



ANNALES

DE

L'INSTITUT FOURIER

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Tome 68, n° 7 (2018), p. 2779-2781.

http://aif.cedram.org/item?id=AIF_2018__68_7_2779_0



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JEAN-PIERRE: SOME PERSONAL REMINISCENCES

by Thomas PETERNELL

My first contact with Jean-Pierre was on the occasion of a conference on complex analysis in Trento, held in the beautiful Villa Madruzzo in June 1983 - Jean-Pierre gave a lecture on positive closed currents at that conference. Apart from mathematics, I still remember at least one joint soccer match during one of these meetings which took place every year in early summer. We were in the same team, a hint for the future. At that time (1983) he already held a professor position in Grenoble. One of his first visits to Bayreuth was in 1990 to speak at a conference "Complex Algebraic Varieties" which I organized with Klaus Hulek, Michael Schneider and Frank-Olaf Schreyer. This was - shortly after the dramatic political changes in 1989 - one of the first international meetings with participants both from the West and the East. Jean-Pierre lectured on "*A numerical criterion for very ample line bundles*"; one of his numerous breakthroughs in Complex Analysis and Algebraic Geometry and the starting point for all subsequent developments around the Fujita Conjecture. His contribution to the proceedings of this conference, appearing as Springer Lecture Notes 1507, is the extremely influential article "*Singular metrics on positive line bundles*". Not only did he introduce the important notion of a singular hermitian metric on a holomorphic line bundle which allows in particular to characterize pseudoeffective line bundles by the positivity of the curvature current of a singular metric. But he also invented the notion of *Seshadri constants* for nef line bundles, a measure for positivity, which have been studied in numerous research articles since then.

Around 1990 we started, together with Michael Schneider, joint research projects. The first paper studied compact Kähler manifolds X whose tangent bundle are *nef*, a geometric version of having a metric with semipositive holomorphic bisectional curvature. A priori, the nefness assumption is

weaker than the metric assumption. We proved structure theorems which gave a rather precise picture of those manifolds up to a central conjecture which states a *Fano* manifold with nef tangent bundle must be rational-homogeneous. Despite many efforts and results in special cases, this conjecture is still very much open. Our collaboration was sponsored at that time by a French-German program, called PROCOPE, financing mutual visits. In the following decades, we studied compact Kähler manifolds with nef anticanonical bundles followed, pseudoeffective line bundles, in particular in connection with the nonvanishing and the abundance conjecture, furthermore line bundles with some partial positivity and as well the geometry of special varieties.

Actually, despite a unified Europe, a travel from Grenoble to Bayreuth or the other way around was, and is not that easy, taking some time. Usually Jean-Pierre took a night train from Paris in a *couche*, a compartment with six people. For our part, we enjoyed the hospitality of the Hotel Gloria and the Hotel des Alpes during visits to Grenoble. Of course, Grenoble has the advantage of being a real city, located in a beautiful landscape and, last but not least, not too far from Burgundy.

Needless to say, we met at many conferences. A very sad occasion was the Bayreuth memorial conference 1998 for our friend Michael Schneider. Here Jean-Pierre lectured on “*Almost complex projective embeddings of compact real symplectic manifolds*” a very broad and general subject outside Kähler geometry.

Jean-Pierre has special connections to Göttingen (my Alma Mater), equivalently to Hans Grauert. Shortly after the solution by Y.T.Siu, he showed that the Grauert-Riemenschneider Conjecture is a consequence of his famous holomorphic Morse inequalities which he developed in the late 80's. Moreover he received the Dannie Heinemann Prize from the Academy of Science in Göttingen in 1991. Needless to say, he was one of the main speakers in the conference of honour of Grauert's 70th birthday, held in Göttingen in 2000, with a lecture on “*Subadditivity of multiplier ideal sheaves and asymptotic Zariski decomposition*”. He also contributed an extremely elegant article “*On the Frobenius integrability of certain holomorphic p -forms*”, which had its origin - and was wrapped up - during the conference. Namely, jointly with Stefan Kebekus, Andrew Sommese and Jaroslaw Wiśniewski, I was studying projective contact manifolds X with second Betti number at least two. In order to prove our structure theorem for these manifolds we needed the fact that the canonical bundle of X is not nef. So, we asked Jean-Pierre and he solved the problem (in a much

more general setting and establishing an integrability theorem) during the conference - without even missing talks, I guess.

The Complex Analysis meetings in Oberwolfach - the institute located more or less half way between Grenoble and Bayreuth - in late August every other year are a great tradition, going back to the early 50's. For a long period they were organized by Grauert-Remmert-Stein and later Grauert-Remmert-Barth. It was absolutely natural that Jean-Pierre should become an organizer, and I had the pleasure to work with him and Klaus Hulek in this function from 1996 to 2012.

The mathematical influence of Jean-Pierre cannot be overestimated. He introduced important techniques such as his regularization of closed positive currents, his holomorphic Morse inequalities (as already mentioned), enforced the study of the multiplier ideal and the use of Monge-Ampère equations. His new methods in the study of hyperbolicity are indispensable.

The scientific and the personal appreciation of Jean-Pierre was manifested in a conference in Grenoble in June 2017 in his honour with a large number of outstanding mathematicians participating and an illustrious program - and by this volume.

Of course, these are just a few personal remarks and views. It would take many pages to give a detailed overview over the extraordinary mathematical work of Jean-Pierre (and it would be only temporarily!), not to speak of his mathematical school with many extremely successful students and his further numerous activities: organizing science, publication of science (the Episcience project), school education in France, and nuclear energy problems. Better not even to try!

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