



EAA AWARD 2014

For lifetime achievements in acoustics

**Michel Bruneau**



Michel Bruneau's career in Acoustics dates back in 1970, when he started research in electroacoustics with his wife Anne-Marie at Université du Maine (Le Mans, France). Their early work was focused on the electrodynamic loudspeaker, describing both its internal behaviour, its electric interface and its radiation - quite tricky problems at these times. Instead of following the dominant track which eventually led to the well-known Thiele/Small model, they focused on analytic models for diaphragm bending modes, and near-field description of the radiation with finite baffles. They ended up by publishing around 1980 a complete model of the loudspeaker from its electric terminals to 3D space, taking into account most of the phenomena relevant in real life, and validated through carefully designed experiments.

This interest for investigating complex phenomena - especially various dissipative mechanisms - is probably linked to Michel Bruneau's initial skills, who was granted a PhD in theoretical nuclear physics at the Université de Bordeaux and started research on this topic at the Laboratoire de Physique Théorique in Orsay. It indeed explains that his further research almost always involved a physical description of dissipative phenomena, building a generalization of Kirchhoff theory on acoustics in dissipative fluids. A major part of this work dealt with acoustic boundary layers, where thermal conduction and viscosity play a major role. Worth mentioning is the work conducted by Michel Bruneau for designing an acoustic gyrometer, an astonishing device made of an empty box filled with air ... in which the inertial Coriolis « force » within the boundary layers lead to a coupling between cavity modes, allowing to measure rotation rates with a dynamic range of several decades. Early prototypes were developed in partnership with Crouzet and Sextant companies, raising numerous theoretical and practical issues until miniaturized devices could be implemented on silicon wafers.

Although quite emblematic of Michel Bruneau's contribution to physical Acoustics, the acoustic gyrometer is only an example of the many fields where a better understanding of dissipative phenomena or suited analytic developments allowed significant advances. During the 90s, Michel Bruneau orientated part of his research towards thermoacoustics as thermal boundary layers should play an important role in the generation of heat transfer from an acoustic wave. He contributed to develop analytical models, focusing on nonlinear phenomena that take place in thermoacoustic refrigerators and motors. Recent activities deal with primary calibration of microphones, determination of Boltzmann constant, or models of miniaturized devices. For this outstanding contribution, Michel Bruneau received the Rayleigh Medal of the Institute of Acoustics in 1993 and the Silver Medal of the CNRS in 2000. He is now Emeritus Professor, remaining very active (he published 80 papers in peer-reviewed journals, including 28 during the last 7 years). Moreover he published 5 books (in French or English).

It is difficult to separate the scientific life of Michel Bruneau from the history of the Laboratoire d'Acoustique de l'Université du Maine (LAUM) which has now more than 50 permanent researchers in Acoustics and is a worldwide recognized laboratory in Acoustics. The LAUM was founded by Michel and Anne-Marie Bruneau, together with a Master in Acoustics. The Université du Maine has trained a very large number of students, and this represents a large part of the active French acousticians. Michel Bruneau was an excellent professor. Thus, Michel Bruneau can be considered as one of the fathers of modern Acoustics in France.

Philippe Herzog and Jean Kergomard



photo made by Sebastian Kurczyk