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Cell opto stimulation through intra membrane molecular switches

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I will report about a new family of photocromic molecules that allow optical control of cell activation. We engineered light-sensitive azobenzene compounds that stably partitions into the plasma membrane.

We demonstrated that in neurons loaded with the compound, millisecond pulses of visible light induce a transient hyperpolarization followed by a delayed depolarization that triggers action potential firing. These effects are persistent and can be evoked in vivo up to 7 days, proving the potential of this approach for the modulation of membrane capacitance in the millisecond timescale, without directly affecting ion channels or local temperature. The ability to control optically cardio-myocytes contraction and elicit motion will also be shown.

Short Bio: Guglielmo Lanzani is Full Professor in Physics at Politecnico di Milano since 2011 and Coordinator of the Center for Nano Science Technology @ POLIMI of the Istituto Italiano di Tecnologia since 2009. His research activity, reported in more than 300 publications, regards the science and technology of nanostructured and molecular materials. The main area of experimental work is photo-physics, for application in energy, bio-photonics, neuroscience and medicine. In particular, the overarching goal of the research is to induce light sensitivity in living cells, tissue or organism for photo controlling their functions by developing new light actuators. Application is in life science, medicine and neuroscience. He is involved in the project for developing an artificial retina prosthesis. He is involved in two start-up companies.

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