



## Charles Hirlimann

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### Pioneering days in ultrafast optics

Charles V Shank and his team invented the Colliding Pulse Modelock (CPM) femtosecond laser at the very beginning of the 1980's. This started a rush on the study of ultrafast phenomena. These studies yielded very many new understandings in various fields, of which, this talk will underline new results in the fields of semiconductor physics, laser physics, non-linear optics, and quantum optics. Did you know that it takes silicon only 300 fs to melt down when hit by a short light pulse? This experimental observation seeded the field of ultrafast electron dynamics in semiconductors that in this talk will be further highlighted by the measurement of the time it takes to a pocket of out-of-equilibrium electrons to cool down to a Boltzmann distribution.

It has been very early recognized that light absorption saturates when the flux of photons impinging an absorbing material exceeds the number of electrons available in their energy ground state. But it needed the use of short optical pulses, conveying little energy, to demonstrate the saturation of the two-photon absorption effect. This experiment was performed in Cadmium Sulfide (CdS). It is also using two-photon luminescence excitation in Rhodamine

B that the very existence of photonic jets generated by micro-dielectric spheres was demonstrated. For the first time, the non-linear effect of self-steepening of an optical pulse was observed, when propagating through a transparent material. In 2001, Bardou and Boose theoretically demonstrated that the tunneling probability of an electron can be enhanced by an ad hoc pitch at the time it reflects on a potential barrier. This new quantum effect was demonstrated using an optical transposition of the effect using short femtosecond pulses.

### Speaker Biography

Charles Hirlimann was born in Paris in 1947. He majored in solid-state physics and later acquired competence in laser physics. He pioneered the use of femtosecond lasers applied to ultrafast spectroscopy of solids being at the time assistant professor at University Pierre and Marie Curie in Paris. He then joined CNRS and moved to the Institute for Physics and Chemistry of Materials in Strasbourg (IPCMS) where he initiated femtosecond studies. His interest spanned from the ultrafast spectroscopy of electrons in semiconductors to basics researches in non-linear optics. In the recent past, he served two years as a scientific expert in nanomaterials for the European Commission in Brussels and three years at the CNRS headquarters in Paris in charge of the European scientific policy of CNRS and the International policy for Physics. He is presently interested in the fast developments taking place in the field of electron microscopy.

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