Jean-Yves Bigot, a pioneer of ultrafast magnetism, passed away on May 2 2018

Professor Jean-Yves Bigot died on May 2, 2018. He was a research director at the Centre National de la Recherche Scientifique (CNRS) in France. He was a pioneer of ultrafast magnetism.

Jean-Yves Bigot was born in 1956. He studied in Strasbourg, where he obtained his Master's degree (1982), Ph.D. (1984) and habilitation (Doctorat d'Etat, 1987). From 1996 he was a research director at CNRS.

Professor Jean-Yves Bigot started his scientific career with theoretical and experimental investigations of nonlinear optical and ultrafast phenomena in semiconductors. The idea to apply experimental time-resolved techniques for studies of magnetic materials had opened up a new avenue in fundamental studies of magnetism. In 1996 Jean-Yves Bigot, Eric Beaurepaire and their colleagues published the seminal discovery of ultrafast laser-induced demagnetization of Ni (*Phys. Rev. Lett.*, **76**, 4250–4253 (1996)). Previously it was believed that spins can only weakly couple to light due to the fact that in thermodynamic equilibrium the spin-orbit interaction is only a small relativistic correction to the electronic Hamiltonian. The observed laser-induced collapse of the Ni magnetization on a sub-picosecond time-scale did challenge the fundamental understanding of magnetism at that time. It was realized that using femtosecond laser pulses as stimuli, magnetization dynamics can be pushed into an unexplored counter-intuitive regime, beyond the conventional approximations of equilibrium thermodynamics. This work opened the field of ultrafast magnetism – a research area with a plethora of counter-intuitive experimental observations and many challenges for theory because even the language to describe ultrafast magnetic phenomena was not available. Many quantities of magnetism are still defined in terms of equilibrium thermodynamics.

After 1996 an important aspect of the work of Jean-Yves Bigot was dedicated to the initial non-thermal regime during which the spins are strongly out of equilibrium (*Phys. Rev. Lett.*, **89**, 17401–17404 (2002)). He and his team subsequently demonstrated the importance of time-dependent anisotropies (shape and magneto-crystalline) in the process of launching a precessional spin motion (*Phys. Rev. Lett.* **94**, 237601 (2005); *Chem. Phys.* **318**, 137 (2005)). In the last 15 years the group of Prof. Bigot continued to advance our understanding of the physics of ultrafast magnetism especially by contributing to the development of the theory of ultrafast magnetism. The three-temperature model employed by Bigot in the first publication is still the main model in this research domain. His team was also among the pioneers of using femtosecond time-resolved spectroscopic studies in a broad spectral range, ultrafast microscopy with sub-micron resolution and THz emission spectroscopy (*APL* **84**, 3465 (2004)) as well as ultrafast magneto-acoustics (*PRL* 2012, *Scientific Reports* **5**, 8511 (2015)) as new tools to get better insight in the mechanisms of ultrafast magnetization dynamics. Another major contribution was the study of the ultrafast dynamics in ferromagnetic nanostructures, such as Co (*PRL* **97**, 127401 (2006)) and CoPt nanoparticles (*NanoLetters* **12**, 1189–1197 (2012)). The daring hypothesis of coherent photon-spin interaction suggested by

Bigot (*PRB* **B 85**, 180407(R) (2012)) is another example of recent groundbreaking contributions from the team of Jean-Yves Bigot.

Professor Jean-Yves Bigot received two prizes from the French Physical Society by the turn of the century: in 1987 (Brelot award) and 2000 (Ancel award) for his studies of ultrafast dynamical processes in condensed matter physics. In 2008 he received the silver medal of CNRS, and in 2009 an Advanced Grant from the European Research Council (ERC AdG). In 2011 he received special funding (Equipex UNION) from the National Research Agency (ANR) in France to develop a new research platform dedicated to “Ultrafast optics, nanophotonics, plasmonics”. In 2012 he became the director of the initiative of excellence Labex NIE, also financed by the ANR, which gathers 40 researchers from three laboratories in Strasbourg (IPCMS, ISIS, ICS) around the topic “Nano-objects Interacting with their Environment”. Finally, in 2016, he received the Jean Ricard award also from the French Physical Society in recognition for his seminal studies in diverse areas of solid state physics.

In addition to his research contributions, Jean-Yves was known for his dedication to share his passion for science and to educate future generations of scientists. He stimulated young master's students of Strasbourg University towards fundamental research in solid state physics during his teaching classes on “Light-Matter Interaction” and “Ultrafast Nonlinear Optics”. His door was always open for colleagues, postdocs or Ph.D. students who had the privilege to learn from him. He also was the main initiator of the series of Ultrafast Magnetism Conferences that biannually gathers the actors of the femto-magnetism community.

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