TITLES AND ABSTRACTS

D. Angella: ***Cohomologies on complex manifolds.*** After Pierre Dolbeault initiated its study, the cohomology with coefficients in the sheaf of holomorphic functions revealed as a fundamental tool in Complex Geometry. Further cohomological invariants for complex manifolds were then defined in 1965 by Bott and Chern, and Aeppli. They provide a sort of bridge between de Rham and Dolbeault cohomology, and turn out to be natural tools in Complex Analysis, Complex (non-Kähler) Geometry, and Theoretical Physics.

P. de Bartolomeis: ***On deformation theory of some geometric objects.*** We investigate the DGLA of skew symmetric derivations on the DeRham algebra of a smooth manifold as background pattern of various deformation theories of geometric objects. This includes integral distributions, holomorphic bundles, Levi-flat manifolds etc... This is a joint research with A. Iordan.

B. Berndtsson: ***Convexity of the Mabuchi K-energy and applications.*** The Mabuchi K-energy plays an important role in the study of extremal metrics in Khler geometry. It is a function defined on the space of Khler metrics in a given cohomology class and its key property is that its critical points are metrics of constant scalar curvature. The K-energy is well known to be convex along smooth geodesics, but the usefulness of this fact is limited since two points in the space can in general not be connected by a smooth geodesic.

We will prove that the K-energy is actually convex also along generalized geodesics. By a theorem of X. X. Chen any two points in the space can be connected by a generalized geodesics and we shall see how convexity of the K-energy along these can be used for uniqueness questions. This is joint work with Robert Berman.

J.-P. Demailly: ***Embeddings of almost complex manifolds in directed projective manifolds.*** About twenty years ago, Fedor Bogomolov asked whether every compact complex manifold can be embedded as a smooth transverse to an algebraic foliation in a projective nonsingular manifold. Although there are many examples of such embeddings for large classes of non Kähler manifolds, the general question is still open. We study here a similar question concerning the embedding of compact almost complex manifolds in projective varieties equipped with a non integrable subsheaf of the tangent sheaf. This is a joint work with Hervé Gaussier.

J. Grivaux: ***Derived intersections of complex manifolds.*** In this talk, I will explain a refined intersection theory for analytic cycles using derived categories. I will give applications of this construction (Kashiwara's approach to the HKR isomorphism, and a new proof of the Grothendieck–Riemann–Roch theorem in Hodge cohomology). Then, I will present recent results concerning formality of derived intersections.

G. Henkin: ***Explicit reconstruction of Riemann surfaces with given boundary in complex projective space.*** This talk is based on joint works with Pierre Dolbeault [DH, 1994], Vincent Michel [HM, 2007] and Alexey Agaltsov [AH, 2013]. In [AH] by developing of [DH] we have obtained a numerically realizable algorithm for reconstruction of complex curve with known boundary and without algebraic components in projective space. This algorithm permits, in particular, to make applicable the result of [HM] about principal possibility to reconstruct topology and conformal structure of two-dimensional surface X in $\mathbb{R}^3$ with constant scalar conductivity from measurements on bX of electrical current densities, being created by three potentials in general position.

J.-M. Hwang: ***Cartan–Fubini type extension of holomorphic maps.*** In a joint work with Ngaiming Mok in 2001, we proved Cartan–Fubini type extension of holomorphic maps for Fano manifolds of Picard number 1 with equi–dimensional VMRT's, which generalizes Liouville's theorem in conformal geometry.

I will report on some recent developments on non–equi–dimensional cases with applications.

C. Laurent: ***On the Hausdorff property of some Dolbeault cohomology groups.*** We study the duality for the Cauchy–Riemann complex in various function spaces and deduce the Hausdorff property of some Dolbeault cohomology groups.

X. Ma: ***Ray–Singer analytic torsion and Toeplitz operators.*** Real analytic torsion is a spectral invariant of a compact Riemannian manifold equipped with a at Hermitian vector bundle, that was introduced by Ray–Singer in 1971. Ray and Singer conjectured that, for unitarily flat vector bundles, this invariant coincides with the Reidemeister torsion, a topological invariant. This conjecture was established by Cheeger and Mueller, and by Bismut–Zhang to arbitrary flat vector bundles.

In this talk, we explain first the theory of Toeplitz operators associated with a positive line bundle. We show then how Toeplitz operators appear naturally in the study of the asymptotic properties of cohomology and of the Ray–Singer analytic torsion associated with a family of flat vector bundles. In the case of arithmetic quotients, the asymptotics of the Ray–Singer analytic torsion give informations about the size of the torsion elements in the cohomology group.

N. Sibony: ***Densities for positive closed currents and applications to equidistribution of periodic points.*** The notion of density for a current is an extension of the notion of Lelong Number. Densities are cohomology classes (in the normal bundle) attached to tangent currents to a given positive closed current along a subvariety. They are useful in the study of the asymptotic intersection properties of a sequence of varieties (resp. a sequence of graphs) with a subvariety (resp. the diagonal). We apply the theory to prove that for regular polynomial automorphisms of $\mathbb{C}^k$, saddle periodic points of order n, equidistribute towards an equilibrium measure. This is joint work with T. C. Dinh.

Y.-T. Siu: ***Pluricanonical Hodge decomposition.*** The m-genus of a compact complex manifold is the complex dimension of the vector space of all holomorphic sections of the m-th tensor power of its canonical line bundle. The deformational invariance of the m-genus for any positive m is known to hold for compact complex algebraic manifolds. When $m = 1$, such a deformational invariance for all compact Khler manifolds is a just direct consequence of the Hodge decomposition. The question naturally arises whether the deformational invariance of m-genus for $m > 1$ can also be understood in the context of some form of Hodge decomposition with the vector space of all holomorphic m-canonical sections as a summand. We discuss the results and the developments in the study of this problem by starting with the simplest case of compact Riemann surfaces.

G. Tomassini: ***Global defining functions for unbounded domains.*** I will discuss some results obtained in a joint paper with Tobias Harz and Nikolay Schcerbina on the existence of defining functions for unbounded pseudoconvex domains. In that paper we show that every strictly pseudoconvex domain Ω with smooth boundary in a complex manifold $\mathcal{M}$ admits a global defining function, i.e. a smooth plurisubharmonic function $\varphi\colon U \to \mathbb{R}$ defined on an open neighbourhood $U \subset \mathcal{M}$ of $\overline{\Omega}$ such that $\Omega = \{\varphi < 0\}$, $d\varphi \neq 0$ on $b\Omega$ and φ is strictly plurisubharmonic near $b\Omega$. We then introduce the notion of the core $\mathfrak{c}(\Omega)$ of an arbitrary domain $\Omega \subset \mathcal{M}$ and we prove that if Ω is not relatively compact in $\mathcal{M}$, then in general $\mathfrak{c}(\Omega)$ is nonempty, even in the case when $\mathcal{M}$ is Stein. Moreover, every strictly pseudoconvex domain $\Omega \subset \mathcal{M}$ with smooth boundary admits a global defining function that is strictly plurisubharmonic precisely in the complement of $\mathfrak{c}(\Omega)$. We then investigate properties of the core.

C. Voisin: ***Pushforwards of pseudoeffective classes.*** This is joint work with O. Debarre and Z. Jiang. We study the following problem and its variants: Let f be a proper morphism between projective varieties X and Y and let A be a pseudoeffective real cohomology class on X such that $f_*A = 0$ on Y. Is A a combination with real coefficients of classes of subvarieties of X contracted by f? Note that the answer is obvious if A is effective rather than pseudoeffective.

E. Fornaess Wold: ***Exposing points on the boundary of a bounded strictly pseudoconvex domain in a complex space.*** In $\mathbb{C}^n$ the result we will discuss is the following: Let $\Omega \subset \mathbb{C}^n$ be a bounded strictly pseudoconvex domain, and let $p \in b\Omega$. Then there exists an injective holomorphic map $\phi : \overline{\Omega} \to \overline{\mathbb{B}^n}$ such that $\phi^{-1}(b\mathbb{B}^n) = \{p\}$. The analogous result holds for locally convexifiable domains of finite type if the ball is replaced by an appropriate model domain, and under certain conditions there exist continuous families ϕ_ζ of holomorphic exposing maps, where ζ varies in $b\Omega$ and $\phi_\zeta \in \mathrm{Aut}_{\mathrm{hol}}\,\mathbb{C}^n$. If we let Ω be a bounded domain in a complex space X, assume that $\overline{\Omega}$ is a Stein compact, and let $M \subset X$ be a real hypersurface, then for any smooth point $p \in b\Omega$ there is an injective holomorphic map $\phi : \overline{\Omega} \to X$ with $\phi^{-1}(M) = \{p\}$.

This is joint work with K. Diederich and J.E. Fornæss, and with F. Deng and J.E. Fornæss.

D.-Q. Zhang: ***Positivity of (log) canonical divisors of Brody or Mori hyperbolic normal varieties.*** We consider the nefness, bigness and ampleness of (log) canonical divisors of hyperbolic algebraic varieties and their subvarieties which are not necessarily smooth or compact. Sufficient conditions are given in terms of number of ample boundary divisors, or abundance and the absence of rational curves on Calabi-Yau varieities.