Interview: Carlos Pereira
Por Sergio Wechsler *(IME-USP)*

Carlos Alberto de Bragança Pereira (Carlinhos) might be the pioneer of Bayesian Statistics in the Southern Hemisphere. But certainly this is not his most striking trait, at least for people who know him. Great friendliness and generosity, instead, distinguishes this Copacabana native who grew up in Leblon. In this interview we expect to hear him on his many papers, many friends – including his PhD supervisor, Dev Basu – and Bayesianism.

Sergio: *How did you become a statistician?*
Carlos: I was 11 years old, and my brother Basilio 12, when our mother had to find us a public school to go on. The National School of Statistical Sciences – ENCE – was starting to offer a Basic Commercial Course for kids. They hired very good teachers from Rio de Janeiro. My mother managed to enroll us even half an hour after the deadline. As soon as we finished that four years course, they decided to close it. It seems that they had opened it just for us! After this step, we started in ENCE the 3 years school of Technical Statistics. Finishing this sort of professional high school, we finally entered the ENCE undergraduate 4 years program, which is still active. We stayed 11 years in a Statistics School, in my case for half of my life. People don't always believe when I tell them I had to draw histograms at age 11. While on the undergraduate program I had to work as a technician during the day. Classes were held during night shift.

After graduating, I moved to São Paulo in 1969 to work as an instructor at the department of Statistics at USP - University of São Paulo. Since then I have been always affiliated to the Department. I have completed the Master program in 1971 and started my PhD program at Florida State University in 1977. I have graduated from FSU in 1980, under Dev Basu supervision.

Sergio: *How was life in ENCE?*
Carlos: I had a good time at ENCE. It was located in downtown Rio de Janeiro. I could then meet people of different backgrounds. The teachers also were very special. I remember the one who was responsible for probabilities, Helio Gopfert. First year at undergraduate school and he talks about Borel sets and Measure Theory. He used to say that only after thinking about solutions for problems you could go to textbooks to see standard stuff. I remember one of his definitions: "Experiment is an abstract concept where you give meaning to the words realization and observation". My definition today is: Experiment is a mechanism that transforms unknown quantities into known ones. I believe my Bayesian background starts just there.

Sergio: *All right. Every intelligent kid is Bayesian. But how and when did you become a Bayesian in the academic sense?*

Carlos: Well that would be in São Paulo when the Statistics Master Program was first organized. There was no history about MSc dissertations and I was the first student to graduate. So I had to sort of do lots of reading by myself. There were of course very interesting people teaching the disciplines. Norman Severo, Uppulury and Harold Larson were my first contact with non-Brazilian professors. I also used to go to the Institute of Biology to see the "real" experiments going on. One of their problems interested me very much and looking for good solutions I started to read Savage's 1961 (not 1954!) book on Statistical Inference. It was hard and challenging to read that little book. I decided to read a book by Jeffreys, Scientific Inference, where a biologist discusses Science with a statistician. After those two books I started to look for books on Bayesian methods. I decided at that time to translate Blackwell's "Basic Statistics" book, in collaboration with Wagner Borges who already had very good English. I believe it is the most interesting elementary book in Bayesian Statistics. I used it for undergraduate courses in Mathematics and Medical schools. The trouble was that no standard stuff was in it and nobody else liked the book. But some of my young students moved from Medicine to Biostatistics and from Mathematics to Bayesian statistics. Finally, I graduated in 1971 having written a MSc dissertation with a strong Bayesian flavor in a Genetics problem. As a result, I had my first Statistics publication at Science and Culture, a Brazilian journal.

Sergio: *Tell us about your PhD program experience.*
Carlos: When finishing my MSc, most of my faculty colleagues at USP were abroad in PhD programs. I had to wait for them to return before looking for a new step in my career. Already when joining the research team at the Biology Institute I started to study Reliability and liked the mathematics of Frank Proschan. So in 1977 I have joined the PhD program at FSU. I was very fortunate as I could meet great people. Some of them strongly anti-Bayesians but good challengers. Oscar Kempthorne, for example, made me very good and strong intellectual challenges. Basu host real Bayesians like David Blackwell for whom I have great admiration and respect. Anyone who had him as a teacher is very fortunate. Dick Barlow visited us several times and we became friends after some collaboration. He became Bayesian after his visits to FSU. My conviviality with Frank Proschan, mainly in his Saturday Seminar, and with Dev Basu, my wonderful supervisor, made them my gurus. With Frank I learned also about scientific politics. With Dev I also learned how to survive in academia keeping intellectual freedom and avoiding scientific faddism. My dissertation, under Dev's supervision, was one of the few Bayesian dissertations in FSU, I

believe.

Sergio: *How was your return to Brazil?*
Carlos: I came back in March of 1981. I really thought that as people down here had never been exposed to Bayesianity they would be really happy to finally see the light. This was a huge mistake (laughsJ). Soon all my lectures were ending with conflict. It was difficult in the beginning since I did not realize that conflict is what matters in the progress of scientific groups. I started to understand why Basu used to quote Max Planck: "A new scientific truth does not triumph by convincing the opponents and making them see the light, but rather because its opponent eventually die, and a new generation grows up that is familiar with it". Today, in Brazil, I believe half of the good statisticians are Bayesian. I would like to emphasize that although my colleagues did not buy Bayesian ideas at that time, they never tried to stop my way. In fact I was invited to lecture a Bayes course in the Brazilian symposium in 1982, when I and my colleague Marlos Viana wrote the first, I think, Bayesian book in Portuguese.

Sergio: *What projects and areas interested you most at that time? The list of collaborators on your more than one hundred papers is impressive.*
Carlos: I tried to find echo from my Bayesian background at the Institute of Biology and I realized that it became even harder than in our statistical community. However, I met a young biologist, Andre Rogatko, who was struggling to find a frequentist solution for the Penetration problem in Genetics. We became good friends and he understood that Bayesian ideas were in fact what he needed to go on in his bright career as a scientist. Today, being a very productive scientist, he is the Head of the Biostatistics group in the Fox Chase Cancer Center. His work is 100% Bayesian. I have been working since then with some important groups in the medical and biological areas. My strongest links are with people in Cytogenetics. Most of our papers appeared in Mutation Research. I believe the most important is a consequence of my collaboration with Peter Groer when he was in ORAU: "Current status of Cytogenetics procedures to detect and quantify previous exposures to radiation. Mutation Research 196: 103-59, 1988." I believe that was the first time Bayesian inference appeared in Cytogenetics. Peter is a very good scientist and I believe he is now also 100% Bayesian.

Sergio: *According to I.J.Good, there are 46656 varieties of Bayesians. How do you place yourself?*
Carlos: In fact there could be as many Bayesians as that. However few varieties if not just one hold the lead these days. One does not see independent minds choosing their ways too often. Publication pressure is a very strong barrier to freedom of ideas. One of my last papers got this one-line answer from an important journal: "It considered a problem, obtained data, invented the modeling and applied it. No novelty!" Do you know any paper on applications of Bayesian Statistics that does not follow this way? I have not used MCMC nor Bayes Factors. The computational methods were based on "old-fashioned" ... Mathematical Analysis! Fortunately the paper was published in a Biological Journal and I'm having as many requests as one would like to have.

Sergio: *Important Institutions like the American Food and Drug Administration seem to have become more Bayesian recently. Do you see much impact for the Bayesian standing? What else do you think will help disseminate Bayesian practice and ideas?*
Carlos: Dev Basu made me promise him that I would not become a priest for Bayesian statistics. He wanted me rather to do applied work in other areas of knowledge. He kept telling me that only people working in applications would be listened. I believe this is what is going on today. I tried to do my best to have my students going this way. Telba Irony took my first course while she was an undergraduate. After that I became her MSc dissertation supervisor (Fisher vs Bayes). We had a good time developing her dissertation and in fact it was published in the JSCS. She is a very intelligent person and even before graduating at the PhD program in Berkeley she made me understand how to use Bayesian statistics in practice. Her experience working for a bank was crucial to understand the way for applications. We became very good friends and I cannot say that she was really a student of mine as I have learned a lot from her during the development of our many papers in collaboration. Today she is playing a vital role in developing and implementing the effort to define, coordinate, promote, and disseminate the use of Bayesian statistics at the Center for Devices at the FDA. I am sure that, with her strong background in foundations and her sharp common sense, she will contribute to the progress of design and analysis of clinical trials. Only with smart people like Telba working professionally the dissemination of Bayesian statistics will grow.

Sergio: *Application of Bayesian Statistics has undoubtedly benefited a lot from the development of MCMC and stochastic algorithms in general. How do you see this route?*
Carlos: I believe MCMC algorithms are most important numerical tools and help significantly in the application of Bayesian Statistics. They are tools however, not a body of ideas. I have seen people willing to use MCMC where simple "old-fashioned" calculus techniques would do a good job. It seems to me, quoting Leo Breiman, that when having a hammer in your hands, all problems tend

to become nails. MCMC is a heavy hammer.

Sergio: *What advice would you give to young Bayesian researchers? What are the most fertile areas?*
Carlos: I had the opportunity to be in close contact with very bright and interesting scholars and I learned a lot with them, especially the ones who visited me in Brazil: Basu, Zacks, Lindley, Pericchi, Barlow, and others. I would say to the young Bayesians to always try to find, meet, talk, and listen to great scholars. They will learn more by having contact with them than in lonely readings. Rephrasing Dennis in one of his recent writings: Unfortunately, nowadays, many of the books and teaching are more interested in the methodology ritual than in ideas or in understanding problems and data. Hence my advice is that people should direct their attention to ideas rather than to methodology per se.

Sergio: *You have a reputation of being a wonderful teacher of frequentist Statistics as well.*
Carlos: We were forced to go through all the Statistics ritual of Neyman-Pearson-Fisher. In fact I never took a genuine Bayesian course in my life. Even Basu's course was directed to present counter-examples to classical statistics. My choice for Bayesianity was very careful and conscientious. Most people who criticize Bayesian thinking have not been exposed to our basic ideas. They actually don't have a clue on what they are talking about. It amuses me but, on the other hand, makes me think that we Bayesians had to go through Lehman's books and Fisher's writings and so forth. So we know what we are talking about when criticizing frequentist procedures. In any case this reputation you mention comes as a surprise to me. I think I need to be more aggressive when talking about frequentist stuff to the undergrads. (laughsJ). I actually think that it is very nice when they give you the opportunity to discuss in front of an audience. We have to ask for such opportunities.

Sergio: *Tell us about your Professor, Dev. Basu*
Carlos: Professor Debabrata Basu was a great man. He was a real thinker, a true scholar. He used to tell me to find the master key because a real thinker could not carry a loaded key holder. When we were walking in downtown São Paulo he said it looked just like Calcutta. Then he asked me to go back and answer "what would be the probability that he and myself be walking together in that place?" The probability had to be zero and that is why it related to an important fact. In his opinion only events with zero probability are relevant.

Sergio: *Who is your favorite Brazilian thinker? People say you like Nelson Rodrigues very much. [Nelson Rodrigues is a renowned Brazilian playwright and writer].*
Carlos: Sure it is Nelson since he was born Bayesian. And deFinettian! He coined the term "idiots of objectivity". He also said that every unanimity is stupid. In his last interview, before his death, he was asked about needed skills to be a good writer and he answered that one has to be obsessive. I believe that to be a good researcher in Statistics, like deFinetti, Blackwell and Savage, one also has to be obsessive. This is, by the way, why I believe that the FBST will replace the industry of Bayes Factors.

Sergio: *Tell us about your students.*
Carlos: I must at this point call most of them colleagues or even Big Bosses. José Leite from São Paulo, Pilar Iglesias from Chile, Carlos Paulino from Portugal, Victor Salinas from Chile, Luis Montoya from Colombia, and Veronica Lopez from Argentina are few names that have important professional and academic positions. Their scientific accomplishments and intellectual independence make me extremely proud. I believe that without my students and colleagues, as you Sergio, I would have never built my career and would not be a Full Professor today. I would also like to say that I owe a lot to some great writers. I would like to remember some of them here: Basu, Blackwell, Savage, Good, deFinetti, deGroot, Hald, Lauritzen, Dawid, Kadane, Berry, and Mouchart. I might be missing many others with high probability.

Since Sergio has left the room I would like to talk about him. He is, like Telba, a good friend and collaborator since I return from FSU. His background in the understanding of sciences is very sharp and he helped our Bayesian group a lot with his critics and improvements. Lately when Julio Stern and I started to develop the FBST he could show how this procedure could be looked under the decision theory. His paper in Test was the adding support we needed to believe we are in the right track. I am very fortunate to have a colleague and friend like Sergio. Thank you.