

IMBM

**İSTANBUL MATEMATİKSEL
BİLİMLER MERKEZİ**

2016/2017 FAALİYET RAPORU

IMBM – Kodirektörü tarafından

Boğaziçi Üniversitesi Rektörlüğü
Boğaziçi Üniversitesi FEF Dekanlığı
Boğaziçi Üniversitesi Matematik Bölüm Başkanlığı
ve
IMBM Paydaşları
için hazırlanmıştır.

2006 yılında çalışmalarına başlayan IMBM'nin bu ve önceki yıllara ait etkinlik raporları web sitemizde (www.imbm.org.tr) bulunmaktadır.

Bilimsel etkinlikler.

Eylül 2016 – Ağustos 2017 arasında, IMBM’de listesi ilişikte (Ek-1) bulunan 22 adet bilimsel etkinlik gerçekleştirilmiştir. Bunların 3 tanesi yüksek katımlı konferans/çalıştay, 11 tanesi ortak çalışma ziyareti, 8 tanesi düzenli çalıştay/seminer buluşmalarıdır.

Eylül 2016’da göreve başlayan Yürütme Kurulu’nun ilk toplantısında bilimsel etkinliklere ilişkin kararlaştırdığı aksiyon planında öne çıkan fikirleri not etmekte fayda görüyoruz.

IMBM Matematik Günleri: Doktorasını yakın geçmişte almış ve/veya Türkiye’ye yakın geçmişte taşınmış araştırmacıları ve çalışmalarını İstanbul ve Türkiye matematik camiasına tanıtmak ve bilimsel bağlar kurmalarına önyak olabilmek amacıyla, senede bir defa çalıştay düzenlenecektir. Bunların ilki 14-15 Eylül 2017 tarihlerinde, “IMBM Matematik Günleri” başlığıyla düzenlenmiştir.

İkili Araştırma Programları: Uzun vadeli hedefimiz, Türkiye’de görev yapmakta olan bir araştırmacıyla ortak çalışma yürütmek üzere IMBM’yi en çok iki aylığına ziyaret olanağı sağlayacak (Oberwolfach Bursları benzeri) bir program kurgulamaktır. Böyle bir programın, Türkiye’ye yerleşmiş bulunan matematikçilerin uluslararası bağlarını korumaları ve sağlamlaştırılmaları adına çok önemli olduğunu düşünüyoruz.

Deneyimli Araştırmacıların idaresinde Yoğunlaştırılmış Araştırma Programları: Bu program, Sayılarla Matematik (Women in Numbers) programından esinlenmiştir. Türkiye Matematik camiasının deneyimli üyeleri, genç araştırmacıların (özellikle, doktora sonrası araştırmacılar ve yeni doktora sahipleri) aktif olarak parçası olacakları araştırma projeleri tasarlayıp rehberlik edeceklerdir. Bu gruplar senede birkaç defa IMBM’de buluşacaklar ve projenin tamamlanması için yoğun çalışma programlarına tabi olacaklardır.

İdari yapı.

Bir önceki yıla ait raporda da anlatıldığı üzere, IMBM Bilimsel Yönlendirme Komitesi (BYK) 2016 yazında gerçekleştirdiği toplantıda, IMBM’nin idari işleyişinin yeniden yapılandırılmasını öngörmüştür. Bu toplantıda alınan kararlar uyarınca, yeni bir Bilimsel Kodirektör seçilmiştir. Bilimsel Kodirektör

tarafından hazırlanmış “IMBM İdari İşleyiş Şeması”, BYK'nin tavsiyeleri temelinde IMBM'nin esas idari işleyiş esaslarını kayda geçirmiş ve BYK'nin onayıyla yürürlüğe girmiştir.

Bunu takiben, Matematik'in temel altı alanını temsil eden bir Yürütme Kurulu (YK) belirlenmiştir. YK'de görevli araştırmacılar Analiz-PDE, Cebirsel Geometri, Geometri ve Topoloji, Grup Teorisi, Sayılar Teorisi ve Uygulamalı Matematik konularında çalışan, ülkemizin en önde gelen uzmanlarıdır. YK'nin Ekim 2016'da gerçekleştirdiği ilk toplantıda bir aksiyon planı belirlenmiştir; alınan kararlar 1. bölümde özetlenmiştir. Etkinlik başvurularının şeffaflıkla değerlendirilebilmesi için, IMBM sitesine bağlantılı, “online” başvuru sistemi kurgulanmıştır. Yeni sistemde başvuru sahipleri, başvuru formunda kendi araştırma alanlarına en yakın konuda çalışan bir YK üyesini belirlemektedir. İsmi işaretli YK üyesi ile beraber Bilimsel Kodirektör, başvurunun uygunluğunu değerlendirerek karara bağlarlar. Rapora ekli olarak listelenmiş bilimsel etkinlikler bu karar sürecinden geçmişlerdir.

Eylül 2017 itibariyle Kazım Büyükboduk yerine Burak Özbağcı (Koç Üniversitesi) yeni kodirektör olarak IMBM yönetimine katılmıştır.

Bunların yanında Boğaziçi Üniversitesi Biyomedikal doktora öğrencilerinden Matematik Bölümü araştırma görevlisi Pınar Adanalı, IMBM'nin Lojistik Koordinatörü sıfatıyla tam zamanlı görevlendirilmişti. Pınar Adanalı görevini sürdürmüştür.

Bina ve misafir odalarının bakımı.

Bina ve misafir odalarının bakım, onarım ve temizliği, Boğaziçi Üniversitesi'nin desteğiyle yürütülmeye devam etmiştir. BÜ kütüphane görevlisi Ayşe Aktemur, geçen yıl olduğu gibi bu yıl da IMBM binası sorumlusu olarak hizmet vermektedir.

Mali durum.

IMBM'nin tüm altyapı ve misafirhane masrafları, binanın ve bahçenin bakımı ve konuşmalar sırasında tüm ikram servisi BÜ bütçesinden karşılanmaktadır.

Geçen yıllarda olduğu gibi bu yıl da IMBM Türk Matematik Derneği'nin (TMD) Matematik Araştırma Dostları Projesi (MAD) kapsamında destek almıştır. Üç yıllık destek masrafı 32.000TL olmuştur.

Garanti Bankası Boğaziçi şubesinde bulunan IMBM banka hesabının dönem başı ve sonu durumu aşağıdaki gibidir.

	TL	USD	EURO
1 Eylül 2016	9.381,05	1.000	1.150
1 Eylül 2017	8.919,09	1.000	1.150

Gelecek yıla dair.

Geçtiğimiz akademik takvim, Matematiksel faaliyetler bağlamında oldukça kısır geçmiştir; birçok bilimsel etkinlik iptal edilmiş, ortak çalışma hedefli buluşmalar ertelenmek durumunda kalmıştır. Türkiye'nin araştırmaya adanmış tek Matematik merkezi olarak bu olumsuzlukları aşmaya kararlıyız; bu bağlamda destekleriniz için başta Boğaziçi Üniversitesi, Türk Matematik Derneği ve Feza Gürsey Merkezi olmak üzere tüm paydaşlarımıza sonsuz şükranlarımızı sunarız.

Yürütme kurulu adına
Ferit Öztürk, Kodirektör

SCIENTIFIC ACTIVITIES (01.09.2016 – 01.09.2017)

October 2016

Activity 1.

Local Host: *Ayşe Berkman* (MSGSU)

Guests: *Alexandre Borovik* (University of Manchester,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=199573>)

Greg Cherlin (Rutgers University,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=48035>)

Zoe Chatzidaki (Paris VII,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=47660>)

Angus Macintyre (Queen Mary University of London,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=117660>)

Dates: 17.10.2016 – 23.10.2016

Titles of the talks:

Recognizable sets of power series over a finite field

Remarks on automorphism groups of pseudo-finite fields

A central point of the BN-program, revisited

Modules of Morley rank 3

Bad groups of Morley rank 3

The theory of the integral algebraic functions

From character varieties to quantum representation of mapping class groups

Elimination of Operators in Nilpotent Groups

Issues of definability for various local rings attached to models of Peano arithmetic, and for

SL_2 of those rings

Decidability questions for theories of modules over certain Bézout domains

Frécon's proof on the inexistence of bad groups of rank three

Sharp BN-pairs of rank 1

Invariant Random Subgroups of Locally Finite Groups

Linearization in Dimensional Theories

Geometries and Small Groups of Finite Morley Rank

On Fields of Characteristic 1 and Their Model Theory

November 2016

Activity 2.

Local Host: *Handan Borluk* (Kemerburgaz University)

Guests: *Mithat İdemen* (Işık University)

Dates: 11.11.2016

Scientific Goals: Speaker at the *IMBM Differential Equations Meetings*.

Activity 3.

Local Host: *Dieter Van den Bleeken* (Bogazici University)

Guests: *Joris Raeymaekers* (Czech Academy of Sciences, <http://www.ams.org/mathscinet/MRAuthorID/77535>)

Dates: 14.11.2016 – 18.11.2016

Scientific Goals: We plan to further investigate our recently obtained exact solutions to 3d supergravity in the context of the AdS/CFT correspondence. In particular we want to either prove or disprove the existence of a boundary action leading to boundary conditions that single out precisely the singleton representations of the global $SU(2, R)^2$ symmetry.

Proposed talk: Title: On matter coupled to the higher spin square Abstract: Gaberdiel and Gopakumar recently proposed that the tensionless limit of string theory on $AdS_3 \times S^3 \times T^4$ takes the form of a higher spin theory with a gauge algebra that is referred to as the higher spin square. In this note, we formulate the linearized Vasiliev-type equations which describe a matter field coupled to the higher spin square. We study the particle spectrum of this field and show that it accounts for the entire untwisted sector of the dual symmetric orbifold CFT, thereby confirming a conjecture by Gaberdiel and Gopakumar. In doing so, we pinpoint the group-theoretic data which determine the spectrum of a matter field coupled to a general higher spin algebra, which we illustrate by revisiting the theory based on the $hs[1/2]$ algebra.

Activity 4.

Local Host: *Tinaz Ekim* (Bogazici University)

Guests: *Ademir Hujduravic* (<http://www.ams.org/mathscinet/MRAuthorID/984194>),

Faisal Abu-Khizam (Lebanese American University, <http://www.ams.org/mathscinet/MRAuthorID/738180>)

Dates: 17.11.2016 – 23.11.2016

Scientific Goals: *Workshop on Graph Theory and its Applications (WGT)* is an annually organized workshop bringing together researchers and graduate students working on various areas of graph theory. A wide range of areas such as structural graph theory, algebraic graph theory, design theory, combinatorial optimization, parameterized complexity, computational complexity, etc. is covered by the invited speakers.

It has usually two invited speakers; each one of the invited talks takes two hours and is given at an introductory level. Apart from the two invited speakers, there are also contributed talks, mainly by graduate students. Although the participants are mostly from Turkey, the invited speakers are from high quality institutions all around the world, and as a consequence the workshop is held in English. The aim is to bring together students and researchers all around Turkey and build connections and collaborations with foreign researchers by accommodating them as invited speakers.

[Activity 5.](#)

Local Host: *Teoman Turgut* (Bogazici University)

Guests: *Jens Hoppe* (Royal Institute of Technology)

Dates: 5.11.2016 – 30.11.2016

Scientific Goals:

- 1. Time Evolution of Harmonic Flows (jointly with Dr. Budsaraphorn Luangmalawat)**
Despite much effort to understand classical surfaces motions that sweep out in space time 3-dimensional manifolds which are stationary points of the volume functional, only very little is known concerning quantitative results, i.e. about the concrete (even qualitative) evolution of shapes. Numerical methods are non-trivial to implement and only very limited results have been obtained. For a somewhat related surface flow proposed by Bordemann and Hoppe, however, one can show that the time at which the surface reaches a point in space is a harmonic function. The purpose of the first part of the proposed project (bringing together 3 different kinds of expertise) is two-fold: To broaden and supplement recent results on Riemann surfaces as equipotential surfaces [M.Bordemann, N.Chevallier, J.Hoppe; work in progress] (in particular concerning visualization), as well as to study numerically the evolution of such surfaces, with the important idea of developing and testing numerical methods that could then be applied to the minimal 3-manifold case.
- 2. Higher (co-)dimensional minimal surfaces (jointly with Dr. G. Linardopoulos)**
During Prof. Hoppe's previous visit and O. T. Turgut's visit to Stockholm, we worked on some aspects of minimal surface equations, one of them is to find new solutions by direct methods inspired from some geometric ideas.

Activity 6.

Local Host: *Alp Bassa* (Bogazici University)

Guests: *None.*

Dates: 25.11.2016 – 27.11.2016

Scientific Goals: The Ankara-Istanbul Algebraic Geometry & Number Theory Meetings aim to bring together people working on algebraic geometry, number theory and related areas in Turkey. During each academic year, monthly meetings are planned in Ankara and Istanbul alternately (and possibly other cities in the future). We hope that these meetings will facilitate communication and collaboration among researchers in the field of algebraic geometry / number theory in Turkey.

December 2016

Activity 7.

Local Host: *Nihat Sadık Değer* (Bogazici University)

Guests: *Ilmar Gahramanov* (Albert Einstein Institute, <http://www.ams.org/mathscinet/MRAuthorID/77535>)

Dates: 8.12.2016 – 18.12.2016

Scientific Goals: The topic below will be covered in two 90 minutes talk (Part I: Integrability, Part II: Supersymmetry) by Dr. Gahramanov. Dieter Van den Bleeken from physics department and his students will also benefit from these talks. He also has collaborators at Mimar Sinan University.

Title: Progress in integrable lattice models inspired by supersymmetric gauge theories
Abstract: Recently, there has been observed several connections of integrable models to supersymmetric gauge theories. One of such connections is a correspondence between supersymmetric quiver gauge theories and integrable lattice models such that the integrability emerges as a manifestation of supersymmetric dualities. Particularly, partition functions of three-dimensional $N = 2$ supersymmetric quiver gauge theories on different manifolds can be identified with partition functions of two-dimensional exactly solvable statistical models. Using this relationship one can obtain new solutions of the star-triangle relation and other forms of the Yang-Baxter equation.

Activity 8.

Local Host: *Handan Borluk* (Kemerburgaz University)

Guests: *Taylan Şengül* (Marmara University)

Dates: 9.12.2016

Scientific Goals: IMBM Differential Equations Meetings

Title: Transitions in Fluid Flows

Abstract: In this talk, I will describe transitions in fluid flows. The focus will be on the Rayleigh Benard and other related fluid flow models. I will describe the attractor bifurcation, pattern formation and the dynamic transitions in these models.

January 2017

Activity 9.

Local Host: *Handan Borluk* (Kemerburgaz University)

Guests: *İrma Hacırılıyan* (Istanbul Technical University)

Dates: 13.01.2017

Scientific Goals: IMBM Differential Equations Meetings

Title: Davey-Stewartson Denklemlerinin α -Düzgünleştirilmesi Üzerine

Abstract: Bu konuşmada, türbülansın α -modellerinden esinlenerek eliptik-eliptik durumdaki (2+1) Davey-Stewartson (DS) sisteminin düzgünleştirmeleri ele alınacaktır. Başlangıç değer probleminin yerel ve tüm zamanlardaki çözümleri araştırılacaktır. Ayrıca modülasyon teorisi kullanılarak, düzgünleştirilmiş DS sistemlerinin DS sisteminin ,çözümünün sahip olduğu tekilliğin önlemesi incelenecektir.

March 2017

Activity 10.

Local Host: *İsmail Ş. Güloğlu* (Dogaş University)

Guests: Mohammad Reza R. Moghaddam (Dept. of Math, Khayyam University)

Dates: 02.03.2017 – 05.03.2017

Scientific Goals:

Title of the talk: Some properties of the Central Kernel and Autocommutator Subgroups

Abstract: The talk will present some results about the autocommutator groups generalizing the well-known commutator subgroups and also a report on some open questions and ongoing research which could be the starting point of some common research projects.

Activity 11.

Local Host: *Alp Bassa* (Bogazici University)

Guests: None.

Dates: 03.03.2017 – 05.03.2017

Scientific Goals: The Ankara-Istanbul Algebraic Geometry & Number Theory Meetings aim to bring together people working on algebraic geometry, number theory and related areas in Turkey. During each academic year, monthly meetings are planned in Ankara and Istanbul alternately (and possibly other cities in the future). We hope that these meetings will facilitate communication and collaboration among researchers in the field of algebraic geometry / number theory in Turkey.

Activity 12.

Local Host: *Belgin Korkmaz* (Hitit University)

Guests: *Brita Nucinkis* (University of London,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=627392>)

Fatma Altunbulak Aksu (Çankaya University,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=800402>)

Dates: 10.03.2017 – 12.03.2017

Scientific Goals: As Association for Turkish Women in Mathematics, we have planned a 1 day event on March 11 2017, Saturday, which will be on commutative algebra, group algebras

and representation theory. The aim is to bring researchers in these areas together so that to establish connections for future collaboration. There will be 4 research talks.

Brita Nucinkis, University of London

Title: Cohomological finiteness properties of groups

Abstract: A cohomological finiteness property is a property satisfied by any group admitting a finite Eilenberg-Mac Lane space. Such classical finiteness conditions such as finitely generated and finitely presented are examples, and these can be generalised to finite type. On the other hand, we can define the notion of cohomological dimension.

I will give a survey on these cohomological finiteness properties, and will discuss some old and new questions regarding these in the context of Bredon cohomology.

Fatma Altunbulak Aksu, Çankaya University

Title: Ghost number: A new invariant for modular group algebras

Abstract: A ghost in the stable module category of a finite group G is a map between modular representations of G which induces a trivial map on Tate cohomology. The Freyd's generating hypothesis (GH) for the stable module category of a finite p -group G is the statement that all ghosts between finitely generated modular representations of G are stably trivial. For most p -groups, GH fails. A measurement of the failure of GH, a new invariant, called ghost number for the group algebra, is defined by Chebolu-Christensen-Mináč. It is a hard problem to determine the ghost number of a group algebra. There are few examples for which exact value of the ghost number is calculated. It will be a general talk about some recent results, some problems and some conjectures about this invariant. This is a joint work with David J. Green.

Pinar Mete, Balıkesir University

Title: Algorithms in Commutative Algebra

Abstract: Computational algebra allows to study complicated problems with algorithmic methods with the help of appropriate software tools. Gröbner basis is a very useful technique that provides algorithmic solutions to many problems in Commutative Algebra.

In this talk, I will present basic and powerful algorithms related to the Gröbner basis theory in global and local cases.

İpek Tuvay, Mimar Sinan Fine Arts University

Title: On Brauer indecomposability of Scott modules

Abstract: The Brauer indecomposability of p -permutation bimodules plays an important role in gluing techniques for proving categorical equivalences between p -blocks of finite groups as predicted by Broué's Abelian Defect Group Conjecture. There is a close relationship between saturated fusion systems and Brauer indecomposability of p -permutation modules. Indeed, for every Brauer indecomposable p -permutation module, it has been proved that there exists a corresponding saturated fusion system. But the converse is not necessarily true. However, when the module is taken to be a Scott module there is a control in the reverse direction. In this talk, known results in this context will be given and new contributions towards this direction will be presented.

April 2017

Activity 13.

Local Host: *Ayhan Günaydin* (Bogazici Universitesi)

Guests: *Piotr Kowalski* (Uniwersytet Wrocławski,
<http://www.ams.org/mathscinet/MRAuthorID/658570>)

Dates: 07.04.2017

Scientific Goals:

This meeting is a part of a series of meetings called "IMBM Model Theory Day". Each meeting consists of two or three research talks covering different topics in model theory. The scientific goal of this series of meetings is to present the newest developments in model theory to the mathematical community of Istanbul.

Organisers:

Özlem Beyarslan (Boğaziçi Üniversitesi, obeyarslan@gmail.com)

Ayhan Günaydin (Boğaziçi Üniversitesi, agunaydin@gmail.com)

Piotr Kowalski (Uniwersytet Wrocławski, kowal666kowalski@gmail.com)

Speakers:

Derya Çıray (Universität Konstanz)

Haydar Göral (Koç Üniversitesi)

Piotr Kowalski (Uniwersytet Wrocławski)

Activity 14.

Local Host: *Tınaz Ekim* (Boğaziçi Ü.)

Guests: *John Gimbel* (University of Alaska,

<http://www.ams.org/mathscinet/MRAuthorID/77535>

Dates: 15.04.2017 – 24.04.2017

Scientific Goals:

Title: Fractional Parameters In Graph Theory

Abstract: Approximately thirty years ago the notion of fractional parameters came to graph theory. This is a brief introduction to that subject. Many definitions applied to graphs can be reformulated in terms of integer programming. When expanded to their counterpart in linear programming, they become fractional correspondents. We will consider three examples: the fractional domination, chromatic and chromatic numbers of graphs.

Activity 15.

Local Host: *Nihat Sadik Değer* (Bogazici University)

Guests: *Jan Rosseel* (Vienna Tech. University, <http://inspirehep.net/author/profile/J.Rosseel.1>)

Dates: 16.04.2017 – 23.04.2017

Scientific Goals: With Jan we are working on a paper related to $N=(1,1)$ supersymmetric general massive supergravity in three dimensions which contains higher derivative (i.e. more than 2) gravitational terms in its action. In particular, we investigate how supersymmetry works at critical points of the parameter space of this model. Main motivation for this is to understand the AdS (Anti de Sitter)/Logarithmic CFT (Conformal field theory) duality better.

Title: Carroll and Galilei (higher spin) gravity

Abstract: In this talk, I will consider ultra-relativistic and non-relativistic limits of the Einstein-Hilbert action, that lead to gravitational theories called Carroll and Galilei gravity respectively. I will show that in the first order formulation the equations of motion of these theories lead to geometrical constraints and that unlike for relativistic gravity, not all components of the spin connections can be determined by solving suitable torsion constraints. I will then argue that the undetermined spin connection components can be viewed as Lagrange multipliers for the geometrical constraints. Finally, I will consider generalizations to three-dimensional higher spin gravity theories.

Activity 16.

Local Host: *Dieter Van den Bleeken* (Bogazici University)

Guests: *Ilmar Gahramanov* (Albert Einstein Institute, <http://inspirehep.net/author/profile/I.Gahramanov.1>)

Dates: 24.04.2017 – 06.05.2017

Scientific Goals: Lectures on elliptic hypergeometric functions.

Lecture 1: A brief survey of ordinary (plain) and basic (q) hypergeometric functions: I will try to outline special functions of hypergeometric type, mainly in the context of mathematical physics.

Lecture 2: Elliptic hypergeometric functions: I will review the current status elliptic hypergeometric functions. In particular, I will discuss the elliptic gamma function and its properties, the elliptic beta integral (the top know generalization of the Euler beta integral), the elliptic analogue of the Euler-Gauss hypergeometric function and its $W(E_7)$ symmetry and more complicated elliptic hypergeometric integrals.

Lecture 3: Applications of basic and elliptic hypergeometric functions: I will talk about applications of these functions in mathematical physics, mainly in integrable models, quantum field theory, knot theory and Painleve equations.

May 2017

Activity 17.

Local Host: *Alp Bassa* (Bogazici University)

Guests: *None.*

Dates: 05.05.2017 – 07.05.2017

Scientific Goals: The Ankara-Istanbul Algebraic Geometry & Number Theory Meetings aim to bring together people working on algebraic geometry, number theory and related areas in Turkey. During each academic year, monthly meetings are planned in Ankara and Istanbul alternately (and possibly other cities in the future). We hope that these meetings will facilitate communication and collaboration among researchers in the field of algebraic geometry / number theory in Turkey.

Activity 18.

Local Host: *Ayhan Günaydin* (Bogazici Universitesi)

Guests: *Piotr Kowalski* (Uniwersytet Wrocławski,
<http://www.ams.org/mathscinet/MRAuthorID/658570>)

Dates: 12.05.2017

Scientific Goals:

This meeting is a part of a series of meetings called "IMBM Model Theory Day". Each meeting consists of two or three research talks covering different topics in model theory. The scientific goal of this series of meetings is to present the newest developments in model theory to the mathematical community of Istanbul.

Activity 19.

Local Host: *Cagri Karakurt* (Bogazici Universitesi)

Guests: *Weimin Chen* (University of Massachusetts Amherst,
<http://www.ams.org/mathscinet/MRAuthorID/77535>)

Dates: 23.05.2017 – 08.06.2017

Scientific Goals: Professor Weimin Chen is going to attend Gokova geometry topology conference this year. I saw this opportunity as an excuse to invite him to IMBM to give a lecture series (three 1-hour long lectures) on group actions on four manifolds. Professor Chen is the leading expert on this topic. He has been using both algebraic and analytic methods to solve a number of outstanding problems in four manifolds. He is also famous with his generosity of sharing his ideas. For example his recent survey paper appeared in Gokova proceedings lists many interesting problems some of which are suitable even for graduate students who are just learning the topic. I sincerely believe his visit will benefit whole Istanbul mathematical community particularly the graduate students enrolled in algebraic topology class as a part of IMDI program.

June 2017

Activity 20.

Local Host: *Ekin Özman* (Bogazici Universitesi)

Guests: *Adriana Salerna* (Bates College,

<http://www.ams.org/mathscinet/search/publications.html?pg4=AUCN&s4=salerno%2C+adriana&co4=AND&pg5=TI&s5=&co5=AND&pg6=AUCN&s6=&co6=AND&pg7=ALLF&s7=&co7=A ND&df=all&yrop=eq&arg3=&yearRangeFirst=&yearRangeSecond=&pg8=ET&s8=All&review format=html&Submit=Search>

Dates: 10.06.2017 – 17.06.2017

Scientific Goals:

Title: Alternate Mirror Families and Hypergeometric Motives

Abstract: Mirror symmetry predicts surprising geometric correspondences between distinct families of algebraic varieties. In some cases, these correspondences have arithmetic consequences. Among the arithmetic correspondences predicted by mirror symmetry are correspondences between point counts over finite fields, and more generally between factors of their Zeta functions. In particular, we will discuss our results on a common factor for Zeta functions alternate families of invertible polynomials. We will also explore closed formulas for the point counts for our alternate mirror families of K3 surfaces and their relation to their Picard–Fuchs equations. Finally, we will discuss how all of this relates to hypergeometric motives. This is joint work with: Charles Doran (University of Alberta, Canada), Tyler Kelly (University of Cambridge, UK), Steven Sperber (University of Minnesota, USA), John Voight (Dartmouth College, USA), and Ursula Whitcher (American Mathematical Society, USA). There will be two lectures during this week each about 75mins. The lectures will be geared towards graduate students.

Activity 21.

Local Host: Dieter Van den Bleeken (Bogazici University)

Guests: Ali Seraj (Institute for Research in Fundamental Sciences, <http://inspirehep.net/author/profile/A.Seraj.1>)

Dates: 19.06.2017 – 23.06.2017

Scientific Goals: We are about to finish a research project on geometry of the space of vacua of Yang–Mills theory. By investigating adiabatic solutions we find they are equivalent to geodesic motion on a particular infinite dimensional Riemannian homogeneous space. Talk title: Wandering around gauge theory vacua Talk abstract: We study adiabatic solutions to Yang–Mills theory and relate them to geodesic motion on the space of vacua, which we show has a natural interpretation as a Riemannian homogeneous space. I will also comment on the relation between these results and the recently active area of asymptotic symmetries and soft physics.

July 2017

Activity 22.

Local Host: *Olca* Coşkun (Bogazici Universitesi)

Guests: *Ergün Yalçın*, (Bilkent Üniversitesi,
<http://www.ams.org/mathscinet/search/author.html?mrauthid=641852>)

Dates: 03.07.2017 – 05.07.2017

Scientific Goals:

Title: Equivariant Moore spaces and the Dade group

Abstract: Let G be a finite p -group and k be a field of characteristic p . A topological space X is called an n -Moore space if its reduced homology is nonzero only in dimension n . We call a G -CW-complex X an n -Moore G -space over k if for every subgroup H of G , the fixed point set X^H is an $n(H)$ -Moore space with coefficients in k , where $n(H)$ is a function of H .

We show that if X is a finite n -Moore G -space, then the reduced homology module of X is an endo-permutation kG -module generated by relative syzygies. A kG -module M is an endo-permutation module if $\text{End}_k(M) = M \otimes_k M^*$ is a permutation kG -module. We consider the Grothendieck group of finite Moore G -spaces $M(G)$, with addition given by the join operation, and relate this group to the Dade group generated by relative syzygies.

In the talk I will give all the necessary definitions on Moore G -spaces and Dade group, and explain some of the earlier work on these topics. I will also provide many examples to motivate the statements of the theorems.