



Plenary Conference: Towards Intracellular Computer-Human Interaction: a micro-electronic perspective



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Abstract: Since the beginning of the 60's, Microelectronics has played an important role in practically all the technological fields and knowledge areas. Microelectronics is known for being the area of technology associated to very small electronic systems and devices. These devices are made from semiconductor materials, typically silicon, and they are mainly composed of integrated electronic parts on a chip. Success of the semiconductor industry has been driven in part by the miniaturization process, as approximately every three years we see a new generation of memory chips and microprocessors, in which the size of their fundamental elements, the transistors, is reduced 33%. This means faster devices and a higher density of integrated transistors per area. For instance, in the 70's, the first personal computers had microprocessors which contained $\sim 2 \cdot 10^3$ transistors of $10 \mu\text{m}$. Nevertheless, nowadays, our computers use more than 10^9 transistors with dimensions smaller than 30 nm. The sizes of these transistors are several orders of magnitude smaller in relation typical human body cell (tens of microns of diameter). The microfabrication techniques of the electronics industry are being also routinely adapted to fabricate systems which are able to integrate mechanical, thermal, optical, magnetic, chemical, or even fluidics components in the same silicon chip, in addition to combining them with electronic components. These chips are called MEMS or NEMS (Micro or Nano Electro Mechanical Systems)

and can be used as sensors or actuators. The Micro and Nano research group is engaged in a very new research field for embedding chips into human living cells. These silicon chips inside human living cells could provide endless possibilities, beyond the scope of our imagination. In this talk, we present our research in the bases of this incipient future field. We believe that the study of this field will open a new line of research based on Human-Computer Interactions to investigate the relationship between chips and human living cells, human organs or human actors.

Short Bio: J.A. Plaza was born in Cerdanyola del Vallès (Barcelona), Spain in 1968. He received his Physicist degree and his Ph. D. degree in Electronics Engineering from the Universitat Autònoma de Barcelona (1992, 1997). Since 1995, he has the degree of Specialist in Finite Element Simulation from the Universidad Nacional de Educación a Distancia (UNED, Spain). Currently, he is working at the Micro- and Nanosystems department at the Institute of Microelectronics of Barcelona, IMB-CNM (CSIC), in Cerdanyola (Barcelona, Spain). His research has been focused on the design and simulation, technology development and characterization of Micro- and Nanosystems. He has participated in more than 20 EU and national research projects. He has more than 90 contributions to scientific journals (WOK-JCR indexed) and more than 100 contributions to international conferences on MEMS and NEMS. Now, his research is focused on MEMS and NEMS for life science applications. Dr. Plaza serves as a reviewer of several international scientific journals, and as referee for public-funded projects in Spain and Argentina.

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<http://www.nature.com/nnano/journal/v8/n7/extref/nnano.2013.118-s1.pdf>

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