

Editorial

Jean-Claude Falmagne's career as a mathematical psychologist has been long and exceedingly creative. Clearly, that was the underlying reason for dedicated celebrations of his 70th birth year at both the US Society for Mathematical Psychology meeting at the University of Michigan and the annual meeting of the European Mathematical Psychology Group (EMPG) in Ghent, Belgium, in 2004. From these, the current volume has evolved in great part due to the devoted efforts of the editors.

Born in Belgium, Jean-Claude began his professional career at the University of Brussels, from which he received a Ph.D. in 1965. Apparently, his nominal advisor played only a small role in his 350 page dissertation "Essai sur la construction d'une théorie stochastique pour les réactions de choix." part of which appeared in this journal in the same year. A year earlier, he first came to the United States to participate in a Stanford summer workshop on mathematical behavioral and social science, invited by Patrick Suppes who had met him in Europe. There I, among others, interacted with him for the first time. In the subsequent five years following his Ph.D. Jean-Claude published a number of papers, some in collaboration, on stochastic models, with the beginnings of interest in both probabilistic models of ordering and algebraic measurement.

By 1971, he was so involved in mathematical psychology that, after some discussions with others, he invited about 30 Europeans to participate in a meeting on mathematical psychology at the Maison des Etudiants Belges associated with the University of Paris. All came, leading to the formation of EMPG. He has been the nurturing father of that organization from its inception to the present.

When, later that year, Jean-Claude joined the faculty of New York University (NYU) as a full Professor—his talents were early recognized!—the responsibility of leading EMPG was assumed by the late, very charming Eddie Roskam. But Jean-Claude remained very deeply involved with it ever since then.

Aside from visiting appointments in both Europe and the US, he stayed at NYU for 18 years. In 1981 he became a US citizen. In 1989 he joined the U.C. Irvine (UCI) faculty, from which he has just retired—although I suspect not really.¹ His move to UCI stemmed, in part, from his

membership in a working group at the Center for Advanced Study in the Behavioral Science during 1987–1988. That group included in addition to Jean-Claude both Louis Narens (of UCI) and me (then of Harvard, but soon to join UCI) as well as Mark Machina, an economist at UCSD.

At UCI Jean-Claude was very instrumental in convincing Barbara Doshier and George Sperling, then of Columbia University and NYU, respectively, to join the UCI faculty.

Let me now turn to the general nature of his research. It partitions into five general areas, with appreciable temporal overlaps. Three are concerned with fairly traditional topics:

(i) Stochastic and probabilistic models of choice and reaction times. This included a very careful analysis of mixtures of stochastic processes as well as many important results on the probabilistic inequalities to arise under certain axioms.

(ii) Algebraic and probabilistic models of measurement including topics about biorders, invariance, and ordering of discrete sets. Perhaps his most important work here was that beginning with Narens in their 1983 contribution to the literature on meaningfulness and that has led to a significant generalization published in the 2004 volume of the *Foundations of Physics*.

(iii) Psychophysics is an area in which he extensively developed the ideas of (i) and (ii) and that led to the excellent 1985 monograph *Elements of Psychophysical Theory*. His approach rested on invariant properties that had been overlooked by others and that led to important new results about the perceived relation between signal intensity and discriminability of intensities accompanied by careful empirical tests. A number are summarized there, and later experiments have confirmed his insightful analysis in 2003 with Doble and Berg of the near-miss to Weber's law.

The last two areas are strikingly novel ones that he created essentially de nova, i.e., without any serious modeling precursors. These both are seminal for substantial literatures.

(iv) Knowledge spaces were formulated and explored in a number of publications, mostly done in close collaboration with Jean-Paul Doignon. For example, a well-structured domain of knowledge such as elementary

¹His comment, on reading a draft of this editorial, was: "Indeed!"

geometry is treated as a formal hierarchical structure that students can master only in certain orders. The challenge is to uncover that structure empirically for a culture/structure pair, to develop learning programs to keep track of a student's knowledge location in it, and to schedule appropriate learning exercises. Numerous deep theorems have been uncovered. Two striking consequences of that program are: first, it led to a series of papers, often with excellent students, and a summary and elaboration of these truly novel results evolved into the joint 1999 book *Knowledge Spaces* by Doignon and Falmagne. And second, it led Jean-Claude to develop very practical applications of these ideas in the form of complex computer programs designed both to assess a person's knowledge state and to provide guidance for further instruction of that individual. The creation and evaluation of such programs is extremely time consuming and requires very considerable originality. For many years there was bustling activity down the hall from me with many graduate students involved—mostly non-native and among the best of the UCI Mathematical Behavioral Science Program. Then in 1996 he formed a commercial company, called ALEKS, to advance that work and have it adopted by school systems. It seems to be flourishing with over 40 employees of whom nine are Ph.D.s and about the same number (with some overlap) of engineers.

(v) Media Theory. This, a second highly novel area that also originated with Jean-Claude, was originally aimed at studying the evolution of preferences but ultimately has been interpreted in other ways in combinatoric theory. Although there were a number of well-developed static theories of preference due to economists, psychologists, and statisticians, formal accounts of preference creation and its evolution were and are scarce. In Jean-Claude's scheme, individuals are seen as buffeted by inputs (as in a pre-election period) aimed at influencing them. Under

plausible assumptions, their asymptotic evolution to highly regular patterns is described and methods are devised to infer from aggregated data the numerical parameters describing the relatively unobservable media process. Many election applications are reported. In particular, with B. Grofman, a political scientist, and M. Regenwetter, several large bodies of pre-election polling data have been analyzed in what turns out to be surprising detail. This entire body of work will be reported in a forthcoming monograph in collaboration with Eppstein, Ovchinnikov, and perhaps Doignon.

Clearly, Jean-Claude is, in my opinion, a very accomplished, creative scientist. And one might have expected that he would have been lavished with many honors. To be sure, there are some, including an honorary doctorate from the University of Graz conferred on November 11, 2005, election in 1995 as a Fellow of the Society of Experimental Psychologists, the Presidency of the Society for Mathematical Psychology in 1988–1989, and receipt of a von Humboldt Award in 1982–1983. But some others that one might expect have not occurred. Although he is widely appreciated by all mathematical psychologists, he seems to be decidedly under appreciated by many American non-mathematical psychologists. That is simply a loss to them and to several American organizations.

He is an international scholar of great technical ability who is far more innovative and original than most. It has been an honor to have had him down the hall from me for the past 16 years.

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