
- European Union
- Max Planck Society
- PME Foundation, Switzerland
- National Institute of Health, USA
- DARPA, USA
- USIP: United States Institute of Peace
- Microvision, USA
- Microsoft, USA
- Wacker Chemie AG
- Procter and Gamble
- The German Marshall Fund of the United States
- CFCU (Central Finance and Contracts Unit)
- BOREN

KU Involvement in the European Union Framework Program

A total of 11 projects have been selected for funding under FP7.

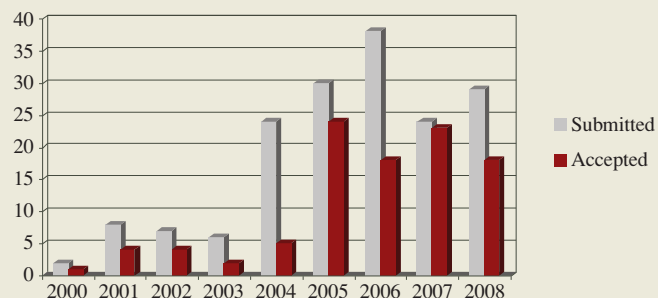
Active Projects	11
FP7 Cooperation	4
EC External Action Central Finance and Contracts Unit	2
European Commission Lifelong Learning Program	1
FP7 People (Marie Curie International Reintegration Grants)	4

As indicated below, interest in the EU FP7 programs has doubled in the past year.

Proposals Submitted	26
FP7 Cooperation	6
FP7 Ideas	5
FP7 People	15

KU Involvement in TÜBİTAK projects

In terms of number of funded projects the largest single sponsor continues to be TÜBİTAK (Scientific and Technological Research Council of Turkey). The chart below provides a snapshot of Koç University's performance in the various TÜBİTAK programs through the years.



Research News



The European Research Council Meets at Koç University

Koç University was selected as the hosting institution of the Scientific Council Meeting of the European Research Council (ERC). It was the first time the delegation, led by the President of the ERC, Prof. Fotis Kafatos, convened in Turkey. As the meetings were closed sessions, Council Members had the opportunity to meet our faculty members on various occasions. The landmark event took place on March 11-12, 2009, and was followed by the “ERC Turkey Conference on ERC Advanced Grant Laureates” held March 13, 2009. The Scientific Council of the ERC is an autonomous, policy-setting body, comprised of 22 distinguished scientists selected by an independent procedure and appointed by the European Commission. The mission of the Scientific Council is to develop the ERC's scientific strategy and operational program.

The ERC is the flagship component of the Ideas Program of the European Union's Seventh Research Framework Program (FP7), and has an overall budget of EUR 7.5 billion over the course of 7 years (2007-2013). The highly competitive Starting and Advanced Grant schemes of the ERC provide support for cutting-edge, investigator-initiated/driven research

in all fields of science, engineering, social sciences and the humanities. The “investigator-driven” nature of the ERC Grants allows researchers to identify new opportunities and approaches in their respective areas of research. This bottom-up approach prevents potential limitations set by the identification of pre-determined areas or priorities. Scientific excellence is the sole criterion for funding.

The establishment of the European Research Council (ERC) is evidence of the importance Europe places on the formulation of a shared science policy to strengthen and shape the European research system. As stated by the Council Members, “By challenging Europe's brightest minds, the ERC expects that its grants will help to bring about new and unpredictable scientific and technological discoveries - the kind that can form the basis of new industries, markets, and broader social innovations of the future”.

Marie Curie International Reintegration Grant Recipients and Their Projects

This past year four faculty members received the competitive Marie Curie International Reintegration Grants. Here we introduce these four recipients.



Seda Kızılel
Microencapsulation of
Islets Within
Functionalized PEG
Hydrogel

Diabetes mellitus has a Europe prevalence of approximately 48 million people, including approximately 1 million with Type I diabetes. Despite the availability of

exogenous insulin, life expectancy and quality are still diminished by chronic or late complications of the disease. These complications can be mitigated by restoring near-normal levels of glucose. The most effective strategy to do so relies on transplanting islets from donor tissue (in the form of a whole pancreas or isolated islets). Islet transplantation has evolved as a meaningful treatment option for Type I diabetes, but its widespread application has been limited by the need for immunosuppression and limited donor tissue supply. Theoretically, this membrane serves as a mechanical barrier isolating the graft from recipient leukocytes and antibodies while continuing to allow the diffusion of glucose, water, insulin, oxygen, nutrients, and cellular waste. This research will focus on microencapsulation of islets with functional coats in order to address many of the shortcomings associated with current techniques of immunoisolation. In this project, the technique of interfacial photopolymerization will be employed to immunoisolate islets with functional PEG hydrogel coats. Encapsulation of islets using interfacial photopolymerization is necessary to achieve higher yields to test in vivo function and immunoprotection of islets encapsulated by this method. The hypothesis is that, by employing interfacial photopolymerization along with the techniques presented in this proposal it will be possible to microencapsulate rodent and canine islets in capsules of adequate quantity and consistent quality and that the function of islets microencapsulated by this method will be equivalent to that of unencapsulated islets in environments where allogeneic and xenogenic immunologic rejection are not factors, and

superior in models in which rejection is a factor.

Seda Kızılel obtained her B.S. and M.S. degrees from Boğaziçi University, both in Chemical Engineering. She got her Ph.D. from Biomedical Engineering Department of Illinois Institute of Technology in Chicago, in December 2004. Next, she worked at the University of Chicago as a postdoctoral scholar to study microencapsulation of islets within PEG hydrogel, which was a collaborative project of Chemistry-Physics-Surgery Departments. She started as an Assistant Professor of Chemical and Biological Engineering at Koç University in January 2008.



Barış Coşkunüzzer
Minimal Surfaces in 3-
Manifolds

Dr. Coşkunüzzer started his research career with his Ph.D. study at Princeton University under the supervision of Dave Gabai. His Ph.D. thesis is on a problem towards Thurston's hyperbolization

conjecture. He greatly improved Calegari's results on a program of Thurston for his hyperbolization conjecture. In particular, he proved that if a 3-manifold admits a uniform 1-cochain, then there is a genuine lamination and a topological pseudo-Anosov flow in M . In other words, he started with a uniform 1-cochain which is an abstract-algebraic object, and he constructed a genuine lamination and a flow which are concrete-geometric objects in the manifold. This start gave him a great experience in 3-manifold topology.

On the other hand, during his Ph.D., the researcher also showed interest on minimal planes in hyperbolic space, and he showed that for a generic smooth simple closed curve in asymptotic sphere of hyperbolic 3-space, there are finitely many least area planes spanning the curve. This is a completely analytic result by using global analysis

techniques. After his Ph.D., he moved to Yale where he found great nourishing mathematical ambience. There, he remarkably improved the generic finiteness result to generic uniqueness for smooth simple closed curves in asymptotic sphere. Then, he generalized his methods to different settings.

Later, he focused on the least area planes in hyperbolic 3-space. He used his topological background in foliation theory for minimal surface problems. He got a very striking result for the asymptotic Plateau problem: A generic simple closed curve in the asymptotic sphere of hyperbolic 3-space bounds a unique least area plane. This result is quite strong and surprising, because there was no result or conjecture on that direction. Moreover, the techniques were very general, and they can be applied to many different settings of Plateau problem. Later, he also showed the existence of simple closed curve with nonunique solutions to asymptotic Plateau problem, which shows that the result is sharp in some sense. Then, he studied the properly embeddedness of least area planes in hyperbolic space. First, he gave an existence proof of a conjecture of Gabai. Later, he also proved a very strong result about properly embeddedness of least area planes in hyperbolic 3-space.

Recently, Dr. Coşkunüzer changed his interest to minimal surfaces in compact 3-manifolds, and got interesting results in this setting, too. Currently, he is working on Universal Cover Conjecture, which is related with one of the famous millennium problems Poincare Conjecture, and existence of minimal foliation in a closed hyperbolic 3-manifold. In short, Dr. Coşkunüzer is essentially using his experience in foliation and lamination theory, and tools of 3-manifold topology for different substantial problems of a classical field of mathematics, minimal surface theory. The techniques are quite original in the field, and the results are very general and powerful.

Barış Coşkunüzer was born in 1977. He graduated from Boğaziçi University in 1999, and finished his M.S. in Caltech in 2001. He got his Math Ph.D. from Princeton University in 2004. After Ph.D., he moved to Yale University, and worked there as Gibbs Assistant Professor for 3 years.

During this period, he got substantial results on minimal surfaces and their applications to geometric topology. Then, he was awarded NSF Topology Research Grant in 2006. He was also invited to evaluate the NSF Grant Applications in Geometry - Topology as a panelist during this time. In 2007, Dr. Coşkunüzer joined Koç University Mathematics Department as an Assistant Professor. During his time in Turkey, he was awarded TUBITAK Career Research Grant in 2007, EU-FP7 Marie Curie Reintegration Grant in 2008 and Turkish Academy of Sciences' Distinguished Young Scholar Award (TUBA-GEBIP) in 2009. Dr. Coşkunüzer has 4 preprints and 7 articles published in highly prestigious math journals. Dr. Coşkunüzer is married with two children.



Kazım Büyükboduk Iwasawa Theory of Galois Representations

Dr. Büyükboduk's research interests fall in the general area of arithmetic algebraic geometry and number theory. More specifically, he is interested in the study of “Galois representations” attached to arithmetically interesting objects. Since

Grothendieck's efforts towards proving Weil's conjectures, Galois representations have gained a central role in number theory and arithmetic geometry. One may associate a Galois representation an L-function, an object of analytic nature; and also a Selmer group, an object of purely algebraic nature. The connection between these two types of data attached to a Galois representation is the subject of many outstanding problems, such as the Birch and Swinnerton-Dyer conjecture (which is one of the six millennium problems), Iwasawa's main conjectures and more generally, the Bloch-Kato conjectures.

The main technical tool to attack the sorts of conjectures mentioned above is the machinery of Euler systems and

Kolyvagin systems. Dr. Büyükboduk has investigated and is currently studying various aspects of the theory of Euler systems. Most recently, he was able to develop an Euler system machinery for a very general class of Galois representations. Before his work, a satisfactory output of an Euler system was only available when the dimension of the Galois representation in question is sufficiently small. Using his refinement, Dr. Büyükboduk used Rubin-Stark elements to generalize the works of Herbrand-Ribet and Mazur-Wiles in order to prove a refined class number formula and Iwasawa's main conjecture for a totally real number field.

Another recent progress that Dr. Büyükboduk achieved relates to the celebrated Gross-Zagier formula which expresses the special value of the L-function attached to an elliptic curve in terms of the Neron-Tate height of an Heegner point. This is one of the incarnations of the principle described above: Analytic data (encoded in an L-function) should also keep track of the algebraic data (encoded in Heegner points). Recent work of Dr. Büyükboduk proves a p-adic analogue of this classical result in a very different setting, expressing the leading term of the associated p-adic L-function in terms of heights on Nekovar's Selmer complexes. This new result sheds light and offers a new perspective on the Gross-Stark conjecture which concerns the special values of the relevant p-adic L-function.

Kazım Büyükboduk was born in 1980. He received his B.S. degree from Bilkent University in 2002 and obtained his Ph.D. in Mathematics in 2007 from Stanford University under the supervision of Karl Rubin. Upon completion of his Ph.D. he was awarded the William Hodge Postdoctoral Fellowship of IHES. In 2008, Dr. Büyükboduk joined Koç University, spending the 2008-09 academic year on leave at Max Planck Institute. He was awarded an EU-FP7 Marie Curie Reintegration Grant in 2008. Dr. Büyükboduk's results have received international recognition and he has been invited to deliver lectures in a number of countries which include France, Germany, Great Britain, Japan and USA to address audience of highest caliber.



Seda Ertay

An Experimental Study on the Economics of Self-Confidence, Motivation, Gender and Incentives

Dr. Ertay's general research agenda involves theoretically and experimentally studying individuals' self-confidence and their motivation to exert effort under different institutions, with applications to organizational and

educational settings. The experimental part of her research uses laboratory experiments, which employ a student population and a highly controlled environment, as well as field experiments, which use non-student populations in a more "natural" setting. The project that has been funded as part of the FP7 IRG program is an experimental project which, in a broad sense, aims to study the link between self-confidence, motivation and institutions using both lab and field experiments, with particular focus on gender and personality as explanatory variables.

Both in educational settings and the workplace, individuals rarely have perfect information about their own abilities, and important economic decisions (e.g. type of occupation, career path, how much effort to exert, whether to persevere in response to failure) are fundamentally based on perceived ability, or self-confidence. How different institutional structures (e.g. types of incentive schemes, amount of uncertainty etc.) affect behavior in these contexts is an important question for organizational policy. Moreover, factors such as personality traits, gender, and biological factors can be instrumental in determining individuals' self-selection into and behavior under different environments and/or institutions. For example, recent literature has found that women may tend to shy away from competitive settings (such as a tournament incentive scheme), which could potentially lead to inefficiencies. The project proposes to conduct a set of laboratory and field experiments

to analyze the dynamics of self-confidence and the motivation to exert effort under different organizational settings, and analyze the determinants of self-selection. In conjunction with behavioral data, the study will also collect data on gender, age, educational background, risk-aversion, and personality traits, and will employ the recent method of neural measurements. Understanding the determinants of motivation, and studying its interactions with the institutional structure as well as individual characteristics can potentially generate important policy recommendations for the workplace as well as for educational settings. In addition, such an exercise can also contribute to the explanation of some of the existing facts about wage determination and occupational choice, e.g. the gender-wage gap.

It should be noted that the project has a strong interdisciplinary flavor, both in terms of topic and methodology. The issues studied are of interest to economics as well as to psychology and organizational behavior. From a methodological perspective, the project utilizes a set of methods (concurrent use of laboratory experiments, field experiments, personality data and neurobiological measurements) that has found growing use in economics in the recent past. The project is

expected to advance the integration of these methods into economics both by employing them in the study of a new research topic, and also by assessing the benefits of their use for improving the accuracy and power in the prediction of economic behavior. The studies conducted under this grant are expected to help establish the field of experimental economics in Turkey, since there are very few researchers currently working in this area in the country.

Seda Ertaç is an Assistant Professor of Economics at Koç University. After receiving her B.A. degree in economics from Bilkent University in 2000, Dr. Ertaç went on to study economics at the graduate level at University of California, Los Angeles, and received her Ph.D. degree in 2006. Dr. Ertaç then completed a 1.5-year postdoctoral study at the economics department of the University of Chicago. She joined Koç University economics department in February 2008. Dr. Ertaç's fields of research are applied microeconomic theory and experimental economics. Her experimental research to date has been supported by grants from the United States National Science Foundation and the Russell Sage Foundation. At Koç University, she teaches courses on microeconomic theory, game theory and experimental economics.







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