TWO ALUMNI OF LOYOLA COLLEGE, CHENNAI

M S Raghunathan

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Loyola College of Chennai is perhaps the under-graduate institution that has the largest number of alumni who achieved a high standing internationally as mathematicians. Seshadri and Narasimhan are no doubt the most famous among them. This talk is about two others, Raghavan Narasimhan and C P Ramanujam, who are not as well known as they ought to be even within the mathematical community. Apart from being outstanding mathematicians, they were both very interesting human beings and I will try to give you glimpses of both their mathematics and their personalities.

NONABELIAN HODGE THEORY

Indranil Biswas

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We will describe the nonabelian Hodge correspondence and some of its applications.

THE HISTORY AND HISTORIOGRAPHY OF THE DISCOVERY OF CALCULUS IN INDIA

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Weaving through the emergence and convergence of various mathematical ideas that led towards the discovery of calculus in India provides an enthralling experience for aficionados of mathematics and its diverse history. During the talk an attempt will be made to briefly capture some of the milestones in the journey made by Indian mathematicians through two eras that paved the way for the discovery of infinite series for Pi and some of the trigonometric functions in India around the middle of the 14th century. In the first part we shall discuss the developments during what may be called the classical period, starting with the work of Āryabhata (c. 499 CE) and extending up to the work Nārāyana Pandita (c. 1350). The work of the Kerala School starting with Madhava of Saṅgamagrāma (c. 1340), which has a more direct bearing on calculus, will be dealt with in the second part. In the third part we shall recount the story of the 19th century European discovery of infinite series in India which seems to have struck a wrong note among the targeted audience in Europe with a serious cascading effect.

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Geomtery of the space of linear operators from the perspective of Birkhoff-James orthgonality

The notion of Birkhoff-James orthogonality was introduced in a normed linear space motivated by the usual orthogonality notion in an inner product space. In this talk we briefly try to present the interaction between the concept of Birkhoff-James orthogonality and some important geometric properties of the space. We then discuss Birkhoff-James orthogonality of bounded linear operators defined between Banach spaces and investigate its role in the study of geometric properties of the space of bounded linear operators. We also plan to talk about some open problems in this area.

UNITS IN INTEGRAL GROUP RINGS

Gurmeet K. Bakshi

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Abstract

Given a group G, the unit group $\mathcal{U}(\mathbb{Z}G)$ of the integral group ring $\mathbb{Z}G$ appear in many branches of mathematics including number theory and algebraic K-theory. The subject is so vast that there exist several books particularly devoted to the subject. It is well known that if G is finite, the unit group $\mathcal{U}(\mathbb{Z}G)$ is finitely generated, in fact finitely presented. However, finding a finite generating set of $\mathcal{U}(\mathbb{Z}G)$ is hard even when we restrict G to be cyclic. During the past several years a lot of progress has been seen in understanding a finite generating set of $\mathcal{U}(\mathbb{Z}G)$ upto a finite index. In this talk, we shall discuss the known status in this direction. along with some recent advancements. The aim is also to provide an overview of some of the other important problems in this subject.

NODAL SETS AND NODAL DOMAINS OF RANDOM EIGENFUNCTIONS OF THE LAPLACIAN

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The Laplacian on a closed surface or a bounded domain in the plane (with Dirichlet/Neumann boundary conditions) has a discrete spectrum. Asymptotic behaviour of eigenvalues consists in understanding the growth, which is given by Weyl's law and higher order corrections to it. A basic understanding of eigenfunctions is achieved by studying the topology of the nodal set (i.e, the set where the eigenfunction vanishes), its total length or the number of components into which it divides the underlying manifold. Unlike in one dimension, where the n-th eigenfunction has exactly n nodal domains, there is very little that can be said in higher dimensions. One of the grand conjectures in the area (due to Berry) is that a high energy eigenfunction looks like a particular random Gaussian function on the plane, known as the random plane wave (it is a random eigenfunction of the Laplacian on the whole plane).

This motivates the study of nodal domains of random functions such as the random plane wave and random linear combinations of spherical harmonics and trigonometric functions. In this lecture, we survey some of the results on nodal sets of random functions that have been found in the last 20 years or so, and mention some open questions.