A Kytherian Journey from 'Molecules to Mind': Professor Charles Claudianos and the Study of Neurodevelopmental Disorders

To the casual observer the iconic sundial house in Avelmonas, Kythera's famous thyme-based honey and research into Autism Spectrum Disorder would have no obvious connection. But as those who attended the lecture by Professor Charles Claudianos learned at Kythera House on 22 August 2015 the study of neurodevelopmental disorders such as Autism Spectrum Disorder (ASD) and schizophrenia and their complex molecular and genetic underpinnings can be aided by research into small animals such as the humble bee.

As Professor George Paxinos, himself a neuroscientist, explained when introducing the main speaker, Charles Claudianos is a direct descendant of the Cavallini family

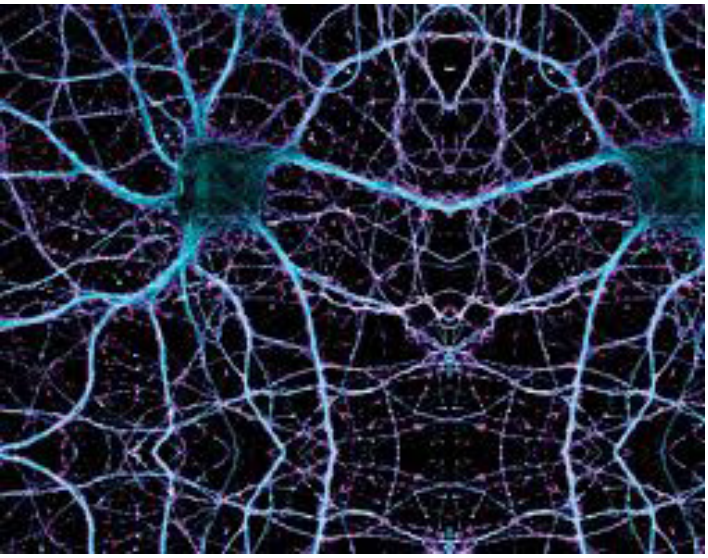
which originally built the magnificent house with the sundial that dominates the Avlemonas landscape (and since wonderfully restored by Charles' brother, John).

Professor Charles Claudianos completed his PhD in Biochemistry and Molecular Biology at the Australian National University in 1999. In 2000 he was awarded a prestigious National Health and Medical Research Council (NHMRC) C.J. Martin Fellowship to work at Imperial College London in the United Kingdom. In 2002 he returned to the Australian National University to continue his work in molecular genetics. In 2007 he was appointed Group Leader of the 'Senses and Synapses Laboratory' at the Queensland Brain Institute, the University of Queensland. In 2012 he wrote one of the three core projects associated with the successful award of the Australian Corporative Research Centre (CRC) for 'Living with Autism Spectrum Disorder' and in 2013 was appointed a Project Theme Leader for the Autism CRC. In 2015 he was appointed Professor

of Neurogenetics and Development in the School of Psychological Sciences and Faculty of Biomedical and Psychological Sciences at Monash University.

The theme of Professor Claudianos' talk was to explain the integrated 'molecules to mind' approach to the study of mental health disorders such as autism incorporating genomic analysis (or genetic screening), cellular/molecular techniques and behaviours such as 'learning and memory' to understand the biological and behavioural relevance of human DNA variations associated with these disorders. Ultimately, it is about how we understand the human brain and the human mind and the intricate molecular basis of neurodevelopment and neuropsychiatric disorders. By using cutting edge genomic and cellular technologies, researchers hope to unravel the impact of defective genes on how nerve cells connect in the brain by allowing them to 'join the dots' and better understand what causes these disorders.

Charles explained that his research work has focussed on the study of the complex disorder of autism and how the brain's amazing plasticity (the ability over time to adapt and overcome abnormal functioning) can assist in dealing with learning and memory deficits. Recently, his team with other dedicated researchers completed the clinical, behavioural and genetic screening of 50 Western Australian families to assess the genetic risk of autism spectrum disorder. The results of that study, as Charles explained, and the molecular profile generated showed for the first time how inherited DNA variations (that is, mutations found in genes) from parents with autistic-like traits that occur in the general population



are significantly associated with autism.

It is hoped that the molecular characterisation of ASD will eventually help in the early detection of autism and lead to more effective treatments for the normative development of children.

And what about the honeybee? Professor Claudianos explained his hypothesis that neuronal and synaptic development is disrupted in ASD. Therefore, he argues that molecular experiments based on non-human animal models such as bees and flies can provide an essential genetic tool for researchers in terms of regulating recorded memory and understanding synaptic plasticity of the brain. Noting that his grandmother on the island was herself a beekeeper, Charles explained that the honeybee, which is a social insect living with thousands of nest mates sharing tasks within the hive, has to both produce and respond to a multitude of social information in order to function properly. The honeybee has an amazing ability to learn and recall sensory information (as well as to relay that information to other bees) such as its associative learning of odours and other recognition cues to locate food sources. Researchers are confident that studying the honeybee can aid in a better understanding of genome sequencing and the impact of genetic mutations on brain development and cognitive function.

The audience was enthralled by Charles' talk and the many questions that followed was clear evidence that the lecture had generated considerable interest.

We are certainly privileged to be able to count Professor Charles Claudianos as one of our own in his ongoing research efforts to gain a better understanding of the biological basis of neurodevelopmental disorders and to help develop more effective treatments in the future.

The "molecules to mind" journey from Avlemonas is well under way.

George Vardas