Kurt Weichselberger
(13.4.1929 – 7.2.2016) [1]

Kurt was born at April, 13th, 1929 in Vienna. After the war he studied Mathematics there and earned his PhD (*Dr. phil.*) in 1953 for the thesis *Bernstein polynomial approximation in higher spaces*, supervised by Johann Radon. He started his academic career at the Department of Statistics in Vienna at the Chair of Wilhelm Winkler, worked at a social research institute in Dortmund, and at Johann Pfanzagl's chair in Cologne, where he received his *Habilitation* in 1962 with a thesis on *Controlling Census Results*.

From 1963 to 1969 Kurt held the Chair in Statistics at the *Technische Universität Berlin*. In 1967 he was elected rector of this university. Being the youngest university president in Germany, he substantially contributed to the then vivid public debate by his visionary ideas about the role of education and scientists in the modern society.

From 1969 on, for almost 50 years, Kurt has been a member of Ludwig-Maximilians-Universität München (LMU Munich). The development of Statistics as a discipline of its own – not only at LMU – is due to his vision and engagement. In particular, he co-founded and chaired the new Department of Statistics and Philosophy of Science at LMU and established, also as Chairman of the Education Committee of the German Statistical Society for more than 10 years, the degree program for a major in Statistics. He intensively contributed to the Munich curriculum as an enthusiastic teacher. His introductory courses and his courses on estimation theory and hypotheses testing, decision theory, sampling, nonparametric statistics, quality control, demography, as well as his famous research seminars on the foundations and history of statistics have strongly influenced generations of German statisticians.

[1] Many thanks to Christina Schneider and Frank Coolen for their very helpful comments on a draft of this text.

The scope of Kurt's research interests has been very broad, ranging from influential contributions to Applied Statistics[2] to pioneering work in the Foundations of Statistics. Already at his inaugural lecture as rector in Berlin he set out the stage for what will become his great scientific mission and passion: the development of a new theory of statistical inference, putting Fisher's fiducial argument back on its feet and substantially extending it. This theory has to be founded on what Kurt called *logical probability*, i.e. a non-subjective probability in its literal sense,[3] evaluating the reasoning from premises to conclusions and, the other way round,[4] finally allowing to describe the degree of support data give to statistical models. Soon Kurt discovered that such a theory has to go beyond the restrictions precise probabilities imply, and credal sets are indispensably needed.

Kurt's ideas on generalized probabilities obtained new impetus in the eighties by the vivid discussion on modelling uncertain expert knowledge, most notably by Glenn Shafer's *Theory of Evidence*. Concerning this debate Kurt has a very clear position: there can be an important contribution of Statistics and Probability, if, but also radically only if, they are ready to overcome the dogma of precision.

His first work on reconciling so-called modern methods developed for modelling uncertain knowledge with probability theory led to the book *A Methodology for Uncertainty in Knowledge-Based Systems*, published together with his post-doctoral researcher Sigrid Pöhlmann in early 1991, the year when also Peter Walley's book appeared. In Weichselberger's and Pöhlmann's book the notions of R- and F-probability ("R" for *reasonable*, corresponding to *avoiding sure loss* to use Walley's terminology, and "F" for *feasible*, corre-

[2]These include in particular work on regional price indices, survey and census methodology, or the development of the so-called *Münchner Verfahren* for smoothing time series, used by German statistical authorities.

[3]Note the etymological basis of the word probability: *prove-ability*, as well as the constituents of the corresponding German word *Wahr–schein–lich–keit*, i.e. the extent to which something seems to be true.

[4]That is the reason, why Kurt later called his theory *Symmetric Theory of Probability*.

sponding to *coherent*) were developed for the first time for the special case of probability intervals.

In 2001 the monograph *Elementare Grundbegriffe einer allgemeineren Wahrscheinlichkeitsrechnung I* (Basic Concepts of a More General Calculus of Probability I) appeared. The title, an immediate allusion to Kolmogorov's *Grundbegriffe ...* of 1933, founding traditional probability theory, formulated the research program. Kurt develops very thoroughly the theory of interval probability as a rigorous generalization of the Kolmogorovian concept of probability to interval-valued assignments.[5] The axiomatization of his theory is strictly independent of any interpretation of probability, as Kurt emphasized. By this, it provides a sound mathematical basis for expressing subjective, frequentist etc. interpretations of generalized probabilities.

This impressive book of about 700 pages was intended to be the first of three volumes. The second volume is devoted to special cases (probability intervals, 2-monotone capacities, cumulative probabilities[6], belief functions), concepts of conditional probabilities and independence, parametric statistical models and a law of large numbers.

All these developments, as interesting they may be on their own, have been understood by Kurt as a powerful preparation for the foundation of his concept of logical probability and thus for the general inference theory. Consequently, from 2003 on Kurt devoted all his energy to this topic, which was to be the core of the third volume. Supported by Anton Wallner he started to (re)build a rigorous framework for logical probabilities, now finding a neat basis in the theory of interval probability.

Although many chapters are in a rather advanced stage, neither the second nor the third volume could be fully finished as a whole in a way that met Kurt's very high standards for publication, and thus both volumes are passed

[5]Some basic elements are also described in Kurt's 2001 paper in the *International Journal of Approximate Reasoning*, based on a paper at the first ISIPTA.

[6]now independently developed under the name generalized p-boxes

on to us as work in progress. On the one hand, this can be seen as a tragic incident, on the other hand, this is a sign of the depth and grandeur of Kurt's scientific program – too much for a simple person but a valuable gift and task for all who are ready to built on his important results.

Like all of us, Kurt was very excited when he heard from the first activities to build up an imprecise probability community. Kurt attended the first six ISIPTA meetings (in Gent, Ithaca, Lugano, Pittsburg, Prague and Durham) from 1999 to 2009 and contributed to them with proceeding papers and by giving tutorials. He very much enjoyed the stimulating discussions and the open exchange of ideas there, and he loved to meet with senior friends as well with the members of the younger generations, whose academic careers he kept observing with great interest and favour.

The German word for PhD theses supervisor is *Doktorvater* (doctoral father), and that expresses rather well what Kurt has been for me: an academic father with an enormous and enduring impact, far beyond research, who guided and accompanied an important part of my life.

We all miss his enthusiasm, his generosity, his creativity, the acuity of his thoughts together with his unique humour, and his scientific thoroughness, but most of all his open minded and warm friendship.

Thomas Augustin