Autobiography[*]

Clive William John Granger

I was born in Swansea in the Principality of Wales in September 1934 and named Clive William John Granger. The "William John" names were traditional Granger boy's names and my mother liked the name Clive because some popular musician at the time had it. My father, Edward John Granger, and with his wife Evelyn (both English) left Wales with me when I was about one year old to go to Lincoln in Eastern England. He was a commercial traveler for a well respected firm called Chivers that made jams, marmalades, jellies, and so forth. He traveled around whatever area he was directed to by the company and took orders for the products from wholesalers and individual grocers. My memory of Wales in this early period is non-existent but it did qualify me to play rugby for Wales, if I had been good enough. I did not get the Welsh ability to sing, unfortunately.

I can remember little about Lincoln except for the night of September 3, 1939, when war was declared and everyone cried. At about ten p.m. the air raid warning sirens went off and we all huddled nervously under the kitchen table. Of course, I now realize that the probability of a Nazi bomber flying over Lincoln on the first day of the war was extremely slight; it was just a wakeup call for the English people that a real war was upon them.

A year or so later my father went off to war to serve as a driver of large support vehicles for the Royal Air Force, first in the south of England and later in North Africa. My mother had three brothers serving in the forces, but we were a fortunate family as they and my father all returned unhurt. Whilst my father was away my mother and I moved to Cambridge to stay with her mother, who was a very short, fierce woman who had brought up many children and had a very strong personality. She was a professional cook and could make a great meal out of almost nothing, a worthwhile ability during the shortages of the war. Earlier in her career she had cooked for gentry and it was said that she once cooked for Queen Victoria. When she was just starting out she had worked as a very junior cook at Windsor Castle and her two sons had played with the princes Edward and George, both later Kings of England. Later we moved across Cambridge to stay with my father's parents. My grandfather repaired shoes in his own shop and sold shoes in a successful small business. I went to a local primary school, did well in mathematics but not much else. A teacher told my mother that "I would never become successful", which illustrates

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[*]Source: http://nobelprize.org/nobel_prizes/economics/laureates/2003/granger-autobio.html

the difficulties of long-run forecasting on inadequate data.

At the age of 11 I passed the necessary exams and was accepted by the Cambridgeshire High School for Boys, where I performed fairly well but showed no particular ability. The headmaster was Mr. Newton-John, who later moved to Australia and had a famous daughter, Olivia.

At this stage of my life I had largely drifted through, just taking things as they came. I had no clear-cut ambition or long-term plan, and that policy has generally continued. My career has largely been determined by a sequence of "lucky breaks", which will be discussed below.

Lucky break #1

My first lucky break was in 1946 when my father returned from the war and his job took him to Nottingham. He bought a nice house in a middle-class suburb called West Bridgeford and I would cycle many miles each day to and from the Grammar School, which was middled sized. At the end of the fifth form, the year when most of the students left and entered the job market, I asked my friends what they planned to do, and they all decided to stay on into the sixth-form, which prepares you for the A-level exams and possible entry to college. Until that time I had never considered going to university, I had expected to leave school at sixteen and work in a bank or an insurance company. My father was very supportive, even though my staying at school would be a drain on his finances. Sixth-form takes two years and I concentrated on Pure Mathematics, Applied Mathematics, and Physics. A decisive event took place, I believe, towards the end of the first year. In one of the classes we all had to stand up and state our planned career. By then I realized that I was quite good at mathematics, but I did not want a career in it, which I thought of as being a school teacher. I preferred to use mathematics in some practical fashion and thought that meteorology sounded promising. In those days I stuttered somewhat and when my turn came to stand up, I tried to say "meteorology" but found I could not get the word out, so I just said "statistics", thereby determining my future path.

It so happened that a particular strength at the West Bridgeford Grammar School was the quality of the mathematics teachers. Mr. Bradshaw and Mr. Midgley were both very well trained and I was told they had firsts at Oxford and/or Cambridge. They were still very enthusiastic about the subject and were very able to pass on this enthusiasm and their knowledge to the students. The fact that our sixth-form produce several First Class Degrees, several Ph.D's, and at least four Professors is largely due to this strong background in mathematics.

Lucky break #2

Applying to universities was a difficult process in those days as quite a small percentage

of British youth went to university. Finding suitable courses that also had available places was not easy. However, I was told that the University of Nottingham was just starting the first joint degree in Mathematics and Economics which sounded ideal for my interests, so I applied and was quickly accepted. As far as I could tell, I was the first person anywhere in my family tree to go to university.

My courses in the first year at Nottingham were one third economics consisting of micro and national accounts taught by Andr Gabor and Brian Tew, with a lot of ability and enthusiasm. I also took large doses of pure and applied mathematics. To my delight I found pure mathematics not so difficult because of my training at Grammar School. At the end of the first year I switched to a Mathematics Degree and I eventually obtained my First. My only formal training in economics was in the first year where I attempted to reformulate what I was being taught in pure mathematical terms, but was usually unsuccessful.

Lucky break #3

On completing my degree I started a Ph.D. in statistics, although I knew very little about the topic. My supervisor was Professor Harry Pitt, who was an excellent pure mathematician and probabilist. He taught me by going through Harold Cramer's book on Mathematical Statistics which is very good text but makes no mention of data. I needed to find a thesis topic and I wanted something of relevance to economics. I went to our university library and found that they had only one book on Economic Time Series by H.T. Davis. I thought that this was both an appropriate topic and also that there must be plenty of opportunities, as there were so few books in the area. I still think that my judgement, made at the age of 22, was correct.

Lucky break #4

The next structural break in my life occurred after I had been doing research for just six months. As background, it is important to know that this was a time when British universities were expanding rapidly, particularly in certain fields which included statistics. Nottingham had received funding for a junior lecturer in statistics and advertised the position, but were embarrassed by having only a single applicant, even though he was from Cambridge and was very well qualified. The professors of the Mathematics Department asked me to apply and my initial reaction was to say no to the idea as I was not qualified and knew that I had little understanding of the area. They responded that I would not get the position anyway but it would be good experience for me to go through with the interview and be helpful to them, so how could I refuse? The selection committee was chaired by the Vice-Chancellor along with about fifteen full professors. The Vice-Chancellor and I had fought over certain undergraduate topics the previous year and my position had prevailed, so I knew for certain that did not help my chances of getting the job. As I knew that I would not get the position I was not at all nervous, and the Vice-Chancellor started the proceedings by making a kind remark about our previous battles and I actually enjoyed

the interview. The other candidate came before the committee, got into a strong fight with the Vice-Chancellor, and did not make a good impression. The result was that I got the job. I was just 23 when I started the position in 1956 with what had to be a record low knowledge of statistics and no established teaching ability. What made it more difficult was that some of the students, returning from Army service (sometimes with battle experience) were older than me and had strong ambitions to learn and to get on with their life. I always found it difficult to accept that they should call me "sir".

One advantage was that I was the only person in the university calling himself a "statistician", so that I was visited by workers from many fields (geography, history, psychology, chemistry, and economic history) asking me questions. Each data set presented unique problems and being confronted with them provided excellent training for a young statistician that many beginners would not get these days with such emphasis on specialization. I even got a few publications from these studies. An even better outcome came from my work with Professor David Chambers, a good economic historian who would often send his research assistant, Patricia, over to ask me questions. She said "yes" to the right one from me and we were married in 1960, which is a significant part of "Lucky Break #4".

In 1959 I obtained a Ph.D. on "Testing for Non-stationary" and applied for a Harkness Fellowship of the Commonwealth Fund. Apparently the Harkness family made a fortune selling saddles and leather wear for horses at the turn of the twentieth century but realizing that that industry may have a limited future, they lent a large sum of money to a friend called Rockefeller, who was having a problem with his oil company. From that investment the family became extremely wealthy, but died out in the mid-century, leaving large funds to various good projects, mostly medical research. Part of the funds went to the Harkness Fellowships, which were for about twenty young people from the United Kingdom, Australia, and New Zealand, mostly from academic subjects but also included artists, writers, and film makers. Each could spend either one or two years in the United States at any location they chose, being given sufficient funds to support themselves. In addition they had to agree to spend one month traveling around the country in December and three further months in the summer, again with all expenses paid.

Lucky break #5

I wrote to many major universities and had two positive responses, one from the Cowles' Commission at Yale, and the other from Morgenstern's Econometric Research Project at Princeton. As Oscar Morgenstern asked me to join his new "Time Series Project" I accepted with enthusiasm for a one year period. Getting the Harkness was certainly a lucky break as the fellowships were highly competitive and rarely went to candidates outside Oxford or Cambridge, and I was especially fortunate to go to Princeton.

When I arrived I found that the "Time Series Project" consisted of myself and Michio Hatanaka, an excellent econometrician who had recently finished a book on "Input-Output

Analysis". He had done the calculations on the original Von Neumann computer at the Institute for Advanced Studies, which is a story in itself. However, Morgenstern had a specific project for us. His close friend, J. Von Neumann, a truly great mathematician, had told him that economists should be using the Fourier methods with their data, so Morgenstern had organized with John Tukey, a very famous Princeton statistician, to teach us how to do that. Tukey has a distinctly original way of teaching. We provided the data, he would describe what calculations he wanted us to do on the computer, Michio would do the programming and produce the results, and I would write mathematically what we were doing. John Tukey would then interpret the results and suggest a new set of calculations. This continued weekly for most of the academic year, by which time we had learnt a lot about filtering, the spectrum for a single series, and the cross-spectrum for a pair of series. This last topic was one that Tukey has been working on and was totally new. Michio and I realized that we had enough material for a book but we told John Tukey that we could not try to publish until he published his results. He said he was far too busy doing new research to publish, and that we should just go ahead, which we did. The book "Spectral Analysis in Economic Time Series" by Michio and myself appeared from Princeton University Press in 1969 and sold over three thousand copies, much to everyone's surprise. We tried to dedicate the book to Morgenstern and Tukey, but they would not allow it.

At the end of my academic year at Princeton, Pat and I were married in the Princeton University Chapel and we used the Harkness funds to finance a trip around the United States as an extended camping trip and honeymoon. After twelve thousand spectacular miles we still liked each other and I had acquired a beard.

I returned to Princeton the next two summers to work on stock market data. Two papers appeared in the journal *Kyklos*, on testing the random walk theory using spectral methods. In one of these, with Mike Godfrey and Oscar Morgenstern, we claimed the first published diagram in economics that was generated by a computer. It appeared in a cathode ray tube and was then photographed. During this period, in 1963, I wrote a very short paper on "The Typical Spectral Shape of An Economic Model". It was quickly submitted to *Econometrica* where it was accepted two years later with no referee reports, and essentially published three and a half years after submission. It has been cited often and I learned that a simple observation is enough to produce a successful paper, but you need patience with its appearance. I also published my second book, on commodity markets, written with Walt Labys, who left Harvard to study with me in Nottingham. A book with Morgenstern on the stock market and the one with Labys both appeared in 1970.

During this period I was also involved with Andr Gabor on some practical price research. To get data to test our theories and estimate models, we arranged with local supermarkets to conduct experiments in which we altered prices of popular products and recorded the change in sales. I believe that more economic micro-theory could be better tested by doing real world experiments rather than believing such an approach is impossible.

Lucky break #6

Around this time I thought that I should try to find a new line of research. In 1968 George Box and Gwilym Jenkins sent an advanced copy of their book "Time Series Analysis, Forecasting and Control" (published in 1970) and asked me for comments. I realized that I knew very little about forecasting and nothing about control. I decided that forecasting had great potential and applied for a grant to get a post-doctoral student to join me. The application was successful and I advertised around the world. I was rather surprised to get only one application, from Paul Newbold - a student of George Box, but one is all you need if the applicant is ideal. We were compatible, with a lot of common knowledge, but we had each been trained quite differently. He also proved to be a good writer, having received a good British education. Together we started a five year period of intense research, mostly on forecasting, leading to the publication of our book "Forecasting Economic Time Series" (Academic Press, 1976, second edition, 1986) which was widely used internationally in graduate courses.

During this period Paul and I conducted a small simulation study showing that if you take a pair of smooth, "highly autocorrelated" time series that are independent and put them into an ordinary least squares (OLS) regression, a surprisingly large number of times an incorrect, spurious, relationship is suggested by the standard statistical procedure. As many major economic publications used this type of analysis a lot of reconsideration of previous results had to be reconsidered. The size of the simulation was quite substantial at the time (1974) but would now be laughable. It shows that the usefulness of the result of a computer exercise depends on the quality of the question asked rather than the amount of computing undertaken.

Lucky break #7

In 1973 I was offered a professorship at the University of California, San Diego. Although I was certainly not unhappy at Nottingham, I had been there over twenty years from starting undergraduate studies to Professor of Applied Statistics and Econometrics and I thought that a change of scene was worth considering. We first decided to go for five years to see if we enjoyed California. We arrived in San Diego in August 1974 and several friends wrote advising me "not to retire", meaning do not spend all my time enjoying the sun and sand. By now the family consisted of Pat and myself, plus our children Mark William John, then aged ten and our daughter Claire Amanda Jane, aged six. They both eventually got their undergraduate degrees from California universities. Mark became a computer software developer and some of his earlier work was included in a movie that starred a future governor of California. Claire obtained her MA from Stanford in Molecular Biology and is now a science writer.

When I joined the Department of Economics at UCSD the theory group was already

very strong but I was the only active research econometrician, although Paul Newbold came for the first year as a visitor to finish our book. That was soon to change.

Lucky break #8

In 1975 I was on a committee in Washington, DC chaired by Arnold Zellner. It discussed the organization of a conference on seasonal adjustment. Robert Engle, then at MIT, was on the same committee and during a break asked if I knew anywhere looking for a time series econometrician. I said that we were, so he visited, liked what he saw, and joined us. A year or so later Hal White came for a six month visit from Rochester, decided that we had the better climate, and accepted an offer. That is how a world ranked (top three) econometric group is formed. Take three active workers who interact, mix in a group of good students, and later add Jim Hamilton, Graham Elliott, and Allan Timmermann, and in under thirty years you produce a couple of Nobel Prizes, at least.

The students come from all over the world, and some started getting positions at good universities, which attracted further excellent students to us. If I start naming the better students I will only disappoint those that I leave out as there are so many that deserve mention. We claim to not only get good students, but also to have a particularly high value added.

Over the years we worked on a variety of questions including seasonal adjustment, aggregation, and several new types of time series models. These included the fractionally integrated model, done with Roselyn Joyeux, which has a so-called "long-memory property" and provided a discrete-time form of a continuous time model discussed by Benoit Mandelbroit. This whole area has resulted in a lot of interest by statisticians. Also considered was a variety of nonlinear models, including the bilinear model which produced a small book with an Australian visitor, Allan Anderson. Here the mathematics proved of interest but the models do not seem to be of great practical importance in economics. I also observed that a series could be serially uncorrelated but could still be forecast, nonlinearly, from its past. This produced a paper on "forecasting white noise" which produce reactions of surprise from those who thought the economic series were necessarily multivariate Gaussian processes. One observation that comes from this work was that squares of white noise series were not always white noise. I discussed this with Rob Engle and it might just have been the rolling pebble that much later produced the avalanche known as ARCH. Rob returned from a year at LSE with the ARCH model which we discussed frequently. As I was on the committees of his many students in the area I learnt a lot about its development.

One of the benefits of joining an American university was the availability of sabbatical leaves plus long summer breaks when one could travel. The family made good use of these opportunities, plus some nice requests, and we spent lengthy periods at Oxford (Nuffied and All Souls), Cambridge (Trinity), Australian National University (Canberra), Aarhus

(Denmark), and Victoria University (Wellington, New Zealand). At the last of these we had a splendid view of Haley's Comet, especially as the city shut off all the street lights for a couple of hours each night.

I find that traveling is usually enjoyable and certainly broadening both in general knowledge and also through cross-fertilization of ideas. Over my career I have visited over thirty countries.

Lucky break #9

The discovery, or invention, of cointegration was discussed in my Nobel Lecture and was a direct result of talking with a scholar from another university. It has an even bigger impact that causality, but cointegration was much less controversial and had more important applications.

The original theory of cointegration was from linear processes whereas causality theory had no such constraints. In 1993 Timo Tersvirta and I wrote an overview of the field of nonlinear time series in economics which appears to have been helpful to people entering the field. This book appeared in the "Advanced Texts in Econometrics" series published by Oxford University Press. This series was edited by Grayham Mizon and myself, and was suggested by Andrew Schuler. Grayham and I agreed to edit the series provided that the books would be issued in both hard cover and paperback versions, and this seems to have been a successful strategy.

One of my latest projects involved analysis of a panel of data on the economy of regions in the Brazilian Amazon based on data collected every five years. The project was concerned with the dynamics and economics of the deforestation process going on in the Amazon forest which covers a huge area. With the help of a one year NSF grant a group was assembled which included Diana Weinhold (a former student) and Lykke Andersen visiting from the University of Aarhus in Denmark. We had available a very useful data set organized by Eustaquio Reis from Rio de Janeiro and built what seemed to be a useful model. The results were published in the book "The Dynamics of Deforestation and Economics Growth in the Brazilian Amazon", by L. Anderson, *et al.*, Cambridge University Press, 2003. This was an enjoyable and potentially important project from which I learnt a great deal.

As a schoolboy, aged around ten and living in Cambridge, England, I decided I did have a mild ambition, to see the year 2000. To achieve that I had to live to the age of sixty-six. In 1944, when I thought about this, such an age was by no means assured, many people did not make their mid-sixties. In 2000 Pat and I were living in La Jolla, next to the UCSD campus and quite near the ocean, Mark and his wife Kate were living in Sacramento in central California, and Claire was about to move back to England.

In 2003 I decided to retire at the age of almost 69 after about 48 years of teaching. I was willing to give up my teaching and administrative duties in exchange for a reduced income and greater freedom of movement. My retirement date was July 31, 2003 and my long-term colleague, Rob Engle, retired from the department on the same day and moved permanently to New York. Pat and I started a visit to Christchurch on the South Island of New Zealand in that October. We greatly enjoy spending time in the Department of Economics at the University of Canterbury where we receive a warm welcome. We particularly like the spectacular Spring in the area.

Lucky break #10

At 3:00 am on October 8, 2003 a telephone call from Sweden turned our world upside down, and it will never return to normality. My colleagues at Nottingham, San Diego, and Canterbury were greatly excited, as were we. It seems all my lifetime friends, students, and acquaintances enjoyed the Prize as much as I did, which was terrific.

My story ends with a recipe for success. Do not start too high on the ladder, move to a good but not top university, work hard, have a few good ideas, chose good collaborators (I had over eighty in my career), attract some excellent students, wait twenty years or so, and then retire. It worked for Rob and I.

Addendum

I have been asked if I consider myself to be naturally lucky. Certainly in my career the breaks have fallen my way. Sometimes I got a scholarship or an appointment at the right time, or I fell into good situations and others, particularly Rob, Hal, and Paul, accepted offers to join me. Even in general life I feel that I am often fortunate, coming across useful information or scarce parking spaces. I have never tried to use the ability by gambling but I do have friends who call on my name when trying to find somewhere to park their car, and they say that it works, even in Florence! I would like to thank my assistant, Mike Bacci, for handling all of the work involved with the Nobel presentations and essays, and much else.

Clive W.J. Granger passed away on 27 May, 2009.

Source:
http://nobelprize.org/nobel_prizes/economics/laureates/2003/granger-autobio.html

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