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Interview with Jorge J. Casal

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Jorge J. Casal was born in the city of Buenos Aires, Argentina. He obtained BSc (1982) and MSc (1987) degrees at the Faculty of Agronomy of the University of Buenos Aires and completed his PhD (1989) at the Department of Plant Biology, Leicester University, UK. Jorge then obtained a permanent position at IFEVA, an institute owned jointly by the National Research Council of Argentina (CONICET) and University of Buenos Aires, where he became a professor (2009) and reached the highest career position possible in CONICET (2010). In 2010, he opened a second laboratory at Instituto Leloir, in Buenos Aires. His research and teaching activities have been recognised by various awards, including the John Simon Guggenheim Memorial Foundation Fellowship (2002) and the Georg Forster Research Award of the Humboldt Foundation (2014). His main research interest is the perception and transduction of signals from the light environment by plants. His studies range from molecular and cellular mechanisms to functional implications. The current focus of his lab is on the system-level analysis of the signalling network that mediates plant responses to shade: its structure, dynamics, and emergent functional properties.

What influenced your path into plant biology?

First of all, I must acknowledge the influence of my father. He was born on a ranch and that was the seed for my interest in crops. Furthermore, he taught me how to grow plants. As a kid, I used to cultivate my own set of plants and I often did experiments changing their light conditions; incidentally, none of them worked out. At university, Rodolfo Sánchez was my professor of plant physiology. His lectures were revolutionary to me, because he trained our critical thinking. I became involved in the research of his group and obtained my MSc degree under his supervision. Harry Smith was also influential not only as my supervisor during my PhD (I always admired his writing), but also because I had read many of his motivating papers before going to Leicester University. A special memory is of Garry Whitelam, who was always ready to help with new protocols during my stay in Leicester. I also acknowledge the influence of many brilliant colleagues and students without whom this path would not be such fun.

How did you decide on your current research topics?

The plant community has made paramount advances in terms of finding signalling components and their molecular interactions, particularly in the field of photosensory receptors. I am convinced that the time is ripe to try and integrate many of the observations that remain scattered and unconnected. In my opinion, the latter requires a systems-level analysis, which will help to identify the areas where more-detailed molecular and biochemical knowledge is needed and to elucidate the emergent functional properties of the network. Plant responses to shade offer a good field for this approach because I intuitively think that the perceived complexity of the signalling network is related to the complexity of light signals in plant canopies. Furthermore, signalling of downstream photosensory receptors is prevalent in multiple aspects of plant physiology.

What would you be if you were not a plant biologist?

I think that the answer to this question would have been different at different stages of my life. Now, perhaps I could be a sports coach because I enjoy physical activity. Anyway, I still prefer being a plant biologist.

What advice would you give?

A good scientist requires the combination of a particular set of skills. I would advise young scientists to analyse their status concerning each one of these skills. Your weakest skill is the one that limits your output; thus, you should seek for improvement in that area or choose a strategy to minimise the negative impact. In my view, the main skills are the following (not necessarily in order of importance): (i) the ability to give thought and dedicate time to critically analyse your next step and your hypotheses. It is crucial to define the most important issues to investigate and prioritise these; (ii) the commitment to reading the relevant literature. It is imperative to keep up with the latest developments to avoid repeating what has already been done. Available literature is the best place to uncover the most meaningful questions to address; (iii) good technical proficiency at the bench and at the computer. If you are slow or sloppy with your daily bench work, your career will suffer. Specifically in the age of large-scale biology, a good understanding of statistics will help you to take

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advantage of large data sets and give you confidence; and (iv) the ability to collaborate. Even if you have high scores at the other skills, there are aspects where other people can help. It is important to choose good collaborators and to trust them.

In hindsight, what in your research career has given you the most pleasure?

There are many things that I enjoy as a scientist. Of course, the discovery of new things is one of the main reasons why we have chosen this profession. I like both the magic moment when, after the results, you can think 'I knew it', and the surprise generated by the unexpected finding, which opens a new door in front of you. I also enjoy reading those papers by colleagues that make you think 'this is fantastic'. I like to feel the adrenaline before knowing the results of key experiments. The excellent students that I have found throughout my career are priceless and help to recharge my own enthusiasm for science.

What is your opinion on the second green revolution?

Food production has to increase at a faster rate to satisfy the expected demand of an increasing human population. We need a second green revolution but we should not take it for granted that it will happen, despite the vigorous increase in our knowledge of plant biology. The green revolution was based on a relatively simple concept; the use of semi-dwarf cultivars to increase lodging resistance and allow the application of nitrogen fertilisation to increase yield, plus the extra bonus of increased allocation of resources to yield. I do not think that we have a comparable powerful single concept of wide applicability in front of us to guide future improvement. A second green revolution might come from a sustained effort aimed at understanding basic plant biology and an unbounded exchange between scientists working at different levels, including molecular biologists, modellers, crop ecophysiologists, biotechnologists, and agronomists.