Conferment of the Degree of Doctor of Social Science, honoris causa
A Citation

Professor Reinhard Selten, PhD, Nobel Laureate in Economics

Game theory is a mathematical method for analyzing the kinds of strategic interaction that take place between players of games such as chess, or, to take a more local example, mah jong. The resulting theories can be applied meaningfully to players in a wide range of situations, such as nations or armies in conflict, animals in competition for food, politicians battling for power, or rival suitors vying for the love of a beautiful woman. But the strongest interest has been generated in the field of economics, where the following scenario may take place. Corporation A has a monopoly of a certain product. Competitor B does not want to enter the market against A because of the threat of a price war. If B takes the threat seriously then it stays out of the market and the monopoly situation persists. A situation where the status quo persists is called an equilibrium in game theory. But if the threat is not credible because B knows that, in a price war, A will face large losses, then B may come into the market without a price war. This will be a new equilibrium. This equilibrium fulfils a requirement called "subgame perfection", which is the requirement that only credible threats be taken into account.

The mathematician who first systematically formalized this requirement was Reinhard Selten, who stands here before us today. "Subgame perfection" was found to be a discovery of such fundamental importance to economics and other fields that all future thinking about strategic interactions between competitors has had to take it into account. It is for this discovery among others that Reinhard Selten was awarded the Nobel Prize for Economics in 1994.

Reinhard Selten was born in 1930 in what was then Breslau, a city in Germany. His father was Jewish and his family barely escaped the Holocaust. These early years under the Nazi repression made a deep impression on him; for the rest of his life Professor Selten has paid close attention to politics, which eventually led him to economics. But, above all, being part of oppressed minority taught him to trust his own judgment rather than that of the majority, whose opinions can be warped by propaganda. After the war he lived in a village near Melsungen, a small town where he attended high school until 1951. Here he first developed his passion for mathematics. During the three and a half hours it took him to walk back and forth from school before he moved to Melsungen he occupied his mind solving problems in geometry and algebra. Here he developed his lifelong love of walking in forested hills and of thinking while he does so. In previous visits to The Chinese University of Hong Kong, he has enjoyed hiking in the beautiful hills around here.

From 1951 to 1957 Professor Selten studied mathematics at the University of Frankfurt. He was not a particularly focused student at first, but he thinks himself fortunate that he attended lectures in a wide variety of fields such as psychology because some of these extra-curricular interests later became of great advantage to him. He had discovered game theory in a popular article in Fortune magazine and followed it up by studying the fundamental book

by von Neumann and Morgenstern in the library. He was immediately fascinated and became the first master's student at the University of Frankfurt to be allowed to minor in mathematical economics.

The early research Professor Selten did for his postgraduate dissertations was some of the most important work he did in his whole career. As he says himself in his Nobel autobiography: "My master's thesis and later my PhD thesis had the aim of axiomatizing a value for n-person games in extensive form. This work made me familiar with the extensive form, in a time when very little work on extensive games was done. This enabled me to see the perfectness problem earlier than others and to write the contributions for which I am now honored by the prize in memory of Alfred Nobel."

Between his master's degree and his PhD Professor Selten worked for one of his major mentors, the economist Heinz Sauermann, where his own research took a crucial turn. He realized that the solutions to the problems he was interested in could not be found simply by reflecting on them in his armchair. The reason is that economic behaviour is not fully rational, but only rational within certain boundaries. Because of this, he needed to subject his hypotheses to the test of empirical observation. Fortunately he was then able to call upon what he had learned as a young unfocused mathematics student attending the lectures of the famous gestalt psychologist, Edwin Rausch. It was Rausch's careful approach to experiments that had taught him about rigorous experimental method and design. This work led to his first published paper in 1959 called "An Oligopoly Experiment". It was from this period that Professor Selten began to be distinguished among game theorists as a "methodological dualist" - one whose research was founded simultaneously on axiomatic and experimental modes of inquiry. Along with Professor Sauermann, he was a leader of the German school of experimental economists.

After his PhD Professor Selten began experimental work that led to his famous paper, published in 1965, called "An Oligopoly Model with Demand Inertia". At the time he had no idea that it would come to be quoted so often, almost exclusively for the idea of "subgame perfection". In the 1970s he came to see that the model he had proposed there needed a further refinement to take into account the mistakes that will always complicate the interactions of players in reality. This refinement is now referred to in the field as trembling hand perfection and is another concept for which Professor Selten is famous.

After his successful habilitation Professor Selten became a full professor in economics of Berlin in 1972. He soon moved to the University of Bielefeld where he had the luxury of working in a small institute in which all the professors were game theorists. In the meantime he had started collaborating with his fellow Nobel Laureate John Harsanyi, in a project that has something to tell us about the time required by fundamental advances in human understanding.

He describes the project as taking many years:

> After John Harsanyi and I had completed our work on bargaining under incomplete information we decided to attack the problem of selecting a unique equilibrium for every

game. He twice came to Bielefeld for a year and I often visited Berkeley for short periods of one or two months. It took us about 18 years to construct a reasonable general theory of equilibrium selection in games. In this time we considered many ideas and rejected two fairly well worked out approaches. Our book of 1988 only describes the theory we finally agreed on.

Succeeding generations who benefit from the care and patience of such profound work can be grateful that it did not have to fall into the rhythm and demands set by contemporary bureaucratic approaches to research assessment.

Professor Selten has received many prizes and awards for his famous work. He has received honorary degrees from the universities of Bielefeld, Frankfurt, Graz, Breslau, Shanghai Jiaotong, Norwich (USA), Cachan, Innsbruck, Indiana and Qingdao. He is currently Professor Emeritus of Economics at the University of Bonn.

At Chinese University he has been a Wei Lun Visiting Professor on a visit hosted by the Asia Pacific Institute of Business at the Faculty of Business Administration. He gave a highly successful lecture on Game Theory here in 2002. He has established links with the University's Department of Economics and has been giving advice on the development of its academic and research programmes.

Mr Chairman, Professor Reinhard Selten is a man whose profound mathematical insights and economic research have defined the intellectual contours within which his successors now think and work. It is truly an honour to present him to you for the award of the degree of Doctor of Social Science, honoris causa.

This citation is written by Professor David Parker