Q & A

David Baulcombe

David Baulcombe was born in the Midlands of the UK into a non-scientific family. He studied botany as an undergraduate at Leeds University (BSc 1973) and started his own research group at the Plant Breeding Institute in Cambridge after his PhD in Edinburgh (1977) and spells as a postdoc in Montreal and Athens Georgia. He has been in the Sainsbury Laboratory in Norwich since 1988 where he is a senior research scientist. His research interests have spanned plant hormones, root nodule symbioses, disease resistance, virology and over the last ten years have focused on RNA silencing and epigenetics. David has served as President of the International Society of Plant Molecular Biology and his research has been recognised by various awards, including elections to the Royal Society and the US National Academy of Sciences (foreign associate). His current interests include a systems approach to understanding the role of short silencing RNA in regulatory networks.

What influenced your path into biology? A school teacher, Mr. Garner, in my primary school. He made school exciting because you never knew what was coming up next. It must be enormously rewarding for good teachers for them to know that they shape the lives of young people so profoundly.

How did you decide on your current research topics? Through a series of accidents. In the mid 1980s someone asked me to make some DNA clones of plant viruses. It turned out to be more straightforward than what I was doing at the time and so I started to read about virology. I found out about all sorts of interesting virological phenomena — non-coding RNA molecules that induce lethal necrosis, for example, and an inducible virus immunity mechanism first described in 1927 — and my appetite was whetted. For the next ten years or so my lab delved in what a colleague recently referred to as the salt mines of virology and, in the process, we picked up on some strange results that led us to the immunity mechanism. It turned out that it was an RNA-mediated mechanism based on RNA silencing or RNA interference as it is sometimes known. I suppose I hoped that the understanding of these phenomena would lead to the 'important question'.

How do you write a grant application to investigate a phenomenon that 'does not make sense'? I did not have to. I have the good fortune to be generously funded by a charitable foundation with the instruction to 'do good science' and, consequently, I had the flexibility to follow up on interesting new angles as they arose. I wish that more scientists had this privilege: it would give them freedom that they may not have now and would release reviewers and grant panel members so that they too could get on with their research. The absence of tenure in my current job helps to focus my mind because, every five years, I have to justify the way that I have spent the funds available to me. If I fail to convince I would be looking for a postdoc job somewhere. Under these terms I think that past achievement is at least as good as a grant application as a predictor of future productivity.

So do you think that peer review is not effective? On the contrary — there should always be the opportunity for some peer reviewed grant applications and in scientific publishing it is an essential quality control. Of course it is not perfect. Bad papers do get through and good papers occasionally get rejected. When papers from my lab are rejected we normally take note of reviewers' comments, modify the text and add new data if appropriate and resubmit elsewhere. I do not normally engage in an argument with the editors. I have been surprised, as an editor, to see vitriolic comments from authors in response to rejection letters. Perhaps journals should publish a special section labelled 'rejected papers' for the work of these objectionable individuals.

Has your work been affected by the resistance in Europe to genetically modified crops? Not directly — most of the work we do is basic rather than applied. However, I can sympathise with the part of the anti-GM campaign in which the real target is industrialised agriculture. I have a feeling that, if we accounted for the full environmental and socioeconomic cost of industrial agriculture, we would end up with smaller and less intensively cultivated farms than we have at present – especially in Europe. Any reduction in yield could be partly offset, perhaps, by genetic enhancements introduced by modern breeding methods or by genetic manipulation of the crop plants.

I also think the GM debate is useful, on balance, because it means that European society is thinking through the implications of a powerful new technology before it is widely introduced. Wouldn't it have been a good thing if someone had done the same thing before the introduction of the motor car? But I do think that some of the objections to GM crops are overstated. In my own area, for example, it is frustrating to hear about virus diseases that could be addressed by RNA silencing in transgenic plants. I do not think there are plausible hazards from these plants but, at present and for the foreseeable future in Europe at least, they are not being grown. The use of GM to transfer plant genes between plants could also avoid some of the conjectured complications associated with the engineering of non-plant genes into plant crops.

So do you wish you worked on animals and could see your work used in medicine? Emphatically no. Plants are what we eat, and what we use to make our clothes, paper, housing and fuel; they fix

CO_2 and stop the planet from frying up; and they underpin the ecosystems and biodiversity that are central to sustainability. Also, they are excellent model organisms for fundamental processes in biology: *vide* Hooke, who discovered cells in cork in the seventeenth century; Mendel and genetics in peas; van Beijerinck who first described viruses in tobacco; McClintock and mobile genetic elements in maize; and many others. How could I want to work on anything else? Modern botany contributes both to medicine and environmental science.

What would you be if you were not a biologist? Probably an economist. I am concerned about the sustainability of current economic models that are dependent on growth and in which the currency is money rather than well-being and quality of life. Even in this other life, however, I might well find myself looking at cells and ecosystems as examples of complex, self-correcting systems that could be used as models for a new economics.

Economics is still science: what about a life outside science? I think it was Lewis Wolpert who referred to a truth in the arts and humanities that is unconstrained by reality. I feel very comfortable with another truth that is constrained by reality and so I have found my niche in science. We all use the unconstrained truth either consciously or not when we imagine, for example, and I have great admiration for the people that use this other way of thinking more completely than I do. I enjoy their paintings, music and writing and their presence in my life but I wouldn't want to fly in an airplane, cure disease or grow crops according to their unconstrained truth. Of course, if I did abandon reality completely, I would be a second Charlie Parker.

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Quick guide

Bonobos

Linda Vigilant

What is a bonobo? One of the last major mammal species to be formally identified, the bonobo (*Pan paniscus*) is still much less familiar to people than its close relative the chimpanzee (*Pan troglodytes*). Chimpanzees and bonobos look much alike, and the bonobo was formerly termed the 'pygmy chimpanzee', but use of this misleading moniker is now discouraged. Physical differences between the two species include a more slender build and longer head hair for the bonobo, along with a suite of behavioral differences. Even before the formal description of the species in 1929, which was based upon skull morphology, the pioneering primate behavior researcher Robert Yerkes noted the unusually pleasant temperament of a particular 'chimpanzee' — now known to be a bonobo — under his care. Scientists are still trying to understand how chimpanzees and bonobos turned out so differently despite living in apparently similar ecological environments.

How's their social life? Like chimpanzees, bonobos in the wild live in groups or 'communities' composed of multiple adult males and females and their offspring. In contrast to chimpanzees, bonobos appear much more egalitarian in their social interactions. Even though they leave their natal communities upon reaching maturity and settle in a new group, the females manage to form strong social bonds and exert social dominance over the males, an exceedingly unusual turn of events for primates. In practical terms this means that females have control over feeding resources, and face little retaliation for aggression directed towards males. Adult males

Ulindi is the dominant female in the bonobo group in the Wolfgang Koehler Primate Research Center at the Leipzig Zoo, where she is choosy about participating in psychology tests. (Photo: Michael Seres.)

retain strong bonds with their mothers, and one study of a wild group suggests that sons of high ranking mothers are particularly successful in the important matter of siring offspring. In keeping with their more peaceful reputation, bonobos have not been observed to engage in the cooperative hunting and consumption of monkeys so often enthusiastically practised by chimpanzees. While bonobo groups occupy specific territories, these can be highly overlapping and even matings across community lines have been reported, while aggressive patrolling of territory boundaries and fearful avoidance of neighbors is more typical for chimpanzees.

The bonobo characteristic that invariably elicits attention is their seeming tendency to have sex all the time. Not only is the frequency of sexual behavior remarkable, but also the manner — pairings can include all imaginable age and sex combinations. This is attributed to the use of sex not just for reproduction, but as a flexible social tool. Engaging in a copulatory bout can mark reconciliation, reduce tension, or elicit social or food benefits.