Jean-Pierre Bourguignon

Dr. Jean-Pierre Bourguignon received his Ph.D. from Université Paris Diderot-Paris 7 in 1974. His research interest is in the field of differential geometry.

Bourguignon was president of the Société Mathématique de France from 1990 to 1992. From 1995 to 1998 he was president of the European Mathematical Society. He was director of the Institut des Hautes Études Scientifiques from 1994 to 2013. He has been the president of European Research Council since 2014.

Recollections

I met Yau Shing-Tung for the first time in the Fall 1972 in Stony Brook. I had been invited by Jim Simons to visit the Mathematics Department for the academic year. This was Shing-Tung's first position after getting his Ph.D. in Berkeley under the supervision of the late Professor Chern Shiing Shen, and this was my first visit to the US, facilitated by my holding an attaché de recherche position at the CNRS. I had heard of the very interesting results he had obtained on non-positively curved manifolds, some jointly with H. Blaine Lawson. His results were of interest to me as I had published an article with Edmond Mazet on this topic. With 12 differential geometers in the faculty, the mathematics department was an incredibly stimulating environment for a young researcher like me.

Very soon, we found each other teaching a Calculus class next to one another. Both of us had to struggle with the attitude of American students who tend to blame their teachers when they do not understand, even when they do not put enough effort into studying. He and I had also to get them used to our accents in English.

It was quite natural for the two of us to start some joint research project together. As he and I came early in our offices, we had early morning sessions. It did not take long to me to realise that Shing-Tung was having at least three other research sessions with other people during the day!
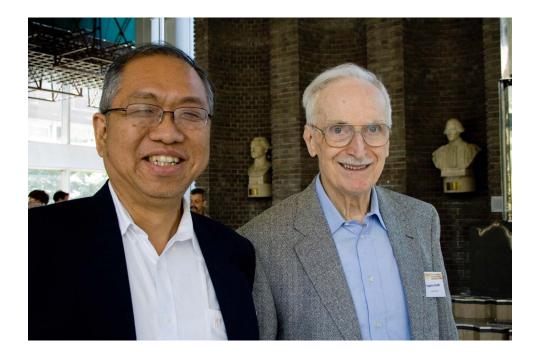
At this time the Calabi conjecture was really open, and we worked at trying to disprove it. At this time this was something others were also trying to do. Our efforts produced some result, namely we established that any non-trivial quotient of a K3 surface cannot have holonomy SU2. Indeed we proved that, along a geodesic minimizing length in a non-trivial homotopy class, the full curvature tensor of the Ricci-flat metric would have to vanish as well as all its derivatives, thanks to a diabolic recurrence heavily using the quaternionic structure. This leads to a contradiction since this would imply the metric is flat, something impossible on a manifold whose universal cover is compact.

We became close friends, and I could witness his remarkable dedication to Mathematics and to his family in Hong Kong. He came to share dinners with my family, and get acquainted with our young daughter Véronique. When we meet, he always asks for news about her.

The rest is history! Thanks to his great inventiveness, he managed to get the key estimates to control the appropriate norm of the Kählerian potential, proving the Calabi conjecture. This was a key success for non-linear Global Analysis, which, often thanks to major contributions by him, became a field in itself. One after the other major conjectures related to Harmonic Maps, Minimal Surface Theory, Yang-Mills Theory, etc. were resolved using Global Analysis techniques.

A great moment has been the Special year at the Institute for Advanced Study in 1980 where he attracted most of the best experts in the field: Karen Uhlenbeck, Cheng Shiu-Yuen, Peter Li, Ric Schoen, Terng Chuu-Lian, … Clifford Taubes and Robert Bryant were also there, both of them still students at this time. This was an extraordinarily successful special year.

In the case of an m-dimensional complex manifold with vanishing first Chern class the solution

of the Calabi conjecture provides many examples of metrics with holonomy SU*m*, a spectacular achievement. It became even more important when, in the 1980s, theoretical physicists pointed to the interest of such metrics on 3-dimensional complex manifolds as possible internal parameter space for String Theories. This was the starting point of a fascinating exploration of "Calabi-Yau" manifolds.

There are not many pictures of Shing-Tung and Eugenio Calabi. Here is one taken in 2007 at the conference at IHÉS and École polytechnique on the occasion of my 60th birthday. I am grateful to Shing-Tung for having accepted to take part in this very special moment of mathematical friendship. Many thanks to Jean-François Dars who caught the joyful atmosphere of the meeting with his camera.

In the Fall of 1980, I also owe to Shing-Tung an invitation to Stanford University… but, when I got there, he had already moved to Harvard! I could still interact very positively with Peter Li, Yum-Tong Siu, Robert Osserman, etc.

In 1981 interacting with mathematicians from Mainland China became possible, an opening in which Professor Chern played a key role. Shing-Tung de-

ployed his fantastic energy in this direction too, opening institutes at the Chinese University in Hong Kong, at Zhejiang University in Hangzhou, and at Tsinghua University. I am thankful to Shing-Tung to have given me the possibility to be exposed to these new developments, in which Global Analysis was always at a centre of attention, due to the remarkable success of many of his students and collaborators.

Over the years, I had the privilege of having numerous discussions with Shing-Tung who continued his very broad engagement with Mathematics, including some applied versions of it. His tireless efforts to promote our discipline and to make it more accessible to the young generation gave some more occasions for me to visit China, either at Tsinghua University or in the great facility he made happen in Heinan, the Tsinghua Sanya International Mathematics Forum, that hosts many conferences designed in particular for young people.

My recent more Europe-centred activities made our meetings less frequent, but I could hear that his tireless efforts to develop Mathematics continued.

Enjoy a long and healthy life, Shing-Tung!