All plant life is there

Robert Shields

Arabidopsis. Edited by Elliot M. Meyerowitz and Chris R. Somerville. *Cold Spring Harbor Laboratory Press: 1995. Pp. 1,300. $175.*

OPEN any of the glossier plant molecular biology journals and many of the articles feature *Arabidopsis*. Look in any journal of plant physiology, biochemistry or pathology and this tiny plant hardly rates a mention. Although *Arabidopsis* has become the virility symbol for plant molecular biologists who argue it is not size but what you do with it that counts, the wider plant community remains less than convinced.

The virtues of *Arabidopsis* for genetic studies — its short generation time, small size, prolific seed production and ease of chemical mutagenesis — are well rehearsed in this volume. The molecular biology really took off with the demonstration that genes could be simultaneously mutagenized and tagged by Agrobacterium-delivered T-DNA and with the realization that high-density genetic maps based on restriction-fragment-length-polymorphisms and the small genome size made positional cloning a possibility. The genome size is generally reckoned to be about a hundred megabases, the same size as that of the nematode *Caenorhabditis elegans*, seven times larger than that of baker's yeast but about a thirtieth of that of maize or man. And like yeast, *C. elegans* and man, *Arabidopsis* has spawned its own genome projects. At least two groups are randomly sequencing complementary DNAs to build libraries of expressed sequence tags and others are limbering up to sequence the entire genome.

Yet results from the yeast and the *C. elegans* genome projects already show us what the results of an *Arabidopsis* genome project are likely to be: large numbers of genes only a third of which have homology to genes in the database (and so whose functions can be guessed) and most whose function will be obscure. At least in yeast a specific gene of unknown function can be selectively mutated by homologous recombination to see what effect its deletion has (none in most cases); targeted gene knock-out is some way off in plants. We already know from T-DNA and transposon-tagging experiments that most non-targeted insertions into the *Arabidopsis* genome (and many of these will be in genes) fail to produce a phenotype (or at least one that is evident to a molecular biologist). To paraphrase an apposite quotation from Sydney Brenner (admittedly made in 1982 — I wonder if he believes it still?), molecular biologists study known genes and their known products, biochemists study the known products of unknown genes, geneticists study known genes and their unknown products, only lunatics study the unknown products of unknown genes. Could it be that the impetus for these genome projects comes more from the desire of granting agencies to have projects with 'timescales', 'milestones' and 'deliverables', to use the currently fashionable management Newspeak, rather than projects that approach interesting scientific questions? For there are plenty of those, as this volume amply demonstrates.

Thanks to efforts of molecular biologists working with mutants of *Arabidopsis*, we have discovered in the past few years a lot more about the mechanism of action of the plant hormones, circadian rhythms, response to light and many other topics than had been learned by plant physiologists in the previous decades. And the pace is accelerating, so much so that even though the papers in this volume date from 1994, some have been overtaken by events.

Apart from what can be learned about what makes a plant tick, the genetic resolution offered by *Arabidopsis* can give insights into questions of interest to plant breeders. What for instance is the genetic basis of heterosis (where a hybrid plant is superior to the parental lines)? Is it due to single genes with true heterozygotic advantage (as hybrid-seed merchants would have one believe) or closely linked genes having simple dominant alleles in a *trans* configuration? What of quantitatively inherited traits (that is traits governed by several genes with different effects and influenced by the environment) and which are so important for plant improvement? Because one can have absolute control over the environment of *Arabidopsis* (just alter the conditions in the incubator), these plants offer the possibility of resolving quantitative traits into their individual genes.

This book, running as it does through plant systematics, genetics, developmental biology, hormones, the chloroplast, pathology, the cell wall, metabolism and many other topics, should be dipped into by plant physiologists, biochemists and breeders and should convert doubters to the virtues of the weed. □

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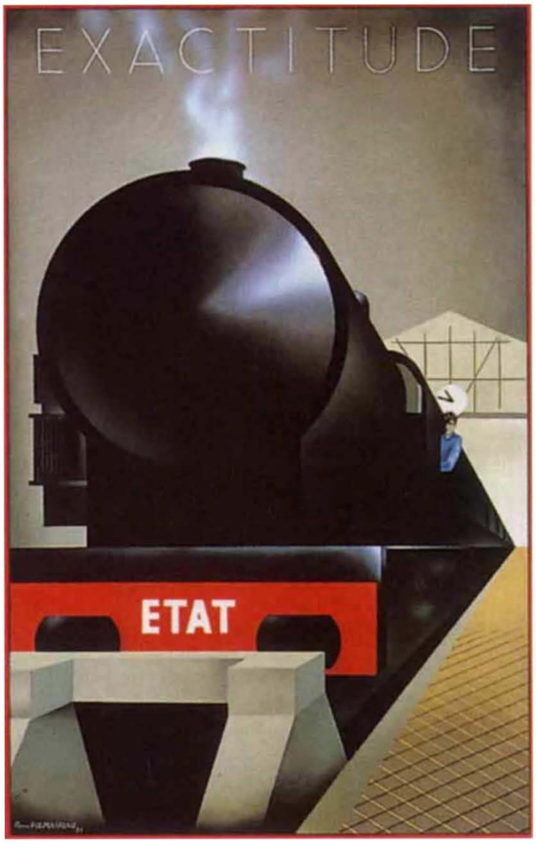

Exactitude **by Pierre Fix-Masseau. The drawing is reproduced on the cover of *The Value of Precision* edited by M. Norton Wise, which looks at the role of precision in the evolution of science and its importance in Western culture. Written by distinguished historians of science, the essays support the view that centralized states — with their increasingly widespread bureaucracies for managing trade, taxation and armies — and large-scale commercial enterprises — with their requirements for standardization and mass production — have been the key promoters of numerical exactitude. Topics range from the measurement of the population of France to the electrical resistance of copper to the solvency of insurance companies. Princeton University Press, $49.50, £35.**