

IPMU'08, June 25, 2008, Torremolinos.

KAMPÉ DE FÉRIET AWARD ADDRESS.

Enric Trillas.



Many thanks. I actually feel deeply honored.

This award means a remarkable event in my life, because it reminds me the more than 84 years old, but spiritually and mentally young, Professor Marie Joseph Kampé de Fériet to whom I met in Barcelona in 1977. It was at the occasion of the ‘First World Conference on Mathematics at the Service of Men’, I organized there, and at which he was an invited speaker jointly with Lotfi Zadeh and the late Luis Santaló.

I keep very nice memories of Kampé de Fériet, to whom I scientifically knew before 1977 due to my relationships with Karl Menger and Berthold Schweizer, and by his late work on the Generalized Theory of Information, he initiated with the Italian mathematician Bruno Forte. I think it was not much later, either in 1978 or in 1979, that my former student Llorenç Valverde did, at my advice, a short stay in Lille with Kampé de Fériet, who kindly accepted his visit.

When I met him in Barcelona, he seemed to me like a lovely and wise professor’s granddad. I remember when Kampé de Fériet was referring to someone he familiarly called ‘Henri’, which resulted to be the famous French mathematician Henri Lebesgue, who died in 1941. I also remember the paper, probably his last one, on the interpretation of membership functions in terms of plausibility and belief of 1982, the same year in which he died on April, the 6th.

Now, thirty one years later, I don't think that many people here ever met Joseph Kampé de Fériet who, undoubtedly, is in the XX Century History of Science by his profound studies in the Mechanics of Fluids, specially in the theory of turbulences, as well as on the Gauss' hypergeometric functions and the Navier-Stockes equation. He, which among other academic institutions belonged as a Correspondent Member to the Spanish Royal Academy of Sciences, published more than two hundred papers, and greatly contributed to the progress of Aeronautics in France from as early as 1928. In Newton's words, we always can look at Science from the shoulders of giants, like it was Marie Joseph Kampé de Fériet.



Now let me change the subject, and shortly tell you on how I think that Zadeh's Computing With Words can be developed. For reasons I will avoid right now, I think that CWW should be considered an Experimental Science based on designing and doing experiments, introducing and using mathematical models, and proving short and long term capability for doing true technological applications in many fields.

There are, in my view, two overlapping main possible lines from which CWW can be approached,

a) Technology line, composed by two sub-lines,

- Hardware line, f. ex., by building electronic devices either "understanding" or answering non-trivial expressions in natural language, and perhaps interacting with humans, animals, or machines.**

- **Software line, f. ex., by building Soft Computing based systems either “understanding” or answering non-trivial natural language expressions, and simulating realistic situations.**

b) Scientific line, composed by two sub-lines

- **Experimental line, f. ex., designing and doing experimentation within natural language, especially but not only through the Internet, with the aim of searching for more complex linguistic expressions and different uses of words, than the ones currently taken into account in fuzzy control, or in the current theories of fuzzy sets.**
- **Theoretic line, mainly with a mathematical character but well connected with these former sub-lines, to find and study new models that could allow, at least, to design the representation of larger linguistic expressions, or more complex linguistically described systems, than those currently considered.**

In what follows I will refer only to the scientific line, the one I am interested in, although my expertise only lies in just a corner of it. I will do it by listing the following ten items, that would be like a ten commandments guide for fuzzy travelers across the new world of CWW,

- 1. In my own view, CWW is a new name for FL which, from the beginning, is nothing else than an elemental kind of CWW. Anyway, CWW is a challenge for fuzzy logic theoreticians.**
- 2. CWW is strongly related with meaning, captured by the use of linguistic expressions, words and connectives. In some sense, and in my view, CWW simply continues what did and does FL, although I also think that the broader name CWW marks an evolution of FL.**

3. **With the current theories of fuzzy sets, larger and more complex linguistic expressions than rules of control should be represented, to know more on the limits of such theories.**
4. **Current theories of fuzzy sets should be enough flexibilized, f. ex., using non-necessarily commutative intersections, allowing more than two but not all values being idempotent, etc. New mathematical models with fewer axioms are needed to fit with complex linguistic expressions.**
5. **Fuzzy Logic should take into account other schemes of deductive reasoning than Modus Ponens, e.g. Modus Tollens, Disjunctive Mode, Constructive and Destructive Dilemma, etc.**
6. **FL should consider modes of inference different from deduction, f. ex., abduction, induction (non-monotonic reasoning), as well as new models for GMT, GDR, etc.**
7. **FL should consider linguistic expressions in which “sequencing” or ‘timing’ is essential, since it modifies the type and the meaning of connectives. At this respect, decision and action processes, modeled by Soft Computing methods, should be especially taken into account.**
8. **Experimentation within language should be designed and done, f. ex., to know the meaning or use of complete phrases and not only isolated words and connectives. The logic’s way of building up the meaning of expressions through the meaning of its parts, cannot be fully assumed when dealing with natural language.**
9. **Experiments in the Internet and in conversational language should be designed and done, f.ex., to develop advanced Soft Computing search systems, to advance in the study of fuzzy probabilities, and to study sets of complex linguistic rules where not all of them are representable by the same implication function.**

10. The core concept of ‘degree up to which x is P’ should be rethought within, for example, other preordered structures than the unit interval, and linked with the ordering that a predicate induces in the universe of discourse.

Finally, and for all that has been said, we need to have new representation’s possibilities for linguistic expressions that those available within current theories of fuzzy sets. Hence, it could be interesting to go back into the old line of Goguen’s L-sets, but with a new semantic way of considering it.

Even more, a rethinking is also necessary for a deeper further study of the structure of expressions compound by means of the particles ‘and ’, and ‘or’, as well as the structure of opposite, qualified, modified, and relational predicates. In particular, to advance in the analysis and modeling of the general form of their degrees.

In some of the just mentioned points, CWW could collide with Linguistics, a discipline that could result upgraded and improved by introducing in it the FL research’s methodology as it happened, for example, in the study of antonymy.



To end this short address, and coming back to the Kampé de Fériet award, let me pose the question,

‘Why me, or why only me?’

a question whose answer is not so easy to advance, mainly when oneself did not ask for the award, and who delivered it said some words in favor of the currently awarded person. And, of course and by the way, no one has the will of becoming impolite by contradicting such words. Even more, since they contain right arguments.

But, you know, since one completely knows what was behind all that, one must openly recognize that these arguments are right, but... incomplete. Incomplete, because there were more people involved in what added for the award.

There were people without whom things would have not started, failed or, at least, happened differently. There are people to whom I owe so much. Is for this reason that I would like to share the award with these currently unnamed people. But unfortunately, this aim could only remain closed in my heart, since most awards are not yet given to fuzzy sets of people, but only to classical sets of them and, too frequently, as it is tonight, to a crisp singleton.

In that line of thought, and avoiding a lot of other personal stories, let me tell you how I arrived at fuzzy logic after I have been working, for around ten years, on lattice semigroups and Statistical Metric Spaces (later on called PMS).

In the summer vacation of 1974, a young student of mathematics, today a university associated professor, showed me a short article in a French newspaper announcing a theory called ‘théorie des ensembles flous’, and presented in a book by Prof. Arnold Kaufmann. I read the book and I did not liked it at all, but it conducted me to the 1965 ‘Fuzzy Sets’ paper by Lotfi Zadeh. This paper fully convinced me of the great interest of Zadeh’s idea, an

idea that seemed to me better than what I was searching for from some similar Menger's ideas.

Indeed, and from some time, I was trying to take some distance from the very structuralist point of view of the tendencies then marked in mathematics by Bourbaki's books, tendencies that I judged too rigid, for me scarcely exciting, and too far from real world problems. Against these tendencies I was prevented by my own reflections, as well as by some nice discussions at that respect I maintained with my good friend the world's famous geometer Prof. Luis Santaló who, as it is worth to say, always was in favor of fuzzy sets. For me, Zadeh's paper meant something like to open the window and look at a fresh new world of thought.

From the very beginning, I benefited from my advisors, friends, colleagues, relatives and students. I never worked completely alone, and I am intellectually, and personally, in debt with a lot of people. Let me say, at this point, that in the last more than thirty years, the support and friendship of Lotfi Zadeh has been extremely important in my scientific development. Following him, I always tried to create around me a neighborhood of discussions and curiosity, conducting to scientific creativity and to fertile criticisms. Although when Aristotle, in his 'Rhetoric', says that 'No man is all-over lucky', says the truth, let me add that at this respect I feel myself a lucky person.

Hence, the only I can honestly do right now, is to repeat that I feel deeply honored by receiving the Kampé de Fériet Award, to acknowledge the existence of these people I referred to, cordially thank them, and finish by expressing my thanks for the award to the IPMU's organizers.