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"Bioelectricity and Intercellular Communication in Model Multicellular Ensembles"

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Cancer research tends to focus on genes and biochemistry. However, bioelectricity and intercellular electrical coupling could also be significant. Experiments with model animals and cell culture assays suggest the instructive role of spatio-temporal maps of cell membrane potentials. These potentials regulate and are regulated by the ion channel proteins that transport signaling molecules, thus influencing the expression of growth genes. In particular, cell depolarization and tumorigenesis can be related but experimental procedures for the manipulation of specific ion channels have serious risks because the channels also control healthy tissues. The external modulation of cell potentials requires a precise spatial localization, which might be achieved by using nanoparticles, microwires, local transfer of exogenous channels, mRNA and miRNA, and optogenetics. However, the interplay between bioelectrical and biochemical networks is still unclear. We will describe simple but biologically-motivated theoretical approaches based on bioelectric concepts and weakly coupled cell lattice models.

Short CV:
Salvador Mafe received the M.Sc. (Extraordinary Award, 1984) and Ph.D. (Extraordinary Award, 1986) degrees in Physics from the Univ. of Valencia (UV). He was appointed Assoc. Prof. at the Univ. of Castilla-La Mancha (1988). He was a visiting scientist at the Helsinki Univ. of Technology, UCLA, MIT, and Tokyo Inst. of Technology. He has been Prof. of Applied Physics at UV since 1999 where he teaches Statistical Physics and Experimental Thermodynamics courses. His current research interests concern transport phenomena in nanostructures and the modeling of bioelectrical phenomena in multicellular ensembles. He is recipient of the "Tajima Prize"(International Society of Electrochemistry) and the "Investigadores Noveles"prize (Real Sociedad Española de Física).

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