Spotlight Interview: Vincenzo De Paola
Neuroplasticity & Disease

How would you describe what your group does?

We are trying to understand which changes in the adult brain accompany cognitive processes such as learning and neuropathologies including brain injury and neurodegeneration. Our favorite objects of investigation are the micro-connections between nerve cells, called synapses. Synapses make sure that a signal from one neuron is passed onto many others and it is really bad news when they fail to do so.

This activity in key areas of the brain is in fact necessary for memory formation and learning. Synapses stop working properly in many neurodiseases including mental retardation and Alzheimer's. In fact many of the dramatic cognitive deficits found in these diseases such as memory and learning disability correlate well with the onset and degree of synaptic impairments and less well with neuronal death. However, we know surprisingly little about the dynamics of synaptic architecture in the intact brain. Do we carry the same synapses we had 10 years ago? And exactly when and how diseases alter synaptic activity and organization. In the past we were lacking the tools to study the intact brain at cellular and synaptic resolution.

Nowadays, due to technological advances in microscopy, we can repeatedly visualize cellular structures such as synapses and even synaptic molecules deep into the intact brain, over a wide range of temporal scales, from seconds to several months. In our group we do this by exploiting the selective neuronal expression of fluorescent proteins and powerful microscopes that would not fit in the average London studio apt. Using these so called 2-photon microscopes we glance into the living brain by using a tiny glass window. We are then able to observe how precisely neurons and their connections, previously invisible to ordinary microscopes, remodel during learning and memory formation or aging and study how neurons respond to damage.

Using this technique we have recently discovered that synaptic changes do occur in the adult brain and that some cell populations are more plastic than others. By further watching neurons and synapses in their natural environment we hope to discover synaptic defects at early stages of disease that might give us a useful time window to try to slow down or revert the defects and eventually ease some of the disabilities.

Why did you choose your particular field of science?

I always loved microscopes ever since I received one to play when I was 8 or 9. I remember being enchanted by restless paramecia I had cultivated in rainwater (had I grown up here in London instead of in sunny south of Italy it would have certainly made my career as a baby scientist a lot easier...) and trying to stick almost anything under the microscope. I guess it was the thrill of seeing something nobody had been able to see before that attracted me to science. Microscopes are great tools for that. I studied molecular biology and went into Neuroscience more or less by chance, at the time of my PhD it really seemed such a cool thing to explore as we know so little about many things concerning the brain. With its billion neurons and trillion synapses it didn't seem like we were going to run out of things to study anytime soon. But I think it helped that when I had to make my choice a new microscopy technique called 2-photon imaging was developed. It allowed for the first time 'neuron watching' in the intact living brain and opened many new fascinating avenues of research.

Why did you decide to work for the MRC/CSC?

I thought the diversity of interests and expertise would constitute a fantastic environment to pursue unconventional lines of research.

Who are your "science heroes" - and why?

If I told you that the mysteries of human memory and learning could be untangled by studying a simple sea mollusk (!), you would probably be as skeptical as the scientific community was in the 60's, when Eric Kandel started to adopt his reductionist approach to the study of mind. However, much of what we know about the cellular and molecular basis of memory storage and learning comes from the remarkable success of his risky choice. People such as Galileo Galilei, a missed priest, and Santiago Ramon y Cajal, a missed painter, grade also very high in my 'science hero' ranking. They remind us that we can learn a great deal about natural phenomena by simply being able to observe them carefully. For example Cajal's, ability to grasp the basic functioning of the nervous system by simply looking at its detailed structure is a striking paradigm. He also accompanied his discoveries by wonderful drawings of the organization of nerve cells.

If you weren't a scientist, what would your dream job be?

Photographer or football player

Where was the best conference you attended and why?

For some strange reason I remember vividly a Caribbean Neurosciences Meeting..

What do you most admire in other people?

Creativity and humour, especially together.

What do you do when you're not at work?

Think about it, sometimes.

What are your favourite films, books, music?

Top ten films: Ran, band of outsiders, the dekalog, manhattan, rear window pulp fiction, the royal tenenmbaums, the godfather II, Once upon a time in America, jules et jim.

Books: Melville's Moby Dick, autobiographies and detective stories, eg Chandler, S.S. Van Dine, Simenon

Dish: Pasta, of course.

Music: Rachmaninov, Led Zeppelin, U2, Jack Johnson, Puccini, Gloria Estefan...etc.

Song: my way

Artist: Botticelli, Vettriano

Holiday spot: Any place I haven't been yet

If you would like to feature in a Spotlight interview please contact: cscnews@csc.mrc.ac.uk