1 Gholamreza Abbaspour T (Ferdowsi University of Mashhad, Iran), A.Niknam and M. S. Moslehian

Title: Generalized derivations on Hilbert C^*-modules

Abstract: We investigate the generalized derivations and show that every generalized derivation on a simple Hilbert C^*-module either is closable or has a dense range. We also describe dynamical systems on a full Hilbert C^*-module M over a C^*-algebra A as a one-parameter group of unitaries on M and prove that if $\alpha : \mathbf{R} \to U(M)$ is a dynamical system, then we can correspond a C^*-dynamical system $\alpha^{'}$ on A such that if δ and d are the infinitesimal generators of α and $\alpha^{'}$ respectively, then δ is a d-generalized derivation.

2 Jiro Akahori (Ritsumeikan University, Japan)

Title: Tsirelson's Thin Air in a Laboratory

Abstract: I will talk about probabilistic meaning(s) of Tsirelson's thin air [1], which produces special randomness that makes a corresponding product system (*noise* in Tsirelson's terminology) *type II*.

As an experiment in a laboratory, I will introduce a random recursive equation in a separable metric space indexed by $-\mathbf{N}$:

$$\eta_k = \theta(\eta_{k-1})\xi_k, \quad k \in -\mathbf{N}, \tag{1}$$

which I call *Yor* equation because it is deeply studied in [2] by Marc Yor in Paris, another eminent probabilist. The meaning of the equation (1) is as follows.

1. ξ_k's are given mutually independent random variables,
2. θ carries an element of the metric space to a topological group, and
3. the group "act" on the metric space.

Assuming a commutation property on θ, one gets the special randomness (meaning that it is independent of ξ's) out of a **Tsirelson's thin air**; in this case the "far remote past" or the "beginning of the world" at time $-\infty$.

References

[1] Tsirelson, B. "On automorphisms of type II Arveson systems (probabilistic approach)". math.OA/0411062

[2] Yor, M. "Tsirel'son's equation in discrete time." *Probab. Theory Related Fields* **91** (1992), 135–152.

3 Ameer Athavale (Indian Institute of Technology, Bombay)

Title: Sectorial Forms and Unbounded Subnormals

Abstract: We marry the theory of sectorial sesquilinear forms to the theory of unbounded subnormal operators in Hilbert spaces. (This is a joint work of the speaker with Sameer Chavan.) The applications include in particular the following: (1) A characterization of the closure of the Creation Operator of Quantum Mechanics in the classical set-up (2) A sufficient condition for the existence of complete sets of eigenvectors for certain sectorial operators (3) Treatment of parabolic evolution equations associated with certain analytic models of which the classical Segal-Bargmann space is a prototype (4) Approximation results of the Galerkin type on certain unbounded subsets of the complex plane.

4 Bhaskar Bagchi (Indian Statistical Institute, Bangalore)

Title: On the unilateral homogeneous operators

Abstract: Any irreducible homogeneous operator is necessarily a block shift: unilateral or bilateral. This talk is to be a progress report on our attempts to produce a classification of all the unilateral irreducible homogeneous operators.

5 Joseph A. Ball (Virginia Technology, USA)

Title: Homogeneous interpolation problems for inner multipliers on the Arveson space.

Abstract: It is well known that the Blaschke product $b(z) = \prod_{k=1}^{N} \frac{z-z_k}{1-z\bar{z}_k}$ is the unique (up to a unimodular scalar multiple) inner-function solution of the homogeneous interpolation problem

$$\begin{aligned} b(z_k) &= 0,\, b'(z_k) \neq 0 \text{ for } k = 1, \ldots, N, \\ b(z) &\neq 0 \text{ for } z \neq z_1, \ldots, z_N \end{aligned}$$

where $z_1, \ldots, z_N$ are prescribed points in the unit disk $\mathbb{D}$. More generally, the essentially unique matrix-inner-function solution of the left-tangential matrix homogeneous interpolation problem

$$\begin{aligned} &\det B(z_k) = 0,\, \frac{d}{dz}[\det B(z)]|_{z=z_k} \neq 0,\, x_k B(z_k) = 0, \\ &\det B(z) \neq 0 \text{ for } z \neq z_1, \ldots, z_n \end{aligned}$$

(where x_k are given row vectors) has been given in explicit form by Ball-Gohberg-Rodman. The solution of such problems with J-inner matrix fucntions in place of inner matrix functions is connected with parametrizing the set of all solutions of a tangential matrix Nevanlinna-Pick interpolation problem. We discuss extensions of these ideas to the setting where the Hardy space H^2 over the disk is replaced by the Arveson space (the reproducing kernel Hilbert

space $\mathcal{H}(k_d)$ with reproducing kernel $k_d(z,w) = \frac{1}{1-\langle z,w\rangle})$ over the unit ball $\mathbb{B}^d$ contained in $\mathbb{C}^d$. The is joint work with Vladimir Bolotnikov of the College of William and Mary and Quanlei Fang of Virginia Tech.

6 Stephen Barreto (Padre Conceicao College Of Engineering, Goa)

Title: Some topics on quantum disordered systems

7 Solel Baruch (Technion-Israel Inst of Tech, Israel)

Title: CP-Semigroups: Product Systems and Subordination.

Abstract: This is a joint work with Paul Muhly. We study Borel structure on product systems. We show that if the product system comes from a CP-semigroup, it carries a natural Borel structure with respect to which the semigroup may be realized in terms of a measurable representation. We show, too, that the dual product system of a Borel product system also carries a natural Borel structure. We apply our analysis to study the order interval of all CP-semigroups that are subordinate to a given one.

8 Subhash Bhai Bhatt (Sardar Patel University, Gujarath)

Title: Topological Algebras and Differential Structures in C^*-algebras

Abstract: The concepts and methods of Topological Algebras are applied to investigate the differential structure in a C^*-algebra A manifested by a dense *-subalgebra B of A satisfying smoothness properties like spectral invariance, closure under suitable functional calculi, K-theory invariance, completeness under an appropriate locally convex*-algebra topology etc. We consider smooth subalgebras defined by differential seminorms. Let B_τ be the differential Frechet *-algebra defined by a differential seminorm neither closable not l^1-summable. Let $\tilde{B}$ be an α-invarient smooth envelop of B defined by an action α of $\mathbb{R}$ on A. The spectral invariance of B_τ and $\tilde{B}$ in A via the homomorphisms induced by the inclusion of B in A as well as the K-theory isomorphism $K_*(B_\tau) = K_*(\tilde{B}) = K_*(A)$ will be discussed. For smooth Schwartz Frechet algebra crossed products $S(\mathbb{R}, \tilde{B}, \alpha)$ and $S(\mathbb{R}, C^\infty(B), \alpha)$, smooth Frechet algebra analogue of Connes analogue of Thom isomorphism will be discussed. The main tools are the spectral invariance of Frechet algebra B in its enveloping C^*-algebra $E(B)$ and the isomorphism $E(S(\mathbb{R}, C^\infty(B), \alpha)) = C^*(\mathbb{R}, E(B), \alpha)$ between the enveloping algebra of smooth crossed product and the continuous crossed product of the enveloping algebra. The C^k-structure ($1 \leq k \leq \infty$) defined by differential seminorms (Blackadar and Cuntz) will be reviewed; and incorporation of analyticity in it will be suggested. Smooth crossed products (Schweitzer, Phillips) will also be reviewed. A Frechet infinite order analogue of the smooth Banach (D_p^*)-algebras (Kissin and Shulmann) will be proposed;

and via the Arens-Micheal decomposition, its smoothness properties will be exhibited. We shall also discuss limit algebras of differential forms in Non-commutative Geometry as topological algebras. The presentation is partly a review of literature, partly based on joint work with Maria Fragoulopoulou, A. Inoue and H. Ogi; and partly based on some unpublished work in progress.

9 Lewis A Coburn (State University of New York, USA)

Title: A Lipschitz estimate for Berezin's operator calculus

Abstract: F.A. Berezin introduced a general "symbol calculus" for linear operators on reproducing kernel Hilbert spaces. For the particular Hilbert space of Gaussian square-integrable entire functions on complex n-space, $\mathbf{C}^n$, I recently obtained Lipschitz estimates for Berezin symbols of arbitrary bounded operators. Additional properties of the Berezin symbol and extensions to more general reproducing kernel Hilbert spaces are discussed.

10 Michael Cowling (University of New South Wales, Australia)

Title: Uncertainty principles on general locally compact groups and manifolds

Abstract: This is an account of joint work with Sundari. Hardy's Uncertainty Principle asserts that if f is a function on $\mathbf{R}^n$ such that

$$|f(x)| \leq C\exp(-\alpha|x|^2) \quad \text{and} \quad |\hat{f}(x)| \leq C\exp(-\beta|\xi|^2),$$

and if $\alpha\beta > 1/4$, then $f = 0$. We extend this principle to operators on $L^2(\mathbf{R}^n)$, showing that simultaneous kernel estimates and spectral estimates imply that an operator must be zero. We then consider convolution operators on Lie groups, and establish a version of Hardy's inequality for functions in the algebra generated by a Laplacian, and then consider general functions on the Lie group.

11 R G Douglas (Texas A & M University, USA

Title: Locally Determined Operators and Complex Geometry

Abstract: One surprising feature of operator theory on infinite dimensional Hilbert space is that operators can possess an open set of eigenvalues. Almost thirty years ago the speaker and M. Cowen developed a method for studying such operators using concepts and techniques from complex geometry. The operators studied were shown to be locally determined in the sense that restrictions of the operators to finite dimensional subspaces of generalized eigenvectors determined them up to unitary equivalence. While the statement of this result was completely in the language of operator theory, the method of proof involve complex geometry.

In this talk, we will describe and explain these results including generalizations

of them to multivariate operator theory in which, again, the language of operator theory is used but complex geometric methods, this time in several variables, are the key. Throughout the talk, there will be an emphasis on examples.

12 Debashish Goswami (Indian Statistical Institute, Kolkata)

Title: Twisted entire cyclic cohomology, JLO cocycles and equivariant spectral triples

Abstract: We study the "quantized calculus" corresponding to the algebraic ideas related to "twisted cyclic cohomology" introduced in [5]. With very similar definitions and techniques as those used in [4], we define and study "twisted entire cyclic cohomology" and the "twisted Chern character" associated with an appropriate operator theoretic data called "twisted spectral data", which consists of a spectral triple in the conventional sense of noncommutative geometry ([1]) and an additional positive operator having some specified properties. Furthermore, it is shown that given a spectral triple (in the conventional sense) which is equivariant under the (co-)action of a compact matrix pseudogroup, it is possible to obtain a canonical twisted spectral data and hence the corresponding (twisted) Chern character, which will be invariant (in the usual sense) under the (co-)action of the pseudogroup, in contrast to the fact that the Chern character coming from the conventional noncommutative geometry need not be invariant. In the last section, we also try to detail out some remarks made in [2], in the context of a new definition of invariance satisfied by the conventional (untwisted) cyclic cocycles when lifted to an appropriate larger algebra.

References

[1] A. Connes, *Noncommutative Geometry*, Academic Press (1994).

[2] A. Connes, Cyclic Cohomology, Quantum group Symmetries and the Local Index Formula for SUq(2), preprint (2002), math.QA/0209142.

[3] P. S. Chakraborty and A. Pal, Equivariant spectral triples on the quantum $SU(2)$ group, *K-Theory* **28**(2003), No. 2, 107-126.

[4] A. Jaffe, A. Lesniewski, K. Osterwalder, Quantum K-theory. I. The Chern character, *Commun. Math. Phys.* **1**18 (1988), no. 1, 1-14.

[5] J. Kustermans, G.J. Murphy and L. Tuset, Differential Calculi over Quantum Groups and Twisted Cyclic Cocycles, *J. Geom. Phys.* **44** (2003), no. 4, 570–594.

[6] T. Masuda, Y. Nakagami and J.Watanabe, Noncommutative Differential Geometry on the Quantum $SU(2)$, I: An Algebraic Viewpoint, *K Theory* **4** (1990), 157-180.

[7] K. Schmüdgen and E. Wagner, Dirac operator and a twisted cyclic cocycle on the standard Podlés quantum sphere, preprint (QA/0305051).

13 Philippe Jaming (Universite D Orleans, France)

Title: Uncertanity principles for orthonormal basis

Abstract: In an unpublished paper of the early 90's, H. Shapiro proved that the elements of an infinite orthonormal sequence, as well as their Fourier transforms, can not be all bounded by a fixed function in L^2. He also proved that their means and dispersions could not be bounded by a fixed constant.

Using a different method, we provide quantitative information on the number of elements in orthonormal sequences having the above property.

joint work with A. Powell

14 Vijay Kodiyalam and V S Sunder (The Institute of Mathematical Sciences, Chennai

Title: Planar algebras, Hopf algebras
and 3-manifold invariants

Abstract: These lectures will be in two parts. The second part of the lectures will attempt to describe our alternative method of constructing Kuperberg's invariant of 3-manifolds from (semisimple, and cosemisimple) Hopf algebras. Our method is via the techniques of 'planar algebras' and holds the hope that this method might be applicable to more general planar algebras than those coming from Hopf algebras.

The first part of the lectures will try to fill in some background material on planar algebras and Hopf algebras. Planar algebras were introduced by Vaughan Jones in the context of subfactors. In particular, the ground field is always **C** in this context. A special class of subfactors come from Kac algebras (finite-demensional Hopf algebras over **C** which come equipped with a well-behaved involution). However, in order to get Kuperberg's invariant, we need to work with semisimple and cosemisimple Hopf algebras overgeneral fields. Hence some effort needs to go into reworking the planar algebra formalism, and this will be indicatd in the first lectures.

The first and second parts of the lectures will be based on the papers posted in

the eprint arXiv as math.QA/0506153 and math.QA/0509302 respectively.

15 S. H. Kulkarni (Indian Institute of Technology Madras)

Title: Condition Spectrum Of An Element In A Banach Algebra

Abstract: Let A be a complex Banach algebra with unit 1, let $a \in A$, and $0 < \epsilon < 1$. Condition spectrum $\sigma^{\epsilon}(a)$ of a is defined to be the set of all those complex numbers λ for which $\lambda - a$ is not invertible or $\|\lambda - a\| \|(\lambda - a)^{-1}\| \geq 1/\epsilon$. In this talk, we discuss motivation for this concept, some properties and examples of this condition spectrum and compare these with similar propertis of usual spectrum, Ransford's generalized spectrum and pseudospectrum.

16 V.Muruganandam (Pondicherry University, Pondicherry)

Title: Amenability of hypergroups

Abstract: One aspect of amenability is given in terms of the Fourier algebra of a group by the following theorem due to Leptin and Victor Losert.

If G is a locally compact group, let $A(G), B(G)$ denote the Fourier algebra and Fourier Stieltjes algebra of G respectively. Let $M\ A(G)$ denote the algebra of all multipliers of the Banach algebra $A(G)$. Then

Theorem 1: *The following are equivalent: (i) G is amenable.*
(ii) The Banach algebra $A(G)$ has a bounded approximate identity.
(iii) The norm of $A(G)$ is equivalent to the multiplier norm which $A(G)$ derives as a subalgebra of $M\ A(G)$.

Our recent study of the Fourier algebra of a hypergroup prompts us to look into the validity of the above theorem for hypergroups. We mainly discuss some partial results obtained in this direction.

17 M.G Nadkarni (Mumbai University, Mumbai)

Title: On the existence of a finite invariant measure

18 M.N Narayanan Namboodhiri (Cochin University of Science and Technology, Cochin)

Title: On a Problem Of W. Arveson

Abstract: Let H be a separable, complex Hilbert space and let $\{H_n\}$ be an increasing sequence of finite dimensional subspaces of H such that $\cup_{n=1}^{\infty} H_n$ is dense in H. For each positive integer n, let $A_n = P_n A P_n$, where A is a bounded self adjoint operator on H. ie., A_n 's are compressions of A to H_n.

Definition (Arveson)

For an open set U in R, let

$$N_n(U) = \#\sigma(A_n) \cap U, \text{ where } \sigma(A_n)$$

denotes spectrum of A_n for each n. A point is in R is called essential if for every open set U containing λ,

$$\lim_{n\to\infty} N_n(U) = \infty$$

A point λ in R is called transient if there is an open set U of λ such that

$$\sup_{n\geq 1} N_n(U) < \infty$$

where A is a special type of operator that Arveson identifies, he proves that the essential spectrum $\sigma_\epsilon(A) = \cap_\epsilon(A)$, where $\cup_\epsilon(A)$ denotes the set of essential points of A:

Arveson 's query is precisely how to distinguish between transient points of A, which belongs to $\sigma(A)$ and which are not in $\sigma(A)$. This lecture attempts to provide an answer to this query.

Acknowledgement: Thanks are due to Prof. K. B. Sinha for many fruitful discussions.

19 Hiroyuki Osaka (Ritsumeikan University, Japan)

Title: Operator monotone functions and C*-algebras

Abstract: A real-valued continuous function $f : I \mapsto \mathbb{R}$ on a (non trivial) interval $I \neq \mathbb{R}$ is called A-monotone for a given C^*-algebra A if for any $x, y \in A$ with their spectra in I,

$$x \leq_A y \quad \Rightarrow \quad f(x) \leq f(y) \tag{2}$$

We denote by $P_A(I)$ the set of all A-monotone functions (defined on the interval I) for a C^*-algebra A. If $A = B(H)$, the standard C^*-algebra of all bounded linear operators on a Hilbert space H, then $P_A(I) = P_{B(H)}(I)$ is called the set of all operator monotone functions. If $A = M_n$, the standard C^*-algebra of all complex $n \times n$ matrices, then $P_n(I) = P_A(I) = P_{M_n}(I)$ is called the set of all matrix monotone functions of order n on an interval I. The set $P_n(I)$ consists of continuous functions on I satisfying (2) for pairs (x, y) of self-adjoint $n \times n$ matrices with their spectra in I. For each positive integer n, the proper inclusion $P_{n+1}(I) \subsetneq P_n(I)$ holds [1, 2]. For infinite-dimensional Hilbert space,

the set of operator monotone functions on I can be shown to coincide with the intersection

$$P_\infty(I) = \bigcap_{n=1}^{\infty} P_n(I).$$

In this talk we present the following results

1. Characterization of polynomials in the gaps $P_{n+1} \subsetneq P_n$ for bounded intervals I.
2. Characterization of C*-algebras with some class of monotone functions.

References

[1] W. F. Donoghue, Jr., *Monotone matrix functions an analytic continuation* (Springer-Verlag, New York, 1974).

[2] F. Hansen, G. Ji, J. Tomiyama, *Gaps between classes of matrix monotone functions*, *Bul. London Math. Soc.* 36(2004), 53 - 58.

[3] H. Osaka, S. Silvestrov, and J. Tomiyama, *Monotone operator functions on C*-algebras*, *International J. Math.* 16(2005), 181 - 196.

[4] H. Osaka, S. Silvestrov, and J. Tomiyama, in preparation.

20 K Parthasarathy (University of Madras, Chennai)

Title: Submodules of $VN(G)$, submodules of $V(G)^*$ and spectral synthesis

Abstract: For a locally compact group G, we study spectral synthesis in the Fourier algebra $A(G)$ with respect to $A(G)$-submodules of the group von Neumann algebra $VN(G)$. When G is compact, let $V(G)$ denote the Varopoulos algebra. We give a correspondence between $A(G)$-submodules of $VN(G)$ and $V(G)$-submodules of $V(G)^*$ and use it to study the relation between spectral synthesis in $A(G)$ and spectral synthesis in $V(G)$.

21 S. R Patel (Indian Institute of Technology, Kanpur)

Title: On Frechet algebras of power series

Abstract: If the indeterminate X in a Frechet algebra A of power series is a power series generator for A, then either A is the algebra of all formal power series or is the Beurling-Frechet algebra on non-negative integers defined by a sequence of weights. Let the topology of A be defined by a sequence of norms. Then A is an inverse limit of a sequence of Banach algebras of power series if and

only if each norm in the defining sequence satisfies certain closability condition and an equicontinuity condition due to Loy. A non-Banach uniform Frechet algebra with a power series generator is a nuclear space. A number of examples are discussed; and a functional analytic description of the holomorphic function algebra on a simply connected planar domain is obtained.

22 Mihai Putinar (University of California, USA)

Title: Poincaré's variational principle in potential theory.

Abstract: After Poincare has deviced his famous balayage method, as a general strategy to prove the solvability and well poseness of the Dirichlet problem on domains in R^n, he has returned to the much older and more constructive technique of double layer potentials (C. Neumann). He has sketched a powerful variational principle for solving what is called today the Poincare-Neumann integral equation. In modern terms, this is a min-max phenomenon for non-symmetric linear operators. In spite of partial notable results of Carleman, M.G. Krein, Ahlfors, Bergman and Schiffer, Poincare's programme was never completed. Last summer, Harold Shapiro, Dima Khavinson and myself took this task. I will present the resulting general framework and the new facts deduced from it.

23 R Radha (Indian Institute of Technology Madras)

Title: Hardy's inequalities

Abstract: In this talk, we discuss the Hardy's inequalities for Hermite, special Hermite and Laguerre expansions.

24 P K Ratnakumar (Harish Chandra Research Institute, Allahabad)

Title: Schrödinger equation and the Oscillatory semi group for the Hermite operator

Abstract: We discuss the regularity property of the oscillatory semi group e^{itH}, where $H = -\Delta + \|x|^2$ is the Hermite operator on $I\!R^n$. The above semi group arises as the solution operator for the Cauchy problem for the Schrödinger equation with with quadratic potential $V(x) = |x|^2$. We discuss a Strichart's type estimate(a space time estimate) for the solution of the initial value problem, for L^2 initial data.

25 Swagato K Ray (Indian Institute of Technology, Kanpur)

Title: Approximation by K-finite functions on L^p spaces

Abstract: Let $\Gamma \subset I\!R^n, n \geq 2$, be the boundary of a bounded domain. We prove that, translates by elements of Γ of functions which transform according to a fixed irreducible representation of the orthogonal group forma dense class in $L^p(I\!R^n)$ for $p > \frac{2n}{n+1}$. A similar problem for noncompact symmetric spaces of rank one is also considered. We also study the connection of the above problem with the injectivity sets for weighted spherical mean operators.

26 Rudra Sarkar (Indian Statistical Institute, Kolkata)

Title: Revisiting Wiener-Tauberian Theorem on $PSL(2, R)$

Abstract: It is well known that the analogue of the classical Wiener-Tauberian theorem resting on unitary dual does not hold for noncompact semisimple Lie groups. A modified statement, which was conjectured as the *correct* version of the $W - T$ could not be proved so far for any group of this class. Though there are results dealing with some particular cases which are fairly close to the correct statement, they still impose additional conditions. We will indicate a proof for an analogue of $W - T$ without any superfluous condition for the group $PSL(2, R)$, which is the simplest group in this class.

27 Jyoti Sengupta (Tata Institute of Fundamental Research, Mumbai)

Title: An anallogue of Beurling's theorem for symmetric spaces and semisimple Lie groups

Abstract: In this talk we will discuss the formulation and proof of an appropriate analogue of Beurling's theorem, which is the key theorem in the Uncertainty principle, for a class of Riemannian symmetric spaces and semisimple Lie groups.

28 V. M. Sholapurkar, Pune

Title: On a Class of Alternatingly Hyperexpansive Subnormal Weighted Shifts

Abstract: If T is a weighted shift operator on a Hilbert space with the associated weight sequence $\{\alpha_n\}_{n\geq 0}$ of positive weights, then meaningful insights into the nature of T can be gained by examining the sequence $\{\theta_n(T)\}_{n\geq 0}$ where $\theta_0(T) = 1$ and $\theta_n(T) = \prod_{k=0}^{n-1} \alpha_k^2 (n \geq 1)$. We characterize those subnormal weighted shifts whose associated $\theta_n(T)$ are interpolated by members of special subclass of the class of absolutely monotone functions on the nonnegative real line. The special subclass has such pleasant properties as being closed under differentiation and integration. We also attempt to highlight the operator theoretic significance of such characterization.

29 K B Sinha (Indian Statistical Institute, Delhi)

Title: Quantum Random Walk

Abstract: In the framework of the symmetric Fock space over $L^2(R+)$, the approximation of the four fundamental quantum stochastic increments by the four spin-matrices are studied. This is then used to prove the strong convergence of a quantum random walk as a map from an initial algebra A into $A \times B(\text{Fock})$ to a $*$-homomorphic stochastic flow.

30 A Sitaram (Indian Statistical Institute, Bangalore)

Title: Around the Cowling-Price theorem on rapidly decreasing Fourier transforms for $\mathbb{R}^n$ and symmetric spaces

31 Michael Skeide (Universita degli Studi del Molise, Italy)

Title: Unit Vectors, Morita Equivalence and Endomorhisms

Abstract: We show that every (strongly full) von Neumann correspondence over a von Neumann algebra B stems from a normal unital endomorphism of the algebra of all adjointable operators on a von Neumann B-module. This means, in particular, that every discrete product system of von Neumann correpondence comes from an E_0-semigroup. Via a duality, called commutant, between von Neumann correspondence over B and von Neumann correspondence over B' the result is equivalent to that every von Neumann correspondence with faithful left action admits a nondegenerate normal representation on a Hilbert space. Such a result has been proved recently by Hirshberg for C*-correspondences. Our version for von Neumann correspondences can also be used to reprove Hirshberg's result in a completely different way.

32 M.A Sofi (University of Kashmir, Srinagar)

Title: On the Nuclearity of ℓ-valued Summing Operators

Abstract: The study of the geometry of Banach spaces arising as solutions of equations involving operator ideals is a favourite theme in functional analysis. Considering the role of (the ideal of) nuclear operators N in the structure of Banach spaces, it is natural to ask for a description of Banach spaces X such that, for a given operator ideal A, all operators from X (resp.into X) belonging to A coincide with N. In their path-breaking work (Jour.Func.Anal., vol.32, (1979),353-380), Johnson et al were able to show that for A consisting of a composite of two 2-summing operators, the equality $N(X,X) = A(X,X)$ characterizes X as an isomorph of a Hilbert space.

In the present talk, we shall address ourselves to this problem with A consisting mostly of 1-summing($=\prod_1$) or 2-summing maps($=\prod_2$). Thus for $A = \prod_1$, it is known that the equation $N(X,\ell) = A(X,\ell)$ describes precisely those Banach

spaces X for which X^+ is a subspace of L_1. Among other things, we show that the Banach spaces X such that $N(X, \ell_2) = \prod_1(X, \ell_2)$ are exactly those such that X^+ has the Gordon Lewis property and satisfies Grothendieck's theorem. As a by-product, we 'recover' Pelczynski's famous theorem that the disc algebra lacks the Gordon-Lewis property! We conclude with an application to the theory of vector measures.

33 R Srinivasan (The Institute of Mathematical Sciences, Chennai)

Title: Generalisation of CCR flows

Abstract: William Arveson classified the E_0-semigroups of type I, by their index. They are concretely described by a CCR flow of a given index. By applying a twist, it is possible to contruct more exotic product systems, which includes the recent type III examples of Tsirelson, and a family of examples which can not be distinguished from CCR flows by his invariants. We generalise the CCR flows to obtain that contruction. We also provide a necessary and sufficient condition for that E_0-semigroup to be of type III.

34 Sachi Srivastava (Lady Shri Ram College, New Delhi)

Title: Non analytic growth bounds for C_0 Semigroups'

35 Harald Upmeier (University of Marburg, Germany)

Title: Covariant Quantizations of Real and Complex Symmetric Spaces

Abstract: Symmetric spaces of compact or non-compact type, such as the Grassmann manifold or the complex unit ball, are of fundamental importance in harmonic analysis (representations of semi-simple Lie groups) and operator theory (Hardy spaces, Bergman spaces and Toeplitz operators). We give a general theory of covariant quantization (operator calculus) on symmetric domains, with particular emphasis on the so-called geodesic calculus, which generalizes the Toeplitz operators and the Weyl calculus. Our main result (jointly with J. Arazy) determines the spectral behavior of the Berezin transform associated with a covariant calculus.

In the second part we discuss recent generalizations to real symmetric spaces of non-compact type, to cases including supersymmetry and, very surprisingly, to compact symmetric spaces such as the Grassmannian, where the Hilbert spaces are finite-dimensional but in the limit approach a well-defined Hilbert space living on a real symmetric submanifold.

36 S Thangavelu (Indian Institute of Science, Bangalore)

Title: Gutzmer's formula and Poisson integrals on the Heisenberg group

37 Murali K Vemuri (Chennai Mathematical Institute, Chennai)

Title: Inductive Algebras

Abstract: Inductive algebras were introduced as a way to abstractly encode (and thereby understand) the different 'realizations' of the canonical representation of the Heisenberg group that occur in the literature. Inductive algebras may be associated with any irreducible unitary representation of a locally compact group. We will discuss some recent classification results.

38 M Sundari (Indian Institute of Technology, Roorkee)

Title: Heisenberg-Pauli-Weyl inequalities for Lie groups of polynomial growth

Abstract: In its simpler form, the Heisenberg-Pauli-Weyl inequality says that

$$\|f\|_2^4 \leq C(\int_{\mathbb{R}^n} |x|^2 |f(x)|^2 dx)(\int_{\mathbb{R}^n} |(-\Delta)^{\frac{1}{2}} f(x)|^2 dx).$$

We extend this inequality, and variants of it, to groups with polynomial growth, with Δ replaced by a hypoelliptic sum of squares of left-invariant vector fields and $|x|$ by the control distance from the identity element induced by the same vector fields. On nilpotent groups, one can take higher-order left-invariant hypoelliptic operators which admit a homogeneous lifting to an appropriate free group.

39 Victor Vinnikov (Ben Gurion University of the Negev, Israel)

Title: Two-evolution scattering systems, unitary dilations of commuting contractions, and operator vessels

Abstract: The usual construction of a unitary dilation of a contraction can be seen as consisting of two stages: first, embedding the contraction into a unitary 2×2 block operator matrix (the Halmos dilation); second, embedding this unitary block operator matrix into the infinite Schaeffer matrix which provides a unitary dilation. From the point of view of system theory, the first step amounts to embedding a given contraction as the state space operator into a discrete time conservative input/state/output linear time invariant system; the second step consists of embedding this conservative input/state/output system into a scattering system (in the sense of Lax–Phillips and Adamyan–Arov) whose ambient space consists of finite energy trajectories of the input/state/output system. This construction also allows to fully elucidate the geometric structure of the minimal unitary dilation of a given contraction, which is as important for

applications to spectral theory as the very fact that the dilation exists.

A major obstacle in the case of two commuting contractions is that the proof of Ando's dilation theorem gives no information on the geometric structure of commuting unitary dilations of a pair of commuting contractions. This both impedes the applications to two variable spectral theory, and prevents us from understanding why — and to which extent — the dilation theorem fails for three and more commuting contractions.

I will discuss an approach to the two variable dilation theory which parallels the single variable case. We first embed the given pair of commuting contractions as state space operators into a conservative two dimensional input/state/output system; this system is overdetermined and it comes equipped with compatibility difference equations at the input and the output, allowing us to embed it into a two evolution scattering system whose ambient space consists of trajectories of finite energy. The compatibility equations control the geometry of commuting unitary dilations. They are coming from the presence of *an operator vessel* — an algebraic structure reflecting the interplay of several commuting operators (or, more generally, of several operators satisfying given commutation relations).

This construction is natural in the sense that any pair of commuting unitary dilations of a pair of commuting contractions arises in this way. While our technology is currently limited to contractions with finite defects — leading to a model theory on a finite bordered Riemann surface — there is little doubt that it can be extended to handle the general case, and also for three or more commuting contractions, yielding ultimately the exact extent of failure of the dilation theorem (and giving explicit necessary and sufficient conditions for the existence of commuting unitary dilations).

This is a joint work with Joe Ball.

40 M Vidyasagar (Tata Consultancy Services, Hyderabad)

Title: Nevanlinna-Pick interpolation with degree constraint

41 Rongwei Yang (State University of New York at Albany Albany)

Title: Defect operators in the Hardy space over the bidisk

Abstract: The study of the unilateral shift and the Jordan operator is a source of many important developments in classical operator theory. In recent years, there have been continuous efforts trying to formulate a two variable analogue of the study. In this talk, we will report on some advances along this line.

42 T S S R K Rao (Indian Statistical Institute, Bangalore)

Title: An introduction to the geometry of the space of operators on Banach spaces