2020 Taipei-Hsinchu Conference on Geometric Invariance and Partial Differential Equations

MINI-COURSE

December 29 - 30, 2019、January 2, 2020

Room 4B, General Building III 綜合三館, National Tsing Hua University

Professor Sun-Yung Alice Chang 張聖容 Princeton/NTHU

Lecture 1 and Lecture 2

Time: **December 29 Sunday - 30 Monday, 2019** **10:00 - 11:30**

Title: Compactness of conformally compact Einstein manifolds in dimension 4.
Abstract: Given a manifold $(M^n, [h])$, when is it the boundary of a conformally compact Einstein manifold (X^{n+1}, g^+) with $r^2 g^+ \mid_M = h$? This problem of finding "conformal filling in" is motivated by problems in the AdS/CFT correspondence in quantum gravity (proposed by Maldacena in 1998) and from the geometric considerations to study the structure of noncompact asymptotically hyperbolic Einstein manifolds. The problem is largely open, but recently there has been substantial progress made in this research area. I will present the background and some recent progress concerning the aspects of the existence and non-existence, the uniqueness and compactness results of this problem.

Lecture 3

Time: **January 2 Thursday, 2020** **10:00 - 11:30**

Title: Improved Moser-Trudinger-Onofri inequality under constraints.
Abstract: I will report some recent joint work with Fengbo Hang. A classical result of Aubin states that the constant in Moser- Trudinger-Onofri inequality on S^2 can be improved for functions with zero first order moments of the area element. We generalize it to higher order moments case. These new inequalities bear similarity to a sequence of Lebedev - Milin type inequalities on S^1 coming from the work of Grenander-Szego on Toeplitz determinants (as pointed out by Widom). We also discuss the related sharp inequality by the method of perturbation.

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Professor Paul Yang 楊建平 Princeton University

Lecture 4

Time: **December 29 Sunday, 2019** **14:30 - 16:00**

Title: Theory of surfaces in the Heisenberg.

- The classification of singular points, application to the isoperimetric problem.
- The analogue of the Codazzi equation.
- CR analogues of the Willmore energy and examples.

Lecture 5

Time: **December 30 Monday, 2019** **14:30 - 16:00**

Title: The CR Yamabe equation.

- The positivity criteria for the CR Paneitz operator, application to the embedding problem.
- The positive mass theorem and the Sobolev quotient.
- Counterexamples.

Lecture 6

Time: **January 2 Thursday, 2020** **14:30 - 16:00**

Title: The Q-prime curvature.

- The analogue of the Q-curvature equation, extension of the rigidity theorem of Gursky.
- The total Q-prime curvature as a global invariant.