5. OPINIONES SOBRE LA PROFESIÓN

DISCURSO DEL ACTO DE INVESTIDURA COMO DOCTOR HONORIS CAUSA POR LA UNIVERSIDAD DE SANTIAGO DE COMPOSTELA

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Excelentísimo y Magnífico Señor Rector;
Excelentísimo e Illustrísimas Autoridades;
Dignísimos miembros del Claustro Académico;

Dear Friends, liebe Freunde:

Frankly speaking, ever since my childhood, the medieval heroes from the King Artus saga or the adventures of Robin Hood struck my fascination more than Hollywood's movies about the Wild-Wild-West. I always admired the knights taking every risk to serve their country and to support their king. Consequently, later, whenever I happened to take part in a guided tour through a medieval castle, I simply ignored the comments that in those times life was dark, cold, dirty and not easy at all.

Being honoured in such an outstanding way in this ambiente by one of the oldest Spanish universities, I may take the opportunity to invite you for a trip back to a time when the University of Santiago was just founded, and when science began to become more and more established, with special emphasis on my own field: Statistics. For your convenience I have included a picture dating back from the year 1545, showing two women sitting opposite to each other. On the right we see Sapientia, the goddess of wisdom and science, in all her self-confidence and pride. On the left we have Fortuna, the goddess of luck and evil, unable to see what matters, with her wheel turning us up and down. Both represent the ambivalent feelings and experience human beings may face in their life.

As to science Sapientia was right in being proud of all the new insights which were already reached or were still to come. To mention only one, it was Isaac Newton who was able to create a unified program by showing that the motion of diverse objects, including planets, tides, falling bodies and projectiles could be explained through one force: gravitation. By 1800 a well-established scheme for the explanation of natural phenomena was available. The basic properties were explained using differential equations or variational principles. Typically it admitted the skilled scientist to infer all properties of a system for the future given that required parameters were known. The general impression was that nature could be fully predicted if not dominated. Chance was considered as a phenomenon of human limitation, a reflection of imperfect knowledge. Laplace, e.g., the great French mathematician, who in textbooks on probability nowadays is considered as one of the founding fathers of probability, would have considered himself a determinist, putting equal weights to possible outcomes not because nature did it this way but because of human beings' ignorance. Apart from that weakness it was the picture of the "reasonable man", who reigned such different areas like natural sciences, philosophy, social sciences and history.

Things changed with the French revolution, at least in continental Europe. Due to the social tensions following the revolution the confidence in the existence of a single standard vanished. In a sense, Fortuna had proved her power on a large scale. In social science a new prototype was created who, rather than being individual, represented the "average man" (l'homme moyen). Any deviation from the "mean" was considered as an error. These ideas have their roots in the famous work "Ars Conjectandi" of the Swiss mathematician Jacob Bernoulli (1713), who could show through his "Law of Large Numbers" that averaging indeed reduces errors. This picture of mean and error as the only source of randomness was dominating science in continental Europe in the first part of the 19^{th} century. Anot-

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her famous example is the error analysis proposed by the German mathematician Gauss and applied to the movements of planets.

Summarizing, one may say that at the end of the 19^{th} century, after having digested the disaster of the French revolution, statistics provided a tool of collecting mass data helping to direct a large number of individuals (state - statistics). Chance disappeared in large numbers, and with it the discontinuities of a revolution.

In England, things developed in a different way. I mention this, because as we shall see soon, Statistics as a science in the modern sense was founded there. While in France and Germany l'homme moyen was invented as a tool of social physics to facilitate the acceptance of social and political laws analogous to those of celestial mechanics, in England the issue of free will and liberalism preoccupied most authors. They insisted that probability presupposes nothing about individual cases. Rather than averages, for them numbers were just another name for variability. Laws of mass phenomena provided a poor basis for inference about the individual will. For them the error law was not the deviation from a mean but the supreme law of unreason. One of the dominating protagonists of that view in England was without doubt Charles Darwin. For him the origin of variation was a matter of chance and not just ignorance, while the kind of evolution was due to natural selection. The botanist Brown ran experiments which showed that molecules in a liquid substance may move in an irregular way. The physicist Maxwell established his new kinetic theory for gases, in which rather than finitely many states the assumption of a continuum had to be given free way. Classical mathematics provided insufficient tools to keep track of these phenomena. It was the first decade of the 20^{th} century when the field of mathematics and its applications was about to be completely revolutionized, first in England, then in continental Europe and the USA.

Statisticians like Karl and Egon Pearson, Ronald Fisher, Francis Galton and the Polish Jerzy Neyman, who later founded the Statistics department in Berkeley, formalized things and made them applicable to areas like agriculture, psychology, medicine, economics, and many others. It was the moment when mathematics ceased to be the science of "precise matters" alone. A new component was introduced into the field, which as we have seen, has been alive over centuries but arrived in the centre of mathematics only in the last century: the idea of randomness and inaccuracy. Fortuna finally had found her way to what five hundred years ago was seen to be quite the opposite.

Twenty years ago I once was on a plane crossing the USA. I remember an interesting conversation with a man sitting next to me. Just before landing he asked me about my profession. On my response he said something I will never forget: "You are a statistician!? You know, statisticians are the only people I met in my lifetime who admit that they may be erroneous". He was absolutely right. In a complicated world there are almost never clear answers. Rather than having a complete theory, in most cases we only have vague ideas or models for what is going on, being supported (or not) by a few data. Statistics nowadays has become an art of properly weighting this information. Sometimes we may be misled to give wrong answers. Thus the possibility of making errors has become part of our work. The main problem has become one of controlling these risks and optimizing decisions under uncertainty. In a sense Fortuna has turned out to better suited to represent our view than Sapientia.

To tell you the truth, I was not trained as a statistician when I graduated. I was a mathematician without any deeper knowledge of statistics. I remember the first international conference I attended, when somebody asked me, whether I was a mathematician or a statistician. At that time I was a probabilist with a deep background in calculus and algebra. For me this was very important. I'll never forget my roots. Now, 35 years later, I may say that becoming a statistician is like walking down a stony road. It is not smooth at all, and it is neverending. Why? Because our world is so colourful with so many unsolved questions and with non-obvious answers, in particular if you are willing to cooperate with other fields.

At my home institute I teach students of mathematics in Probability, Statistics and Finance. When they come to me in their second or third year they are well trained in calculus and pure mathematics. When talking about indeterminism and risks in connection with mathematics they first have difficulties to understand the message. At the end most of them will be fascinated, however, by the possibility

to merge inaccuracy into mathematics.

More than 20 years ago, just after starting my move from mathematics to statistics, I attended a conference in the city of Bilbao. The whole family was with me, as today, and we spent two wonderful weeks at the beach of Laredo, Cantabria. When I was on leave to Bilbao for the conference, after my talk, a young statistician from Santiago de Compostela, Dr. Wenceslao González Manteiga, approached me, and we had long discussions. He visited me while Germany was still divided in two parts, and on one weekend I showed him the German-German border. Many visits to Santiago followed. Each time I thought this is the last. But this was just an excuse for not learning Spanish. This was really a sin. The friendship, however, continued. Many PhD students from Santiago visited me in Giessen over years to keep the cooperation alive.

About 10 years ago I attended the Galician meeting of Statistics in Vigo. I will never forget this. Not because all talks (up to mine) were in Spanish or Galego, but because it became evident to me that this group of people were like a big family, which had been able to link statistics with many other applied areas in science and industry, as it should be. And it was no question who the father of this family was. By now they have established an internationally known network, which comprises statistical research in medicine, applications to environmental studies and a cooperation with financial institutes, among others. They have been active in organizing international conferences thus bringing world-known capacities to Galicia. After such a success it is only natural that Galician statisticians more and more function as editorial board members of international journals. Above all, what I appreciated most, was the hospitality and friendship which I enjoyed from the very beginning. It was not only the rain which keeps me feeling like home.

If, after today, you would consider me as part of your family, I would be greatly honoured.

Let me conclude with a written piece of music (if at all possible). It is not from Mozart or Verdi, but as you can imagine, from a piece based on lines most of them found in a medieval monastery in Bavaria. It expresses the attitude towards life of the ordinary people who had experienced the changes between luck and evil, health and sickness, summer and winter, but maybe also of a mathematician for whom inaccuracies, unpredictability and errors became part of his profession, but who has never lost his optimism. It's the opening from the "Carmina Burana", a work written by the German composer Carl Orff. He was present when I attended, for the first time, his opera in an open-air concert, in front of the old city hall of Munich, in the summer of 1978:

O Fortuna

velut luna
statu variabilis
semper crescis
aut decrescis

Oh Fortuna

variable como la luna
como ella creces sin cesar
o desapareces

Gracias!