Dr. Marisa Martin-Fernandez
Central Laser Facility, leader of the Functional Biosystems Imaging group

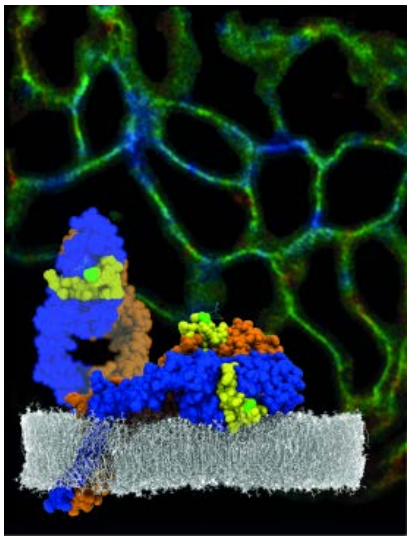
Marisa uses laser imaging to examine the growth of cancer cells. She applied for an IMP so that she could spend more of her time on this vital research.

After graduating in Physics in Madrid, Spain, I obtained an international scholarship to carry out a PhD in Biophysics at the Daresbury Laboratory, studying the molecular structure of frog muscle using X-ray diffraction.

Since 1994 the focus of my research has been on understanding how cancer cells grow and spread. This can happen due to mutations in the specialised molecules on cell surfaces that react to human growth factors, triggering cell growth. I study how these large, complex molecules, called Epithelial Growth Factor Receptors (EGFR), interact with each other to trigger signals inside the cell. If this signalling breaks down because of a mutation in the molecules, cell division can spiral out of control leading to the growth of cancerous cells.

I lead a program to develop ways of observing single molecules, so that we can watch how they signal to each other in live samples. My long term interest is to establish how the signalling mechanisms are influenced by mutations, by anti-cancer drugs that work by blocking the receptor molecules, and by human antibodies.

In 2008 I joined the Lasers for Science Division of the Central Laser Facility, based at the Research Complex at Harwell, where I currently lead the Functional Biosystems group. We have developed a new concept in laser imaging called Octopus (Optics Clustered to Output Unique Solutions) in which multiple coloured light sources are linked to imaging stations so that a combination of techniques can be brought to bear on the samples. We can produce multi-dimensional and multi-colour images of single molecules, and combine this with models of molecular behaviour at atomic resolution to determine the molecular structures and signalling pathways that regulate signalling outcomes.



Background: Image of human epithelial cells. Foreground: Model of human EGFR showing a new conformation lying flat on the membrane and the previously known upright conformation

I am also a visiting senior scientist in the division of Cancer Studies at Kings College London, and I am an Associate Professor of Nanotechnology at the University of Oxford.

I chose to try for IMP because I wanted to spend a significant proportion of my time in research. I believe my work benefits STFC, my organization, because it has led to unique instrumentation developments such as Octopus, and because it could have a high societal impact. My work has the potential of contributing a unique perspective of the onset and development of cancer at the molecular level, which hopefully will play an important role in our understanding of the disease and the development of personalised therapies.