AN INTERVIEW WITH

Richard A. Davis

by **Miguel de Carvalho***

Richard A. Davis (born 11 September 1952) is a world authority in the fields of Time Series Analysis and Extreme Value Theory. He holds the position of Howard Levene Professor of Statistics at Columbia University. He earned his PhD in Mathematics from the University of California at San Diego in 1979. Throughout his academic career, Davis has served in various capacities at institutions such as MIT, Colorado State University, and Columbia University, in addition to having visiting roles at a range of other universities (e.g., Hans Fischer Senior Fellow at the Technical University of Munich 2009–12; Villum Kan Rasmussen Visiting Professor at the University of Copenhagen 2011–13; Chalmers Jubilee Professor at Chalmers University of Technology 2019).

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Davis is a Fellow of the Institute of Mathematical Statistics and the American Statistical Association. He has also been recognized as an elected member of the International Statistical Institute. In 2016, he served as the president of the Institute of Mathematical Statistics, and from 2010 to 2012, he held the position of Editor-in-Chief for the Bernoulli Journal. He co-authored the widely acclaimed books *Time Series: Theory and Methods* and *Introduction to Time Series and Forecasting* alongside Peter Brockwell, and also developed the ITSM2000 software for time series analysis. Davis also co-edited the *Handbook in Financial Time Series* and the *Handbook of Discrete-Valued Time Series*. In 1998, he and W. T. M. Dunsmuir were awarded the Koopmans Prize for their contributions to Econometric Theory.

A mentor to more than 30 PhD students, his research spans time series, applied probability, extreme value theory, and heavy-tailed modeling, with a focus on network models and spatial-temporal modeling.

Richard, can you tell us about your early life?

I grew up in a small town outside of Ann Arbor, Michigan. Our family lived on a lake, where boating and related activities occupied a big part of my childhood at least during the summers. My mother was born and raised in the New York City borough of Brooklyn and she headed west for college to attend the University of Michigan (UM). There, she met my father, married, and they ended up settling on the outskirts of a small town called Pinckney to raise a family. Schools in these rural areas were limited in their academic standards and my mother coming from New York City, where education tended to be highly valued, she made arrangements for her children (4 boys of which I am the youngest) to attend the UM Laboratory School in Ann Arbor. This was not an easy commute as our home was located nearly 20 miles away. The UM school was a training ground for K-12 grade teachers and curriculum development at UM's School of Education. So we were lucky especially in later grades to have professors and student teachers from the school of education to experiment with curriculum and modern teaching techniques. So I think I really got my academic start going to this special school.

How important was this stage for your passion for Mathematics?

Primary schools in rural areas in the 1950s were not particularly good and by making the move to the University School, I was exposed to a more modern and engaging educational experience. The teachers were extremely good, especially the math teachers who either had their PhDs (or were pursuing PhDs) in math education. They were inspiring and novel in their approach to teaching mathematics (as well as other subjects) for which I seem to have some skill. In particular one math teacher used our class as a testing ground for his forthcoming book on algebra and geometry, and as my brother reminded me recently, I took great pride in finding the most mistakes (misprints?) in the book. In any event, these young and energetic math teachers clearly activated my interest in mathematics.

Did a particular moment significantly influence your interest in Mathematics?

Although I loved playing math games and was very good at them, I never imagined making a career out of math. I began my college studies at Michigan State University (MSU), which might seem kind of strange growing up in Ann Arbor, the home of UM. I started college as an undeclared major and at some point in time, the School of Education, which was at capacity for majors, opened up their program briefly for new majors. Since my mother was an elementary school teacher and it was time to declare a major area of study, I chose, in a moment of indecision, to declare math education as my major. This seemed like a safe choice, but teaching at the high school level was something I really didn't want to do as a career choice. Math education was a short-lived selection. During my high school and college years, I was heavily involved with sailboat racing. I had worked for a sail making company during high school and my brother and I raced sailboats all over the country and even overseas a few times. So I became very good at it. I was sailing almost every single day and sailed for the MSU sailing team. In the summer of 1972, I competed for MSU in the collegiate national championships held on Mission Bay in San Diego. Coming from Michigan, this was the most idyllic place I had ever seen. After the championship regatta, I immediately applied to the University of California at San Diego (UCSD), mainly to further my sailing career. I transferred to UCSD in the middle of my junior year and began racing for the UCSD team. Since UCSD did not have an education major, I began as a full-fledge math major. I did the usual

topics of a math major, real and complex analysis, logic, partial differential equations, and algebra, but definitely no probability or statistics!

Graduate School was your next step — why?

After graduating from UCSD, I decided to continue to live in San Diego in order to further my sailing career and also because I just didn't really know what to do next. I was admitted into the PhD program at UCSD, and was supported as a teaching assistant (TA). During the first year of graduate school, I took the basic core PhD courses such as abstract algebra, complex analysis, and applied math. After doing well in year 1, I was trying to decide what to do for year 2 — I really had no clue — whereupon my office partner and fellow graduate student, Gail Gong, told me I should take statistics. She heard there's a future in statistics with plenty of job opportunities. So I followed Gail's advice and after talking to the first year graduate advisor, who was a logician and had no clue about statistics, I signed up to take the PhD level mathematical statistics course.

And Rosenblatt, who would become your supervisor, was teaching that course?

Yes, indeed. I hadn't taken any courses in probability and statistics previously so I decided to meet with Murray Rosenblatt before the summer break to see what sort of preparation I could do. I would be spending the summer sailing in regattas, one of which was the World Championships in France, so I would have to study while training and preparing for the upcoming racing season. Murray, who was very supportive and encouraging, suggested I have a look at Cramér's book, *Mathematical Methods of Statistics*. So I read the book over the summer, which was quite the challenge especially for someone without a rudimentary background in probability and statistics. I made it through the first quarter of the course. During the second term, Murray asked me if I would be willing to read a paper on extreme value theory written by Ross Leadbetter. Of course, I said yes, but really didn't know exactly what he wanted me to do with the paper. I was naive and had no clue about how the publication and refereeing process for research papers worked. I came to learn that

the Leadbetter paper was being considered for a special volume that Murray was editing and that he was using me as a referee. So in a way, this might have been a screening test of sorts to see if I had any ability to read papers and provide reasonable feedback. Leadbetter's paper contained some open questions, and so I started to think about solving them. And then a month or so later, Murray asked, "Do you want to work with me?" I was shocked that anybody would be interested in having me as their student and so I just said yes immediately. I later heard from other students, who were much more connected than me, that Murray was well-known in the probability and statistics community

and that I had made a good decision without having done any sort of due diligence. I was just happy that someone was interested in being my advisor. As it turns out, there was a second professor also interested in having me as a student. In my second year of graduate school, I also took a year long course in noncommutative ring theory. Why I did this, I have no idea! Not more than a couple weeks after I had committed to Murray, the algebraicist teaching noncommutative ring theory asked if I wanted to do noncommutative ring theory with him! The timing was close, but I was relieved that Murray had already approached me--noncommutative ring theory was not going to be for me. So that's how I got started working in probability and statistics. It was purely by accident and certainly not preordained in any way. And it turned out to be fantastic!

What other books or people might have influenced you beyond Rosenblatt and beyond the books you've mentioned as well?

There was a very strong group of probabilists at UCSD including Ron Getoor, Michael Sharpe, Adriano Garsia, and Murray Rosenblatt, who attracted a significant number of PhD students interested in probability theory. I tended to hang out with this group of students, even though I wasn't a hardcore probabilist, at least relative to the others. I took measure-theoretic probability from Michael Sharpe, who in my book, was the best professor I ever had. To this day, I still think about his lecturing style and try to emulate him as much as possible. Sharpe would come into class with just a piece of chalk, no notes, and he would lay out the most beautiful and perfect lecture every time. He was a master of the subject.

The books that influenced me early on in graduate school were essentially texbooks: Rudin's *Real and Complex Analysis*; Breiman's *Probability*, and the two volumes of Feller's books *An Introduction to Probability Theory and its Applications*. I can't really recall any book in statistics, other than Cramér's, of course, that made a major impact on me at that time. Rather it was more reading papers and technical reports in extreme value theory especially those by Leadbetter and collaborators and a couple reports by Breiman and Stone.

What came after UCSD?

After UCSD, my first academic position was a two year appointment as an instructor in applied mathematics at MIT. In actuality, I was part of a statistics subgroup consisting of 5 to 6 people that was embedded in the mathematics department and headed up by Herman Chernoff.

The MIT opportunity was an amazing experience because I didn't really have much exposure to applied statistics. And Chernoff, who was one of the giants in statistics, had wonderful insight and could translate a real world question into a meaningful statistical one with real skill. Hanging around Chernoff was just an unbelievable experience. He would bring in experts from around MIT and elsewhere for seminars, whether it be leading economists or astronomers or climate scientists and he would brainstorm about their problems with our small group of statisticians.

Why Colorado?

After my two-year experience at MIT, it was time to leave and fortunately, I had many attractive options. I ended up choosing the Statistics Department at Colorado State University (CSU), mainly for two reasons. The first was that my brother was already living in Colorado and it would be a great opportunity to reconnect with him. Second, CSU was developing a very strong group in applied probability. Peter Brockwell was the senior guy of that group that included Sid Resnick and Simon Tavaré, who was hired the same year as me. So there was the four of us in this group for a number of years. It was a closely-knit group in the sense that we not only worked together on various research projects, but our families became life long friends as well. Sid and I embarked on a variety of problems in extreme value theory and Peter and I began writing our books on time series analysis. It was an exciting and productive time for me. Peter, Sid, and I had a number of National Science Foundation grants during this period. It was wonderful that Peter and Sid took me under their wings, and showed, by example, how to become a professional academic. They always treated me as an equal and never as a junior partner in our research endeavors. I don't think they ever viewed themselves as mentors to me, but rather kept their eye out on me so that I didn't screw up.

How did you get to lead the department in CSU?

We had a series of really great chairs in the statistics department, and after Sid left for Cornell in 1987, this was a blow to me both personally and professionally. We maintained our research program for a few more years, but it was difficult to sustain when we were not at the same institution. Sid and I had a great collaboration as we both brought different perspectives to the table and learned from each other. The papers we wrote in the 80's have aged well — they are still widely cited today. Around the same time that Sid left CSU, Peter returned to Australia. His future status about living in either Australia or Colorado was uncertain for the next 15 years or so. The bottom line is that there was a lot of uncertainty about the future of applied probability and time series at CSU during this period.

Fortunately, we were able to lure to CSU Richard Tweedie, an Australian, who was a powerhouse in Markov chains. Also, perhaps less known, was that Richard was also an amazing applied statistician who was a player in some of the major issues of the time in applied statistics. So Richard filled an important leadership gap in the department and became the chair of the department shortly after his arrival. After one term as chair, Richard stepped down due primarily to health issues. The Dean of Natural Sciences talked to me about succeeding Richard, and although my research career was going great, I agreed to take a stab at being chair in 1997.

So Columbia was the next step?

Yes, Columbia was the next stop, but this came 10 years later! In early 2006, some faculty from the Statistics Department at Columbia approached me about the possibility of joining the department. Now I am mostly a country boy and never envisioned living in a moderately sized city let alone one as big as NYC. They suggested I come out to give a talk in the department and see what it was like. I had become somewhat disillusioned with the lackluster support I was receiving from CSU's administration, so was more open to the idea of a possible move. Of course, my wife had to be comfortable moving to New York, which would represent a major change in our life style. After visiting NY and seeing what Columbia had to offer, my wife said she was willing to make the move. After giving my go ahead to Columbia, they made me an offer a few months later and I accepted — end of story.

How did you manage to balance research with chairing the Departments at CSU and Columbia?

This may seem strange, but I think some of my most productive research years occurred while I was chair of the departments at CSU and Columbia! I am not sure that I have a good reason for this. There is a saying attributed to Benjamin Franklin that, "if you want something done, ask a busy person," and I think there is a lot of truth in this. I reduced my teaching load substantially while being chair which allowed me to visit various collaborators for 2-week periods. I could get a lot done during these getaways, while being away from everyday hassles in running a department, and then I would continue to finish up these projects upon returning home. This model worked well for me. Now when I have less responsibilities, I feel less productive — it's strange!

One final curiosity. Was your first encounter with the regular variation related or unrelated with extreme value theory?

No, it's definitely related to extreme value theory. And of course, I knew about this in graduate school, but I didn't have such a great appreciation for it until I interacted with Resnick at CSU.

Thank you so much, Richard. It has been a great pleasure and honor.

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An OpenAI speech recognition model (*whisper*) was used to automatically convert the raw recording into text. The source code is available from:

https://github.com/openai/whisper