

A Wonderful Collaboration Tragically and Prematurely Ended

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On 29th September 2012, the world lost my good friend and collaborator Knut Sydsæter, who died suddenly while on holiday in Spain with his wife Malinka and some of their tennis playing friends. No tribute I could ever pay to Knut would do him full credit, or even as much as others who experienced his teaching directly will provide. For that reason, the following remarks largely concern some of the history of our collaboration.

Perhaps because of a tradition created by its two Nobel Prize winners Ragnar Frisch and Trygve Haavelmo, along with Leif Johansen, the University of Oslo may be the only Economics Department in the world which has had several specialist appointments in Mathematics. Knut, together with his colleagues and our collaborators Atle Seierstad and Arne Strøm, formed a troika of such appointments. Starting at the end of the 1960s that troika, along with Bernt Øksendal of the mathematics department, produced a series of textbooks in Norwegian on mathematics for economists. Indeed, I understand that the 5th edition of one of these (*Matematisk Analyse*, Bind I, Universitetsforlaget, 1986) was the first book ever published in Norwegian using the TeX typesetting system that my Stanford neighbour Donald Knuth, a remarkable computer scientist, had devised in order to allow standards of mathematical typesetting to be maintained and even improved. Knut also collaborated with Atle, first on a significant 1977 paper on “Sufficient Conditions in Optimal Control Theory” published in the *International Economic Review*, then on a widely appreciated but unfortunately rather expensive book on *Optimal Control Theory with Economic Applications*. Knut on his own had published a notable “Letter to the editor on some frequently occurring errors in the economic literature concerning problems of maxima and minima” in the December 1974 issue of the *Journal of Economic Theory*, as well as an advanced book in English (*Topics in Mathematical Analysis for Economists*, Academic Press 1981).

Meanwhile, I had started offering instruction in mathematical methods for postgraduate students of economists while at Oxford in 1969–1971. This grew into undergraduate courses in mathematical economics and optimization taught at Essex from 1971–1979, and at Stanford thereafter. Like many academic economists, I was aware of Knut's work largely through the book with Atle on optimal control theory. But our paths had never crossed, as far as I can recall, till we found ourselves both attending a late 1980s meeting of the German Operations Research Society. This was held in Passau, beautifully located at the confluence of the Danube, Inn and Ilz rivers, close to what was then the frontier between Bavaria within the European Economic Community, and Austria which had yet to join. There, over breakfast one morning with Knut, I remember discussing our mutual interest (always more his than mine) in the proper teaching of mathematics for economists, and especially the pedagogical inadequacy of what remains to this day the most prominent textbook on this topic, particularly in the USA.

Some months later, Paul Feyen of Prentice Hall came to my Stanford office to discuss what book titles he might be able to provide for my undergraduate courses. When I decried the quality of all the texts on mathematics for economists that were available, regardless of publisher, he expressed a potential interest in having Prentice Hall publish a new text if I was interested in producing one. Thanks to our meeting in Passau, I felt confident in suggesting that Knut would be far more dedicated to any such project than I could ever be.

This may have been during a sabbatical leave that Knut was taking at Berkeley. Anyway, not many months later, Paul was back in my office having approached Knut, whose response apparently had been that he would be willing to work on a textbook if I could join him as a co-author. This set us

off on a major project that would probably never have been started had it not been for the existing texts in Norwegian, prepared using the TeX typesetting system that made most of the mathematical formulae easy to transfer to the new English version. With much help from Arne, I believe, Knut gradually adapted rather than merely translated these texts into a very serviceable English version. My contribution was mostly in polishing these versions, especially in making the English more lively and colloquial, and in offering some suggestions for economic applications of the mathematical ideas being presented.

During the years when this project was being completed, we met not only in the Bay Area of Northern California, but also in Oslo and at the European University Institute near Florence when I was there in 1989–91. Visits to Oslo during the summer months became increasingly frequent, sometimes flying in from strange places like Moscow. When we left California to spend the academic year 1993–94 mostly in Kiel, I was there just one night before taking the ferry to Oslo with draft chapters in my hands. A few days later Knut and I travelled together by train to Uppsala for the European meeting of the Econometric Society. In fact that academic year was full of handwritten faxes being sent to Knut from places like Kiel, Munich, Louvain-la-Neuve, Bonn, even Rome and possibly Vienna. They would suggest less or occasionally more significant changes to the emerging text. All suggestions were courteously accepted and most were acted on with very good grace. Eventually in 1995 our *Mathematics for Economic Analysis* was indeed published by Prentice-Hall, in hardcover in North America, and almost simultaneously as a paperback for the international market.

This book was a moderate success, including early translations into Spanish and Hungarian, as well as republications in various formats in Zimbabwe, as well as in the Indian subcontinent. Quite recently, at a welcoming reception for our new masters' students at Warwick, I was intercepted by two of them from India who made a point of saying what an honour it was to meet one of the authors of that text, still very much in use.

Knut, however, was always frustrated that nobody would write a proper review comparing our book with what we regarded as pedagogically inferior competitors that retained a larger share, not only of the US market, but of the world market as a whole. Indeed, it soon became clear that sales were considerably better in Europe, including the UK, than they were in North America. After the British based company Pearson (publisher of the *Financial Times* and the *Economist*, as well as many textbooks at both school and university level) bought out Prentice Hall from the cable television company Viacom in 1998, they encouraged us to prepare a new version, with the modified title *Essential Mathematics for Economic Analysis*. Its first edition appeared in 2002, with revised editions in 2005, 2008, and 2012. For the fourth edition Arne, whose work behind the scenes was always indispensable for the whole project, finally relented and allowed his name to appear on the front cover.

In fact, the *Essentials* volume omitted some of the harder chapters on linear algebra that had concluded the Prentice Hall text. These were significantly revised and moved to the beginning of a companion volume, *Further Mathematics for Economic Analysis*, intended for postgraduate students, also published by Pearson in 2005. The other two members of the troika, Atle and Arne, joined us as formal co-authors, and we incorporated versions of material from the control theory book with Atle, as well as from Bind II of *Matematisk Analyse* in Norwegian, for which Arne had also been a co-author.

After his work producing a Spanish translation of *Essential Mathematics for Economic Analysis*, my then Warwick colleague Andrés Carvajal (now at Western Ontario) agreed to join us for the task of preparing a third edition of *Further Mathematics for Economic Analysis*. Apart from selling quite well, the books have achieved recognition such as a prominent mention in the standard textbook on PhD level microeconomic theory by Mas-Colell, Whinston and Green, as well as being the main authority cited in the Wikipedia entry on envelope theorems.

Such dry facts do little justice to Knut's dedication to the project. Based I am sure on his extensive experience in the classroom, as well as with the earlier Norwegian books, he insisted that concepts be introduced rather gradually, with clear examples to illustrate their use. Each chapter, moreover, is broken up into relatively short sections, with several problems at the end of each. Moreover, extensive answers are provided to these problems, either at the end of the book, or sometimes in an accompanying students' manual. One of my tasks, still far from satisfactorily completed, was to give as many of these examples and problems as possible some interesting economic content. When appropriate, Knut allowed relatively advanced mathematical concepts like the epsilon-delta definition of limits to appear, as well as proofs of some results, though usually only in small print.

Not only did Knut exercise a strong influence over the content and structure of the text. He also handled administrative tasks such as being the primary contact for our publishers in several different countries, the person who threatened one national economic association with a lawsuit for non-payment of royalties, etc. Eventually, especially when he had formally retired from active teaching, Knut was working full time, and for long hours, on this multi-faceted project. He also made sure that our translators had access to, and made proper use of, the TeX files for the English edition, since that made translation of the mathematical symbols virtually automatic. Our collaboration with Fred Böker of the University of Göttingen was especially fruitful. Not only did Fred produce a widely appreciated and successful German translation; he used his mathematical expertise to suggest a few important corrections to the original English version he was using. Fred has also produced a large collection of Powerpoint slides which are very likely to be translated (back) into English soon for wider dissemination. It is good to know that Knut and Fred finally managed to meet in Göttingen earlier this year.

Knut, however, was not only a superhuman teacher, but wonderfully human as well. Very warm, friendly, and easy going except on pedagogical issues to which he always gave appropriately serious attention. He always retained a wonderful but restrained sense of humour. He never took offence while I tried repeatedly to find a possibly more concise and colloquial way of rewriting passages that he had already set out in perfectly clear English. On more than one occasion, moreover, he would recite by heart extensive passages in English from the last diaries concerning the tragic ending of Robert Falcon Scott's 1912 Antarctic expedition. Passages from German and French writings would also pass his lips from time to time, and he was trying to learn Russian in his last years.

Thanks to Knut, both Mrudula and I were very hospitably and warmly received during our countless visits to Oslo — first by Gull-Maj, then by Malinka. These visits were usually in Summer or early Autumn, but there was also one occasion when we were able to attend the department's Christmas party, full of seasonal entertainment. It was also a privilege to host Knut — sometimes accompanied, sometimes not — in Stanford, Florence, Kiel, and Coventry. Thanks to Knut, I have been fortunate enough to feel very welcome too in the Oslo economics department, and to get to know so many of its members, apart from our mutual collaborators Atle and Arne, far better than would have otherwise have been possible. The visits have also had some very interesting sidelines, not least the triennial birthday party for the university at which honorary degrees are conferred, but also the opportunity to view an exhibition in 1999 marking the centenary of Sophus Lie's death, as well as to attend some of the events arranged in 2004 when Michael Atiyah and Isadore Singer received the second Abel Prize in Mathematics to be awarded. Last but not least, there was the excitement of the 3 or 4 man light-hearted lightning chess tournaments that Knut would typically arrange during a visit, often with his stepson Jens-Henrik as by far the youngest participant.

Knut leaves a wonderful academic legacy and very many happy memories. I had the great privilege of sharing some of his academic life, though none of his enormous efforts in visiting various African and Latin American countries in a valiant attempt to improve the teaching of mathematics there. He will be very sorely missed, not least as we struggle without him to finish the promised third edition of *Further Mathematics for Economic Analysis* in the forthcoming months. I am sure that our memory of Knut as an extraordinarily skilled, indispensable, dedicated, and totally reliable collaborator is the one that would have brought him the most satisfaction.