Functional and Complex Analysis
Analyse fonctionnelle et complexe
(Org: **Douglas Farenick** (Regina) and/et **Javad Mashreghi** (Laval))

RAPHAEL CLOUATRE, University of Manitoba
Uniform quotients and C^*-envelopes on the Drury-Arveson space

Quotient modules of the Drury-Arveson space serve as concrete functional models in multivariate operator theory. We explore some of the operator algebraic properties of the canonical generators of these modules. We show how the "approximate" zero set of the associated annihilating ideal can detect whether certain operator algebras are uniform algebras. In turn, this information determines the C^*-envelope of these algebras. This is joint work in progress with Edward Timko.

RICHARD FOURNIER, Dawson College (Montreal)
A Schwarz lemma for locally univalent meromorphic functions

We prove a sharp Schwarz type lemma for meromorphic functions with spherical derivative uniformly bounded away from zero. As a consequence we deduce an improved quantitative version of a recent normality criterion due to Grahl and Nevo and also to Steinmetz, which is asymptotically best possible. This is joint work with Daniela Kraus and Oliver Roth from Germany.

BRUCE GILLIGAN, University of Regina
Pseudoconvex homogeneous manifolds

Assume G is a connected complex Lie group with H a closed complex subgroup of G. Then there exists a closed complex subgroup J of G containing H such that the homogeneous fibration $\pi : G/H \to G/J$ is the **holomorphic reduction** of G/H, i.e., G/J is holomorphically separable and $\mathcal{O}(G/H) \cong \pi^*\mathcal{O}(G/J)$.

In this talk we will discuss what happens if G/H is pseudoconvex, i.e, admits a continuous plurisubharmonic exhaustion function. It turns out that in this setting one is in the best of all possible worlds: G/J is Stein and $\mathcal{O}(J/H) \cong \mathbb{C}$.

DAMIR KINZEBULATOV, Université Laval
A new look at the KLMN theorem

The Kato-Lions-Lax-Milgram-Nelson (KLMN) theorem plays a central role in the theory of operators and the PDEs. When applied to the (formal) Kolmogorov operator $-\Delta + b \cdot \nabla$, the KLMN theorem allows to construct its realization in L^2 as the generator of a holomorphic semigroup. We will demonstrate a new approach to the L^2 theory of $-\Delta + b \cdot \nabla$, using the old ideas of Hille, Lions and Trotter. Compared to the KLMN theorem, this approach admits a considerably wider class of vector fields b while providing a greater regularity of solutions to the corresponding elliptic equation. Joint with Yu.A.Semenov (Toronto).

JAVAD MASHREGHI, Laval University
Approximation schemes in function spaces

Let X be a Banach holomorphic function space on the unit disk. A linear polynomial approximation scheme for X is a sequence of bounded linear operators $T_n : X \to X$ with the property that, for each $f \in X$, the functions $T_n(f)$ are polynomials converging to f in the norm of the space. We completely characterize those spaces X that admit a linear polynomial approximation scheme. In particular, we show that it is not sufficient merely that polynomials be dense in X.

Joint work with T. Ransford.

ABDEL RAHMAN, University of Regina
Homogeneous Levi Foliations

Let G_0 be a closed, connected subgroup of a connected complex Lie group G with H a closed complex subgroup of G and set $H_0 := G_0 \cap H$. Further assume that the (real) orbit $\Sigma := G_0/H_0$ is compact in the homogeneous complex manifold $X := G/H$, that $W_x := T_x\Sigma \cap iT_x\Sigma$ has constant dimension for all $x \in \Sigma$, and that the subbundle $W := \bigsqcup W_x$ is integrable. Then Σ is foliated by maximal connected complex submanifolds, called the leaves of the **Levi foliation** of Σ, that turn out to be homogeneous themselves under a complex subgroup of G contained in G_0 and whose tangent space at each $x \in \Sigma$ is W_x.

If Σ is an orbit in a complex projective space, then the leaves are flag manifolds, i.e., they are closed in Σ. Perhaps, more surprisingly, is the fact that if the isotropy H is discrete, then the basic building blocks that can occur are compact homogeneous complex manifolds and fiber bundles involving powers of S^1, the unit circle, lying inside corresponding powers of $\mathbb{C}^*$-bundles in X. We will outline how this happens, even in the setting where the leaves are dense - so no reasonable (i.e., Hausdorff) leaf space exists. This gives a rather explicit description of the structure even in this setting.

CHRISTOPHER RAMSEY, MacEwan University
What is and is not a Tensor algebra

A C*-correspondence is a generalization of Hilbert space where the inner product takes values in a C*-algebra. To such a space one constructs the so-called Tensor algebra. Because this construction is so abstract it is not obvious whether a given operator algebra has a Tensor algebra description or not.

MOHAMMAD SHIRAZI, University of Manitoba
Grunsky and Faber Operators for Riemann Surfaces with One Border

Consider a Riemann surface Σ of genus $g > 0$ with one border Γ which can be described as a compact Riemann surface $\mathcal{R}$ of the same genus g, from which a simply connected domain Ω is removed. That is $\Sigma = \mathcal{R}\backslash cl(\Omega)$, $\partial\Omega = \Gamma$. Let f be a conformal map from the unit disc $\mathbb{D}$ to Ω.

We aim to characterize the Dirichlet holomorphic space $\mathcal{D}(\Sigma)$ and its boundary values on Γ, in terms of the Fourier series of the pull-back of $\mathcal{D}(\Sigma)$ by f, by generalizing the classical *Faber* and *Grunsky* operators associated to f on planar domains to $\mathcal{R}$.

Joint work with E. Schippers and W. Staubach.

RYAN TESSIER, Mr.
Purity of the Identity Map on the Operator System generated by the Free Group

If $\mathcal{S}_n$ is the operator system of the free group $\mathbb{F}_n$, then the identity map $\iota_N : \mathcal{S}_n \to \mathcal{S}_n$ is shown to be a pure completely positive map in the cone of all completely positive linear maps $\phi : \mathcal{S}_n \to \mathcal{S}_n$.

ED TIMKO, University of Manitoba
Row Contractions Constrained by Higher Order Vanishing Ideals.

In this talk we look at similarity classes of commuting row contractions annihilated by what we call higher order vanishing ideals of interpolating sequences. We demonstrate a Jordan-type direct sum decomposition for these row contractions and discuss a few connected results. This is based on joint work with Raphael Clouatre.