

THEMATIC ARTICLES

Keeping the Momentum in Auxin Research

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In May of 2000, many of the leading labs focusing on the mode of action of auxin, auxin homeostasis and transport, and auxin regulation of development met in a small room on a remote island. It was time to meet. A number of key breakthroughs in this vicissitudinous and recalcitrant field had been made and it was time to come together to assess the meaning of these results and to decide where to take them. The workshop, called Auxin 2000, was organized by Mark Estelle, Catherine Perrot-Rechenmann, and me. About 125 junior and senior scientists representing 12 nations, listened, argued, and pondered over mostly unpublished results. Many things were brewing. There were new surprises on the synthesis of auxin and homeostasis of its pools (Normanly and others 1997; Davies and others 1999; Hull and others 2000; Lasswell and others 2000; Barlier and others 2001; Zhao and others 2001). Auxin transport, especially in the complicated zone of the root, was coming into view with the identification and cellular localization of auxin transporters (Bennett and others 1996; Chen and others 1998; Galweiler and others 1998; Luschnig and others 1998; Steinmann and others 1999; Gil and others 2001) and with the role these played in tropisms (Marchant and others 1999; Rashotte and others 2000). New results on the stability and partner specificity of two large and interacting families of

auxin-related transcription factors raised hopes of understanding auxin-regulated gene expression while at the same time, revealing just how much of the iceberg was out of view (Zenser and others 2001; Schwechheimer and others 2001; Ulmasov and others 1997; Ulmasov and others 1999b; Ulmasov and others 1999a; Worley and others 2000). The arrival of genomics to the "auxin problem" piqued our interests at Auxin 2000 and we wait for its promises to be fulfilled. In the area of development, progress was made in the finding that auxin gradients provided positional information for cellular determination and the establishment of body plan (Sabatini and others 1999; Reinhardt and others 2000; Fischer-Iglesias and others 2001). It was recently found that many developmental mutants had defective auxin-related genes (Hardtke and Berleth 1998; Rouse and others 1998; Hamann and others 1999; Tian and Reed 1999; Harper and others 2000; Nagpal and others 2000; Nemhauser and others 2000; Chen and others 2001; Rogg and others 2001). In essence, at Auxin 2000, not just people but many different research areas came together, tethered by an interest in the action of auxin.

Since then, there has been a burst of new findings in this area, probably seeded by ideas, collaborations, and materials exchanged at Auxin 2000. To keep the discussions going until the next international auxin workshop, I have assembled a small sampling of speculations and viewpoints from a few participants at Auxin 2000. Bonnie Bartel and col-

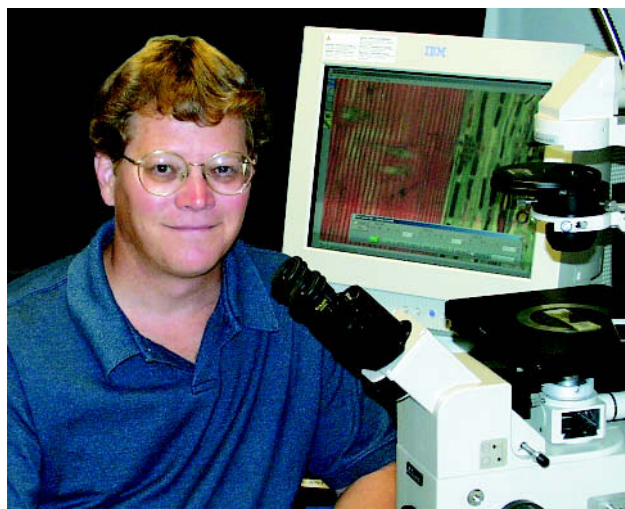


Figure 1. Alan M. Jones, Guest Editor

leagues bring us up to date on auxin synthesis and inactivation. Malcolm Bennett and colleagues discuss the movement of auxins into the cell while Gloria Muday describes movement of auxin out of the cell. Next, Richard Napier uses a long history on auxin binding research to assess the role of one mediator of auxin action called, ABP1. Jin-Gui Chen speculates on multiple pathways for auxin action and Sally Ward and Mark Estelle emphasize one of these, specifically the regulation of protein turnover. Protein turnover is a key concept behind the role of auxin-induced transcription factors as discussed by Qing Tian and Jason Reed in their attempt to bring together the interactions between auxin and light signal transduction. The factors they describe are short-lived partners to DNA-binding proteins called ARFs. Tom Guilfoyle and Gretchen Hagan describe the ARF family members and their role in gene expression. Finally, Thorsten Hamann wraps up this discussion and gives us a taste of what, I believe, will be the major focus at the next auxin workshop. Specifically, we must understand how all these auxin elements described above, plus information integrated from other signaling pathways, come to play in the organization of tissues, organs, and body plans and in the behavior of the plant.

It is an active and exhilarating time for the auxin field and we will see more of these forums and minireviews on auxin issues in coming months. Hopefully, these will recruit more ideas and people into the auxin circle.

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