

# Jacob Palis 80, a message from Groningen

*Henk Broer*

Just after my PhD in 1979 I went to my first international conference, Summer 1980 at the University of Warwick, near Coventry, in England. This was at the Mathematical Institute of Christopher Zeeman, nowadays named after him. Christopher was, like René Thom, Steve Smale and Mauricio Peixoto, one of the founding fathers of Nonlinear Dynamical Systems, an area that was rapidly becoming a full grown discipline. Jacob Palis, a student of Smale, belongs to the next generation and was still very much founding the discipline. The same holds for Floris Takens, Sheldon Newhouse, David Ruelle, Michel Herman and a few others. Many of us met again in Trieste at the International Centre for Theoretical Physics, at that time under the direction of the Nobel laureate Abdus Salam. Jacob and Christopher organized courses and workshops for students from third world countries, I believe under the auspices of UNESCO. Also we met in Rio de Janeiro on grand scale international conferences.

Many of these meetings were repeated over the years, also complemented by workshops at the Mathematisches Forschungsinstitut Oberwolfach in the German Schwarzwald organized by Jürgen Moser and Edward Zehnder and later Michel Herman; this gave a great input from Analysis and Celestial Mechanics, I also like to mention Helmuth Rüssmann and John Mather. I should include more pure geometry represented by Nico Kuiper, a long time director of IHES, and César Camacho, another PhD student of Smale and Paolo Sad.

They were all great conferences and Jacob, a gracious Brazilian gentleman who 'borrowed' cigarettes from Ricardo Mañé and was kind to everybody (including the women), played a central role in them, presenting extremely clear talks. At some moment Jacob became the director of IMPA and the institute flourished and flourishes more than ever! Congratulations to you all!

I myself belong to the next generation, together with Alain Chenciner, Mark Levi, Sebastian van Strien, Wellington de Melo and many others. During visits to Rio I do well remember our trips to Angra dos Reis with Wellington and his wife Gilza to stay in their second house and to sail in the Bay of Angra. It was great fun and Jacob always was a central figure in the events. The field of Nonlinear Dynamical Systems attracted many more people and after a while fell apart in various sub-disciplines. But in the glorious beginning we all went to all lectures!

The research programme that Jacob and several other Brazilians were pursuing, was developing and expanding on a question posed by Smale, namely in how far structural stability of certain classes of parametrized dynamical systems is a generic property. Moduli of stability

form a problem here, but then the question can be widened allowing for finitely many moduli. In the smooth world moduli were known to exist for a long time, but it was quite a surprise that also in the topological case moduli occur. It was the IMPA group led by Jacob that discovered this important fact. With Floris Takens Jacob also investigated gradient systems in this respect resulting in a great paper in the Annals of Mathematics.

Many more results belong to this category and I won't even try to mention them all, but surely the work of Ricardo and Jacob on omega-stability, published in the proceedings of IHES comes to my mind and also that of Jean-Christophe Yoccoz and Jacob on rigidity. Of course I need to mention the work of Sheldon Newhouse, Floris Takens and Jacob on stability and bifurcations of families of diffeomorphisms, which among other things resulted in the nice Cambridge University Text on heteroclinic bifurcations. Last but not least there is the beautiful book with Wellington de Melo, with the elegant Palis lambda-lemma, has become famous and was used all over the world in courses and seminars.

At a more personal level I especially remember the friendly receipt and the marvelous dinner parties with Jacob, at that time together with Maria José (Zé-zé) Pacifico and little Laura, in their apartment overlooking Lagoa with Dois Irmãos in the sunset background. I need to mention that I have often visited the Universidade Federal of Rio de Janeiro, where Zé-zé was my host.

Jacob had a great follow up as the chairman of the IMU, a well-deserved honour. I have been following his career somewhat from a distance, partly due to my own physical condition and later also because of the illness and early death in 2010 of our mutual friend Floris Takens. I do wish Jacob happy 80th birthday and wish you many more years to stay alive and kicking !

Best wishes to all of you and mais uma caipirinha!