Jacobsen, 2011
(modified 2014)

Air Injection of Vessels
(for Maximum Vessel Length Determination)

Based on the methods originally introduced in this paper:

AN APPROACH TO THE STUDY OF VESSEL LENGTH IN HARDWOOD SPECIES[1]

K. N. H. Greenidge

American Journal of Botany, Vol. 39, No. 8 (Oct., 1952), pp. 570-574

And described in this paper:

American Journal of Botany

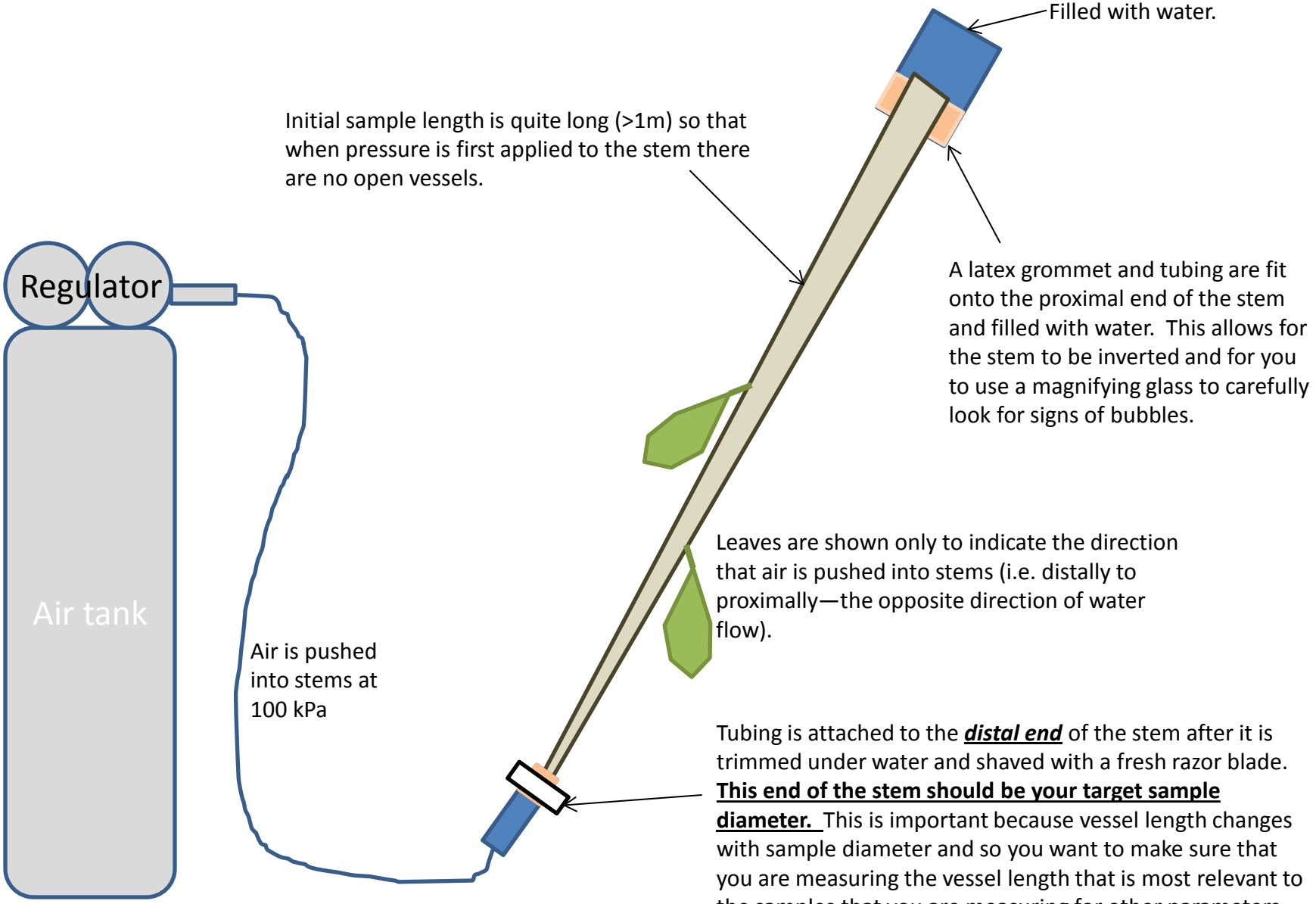
American Journal of Botany 99(10): 1583–1591. 2012.

SPECIAL PAPER

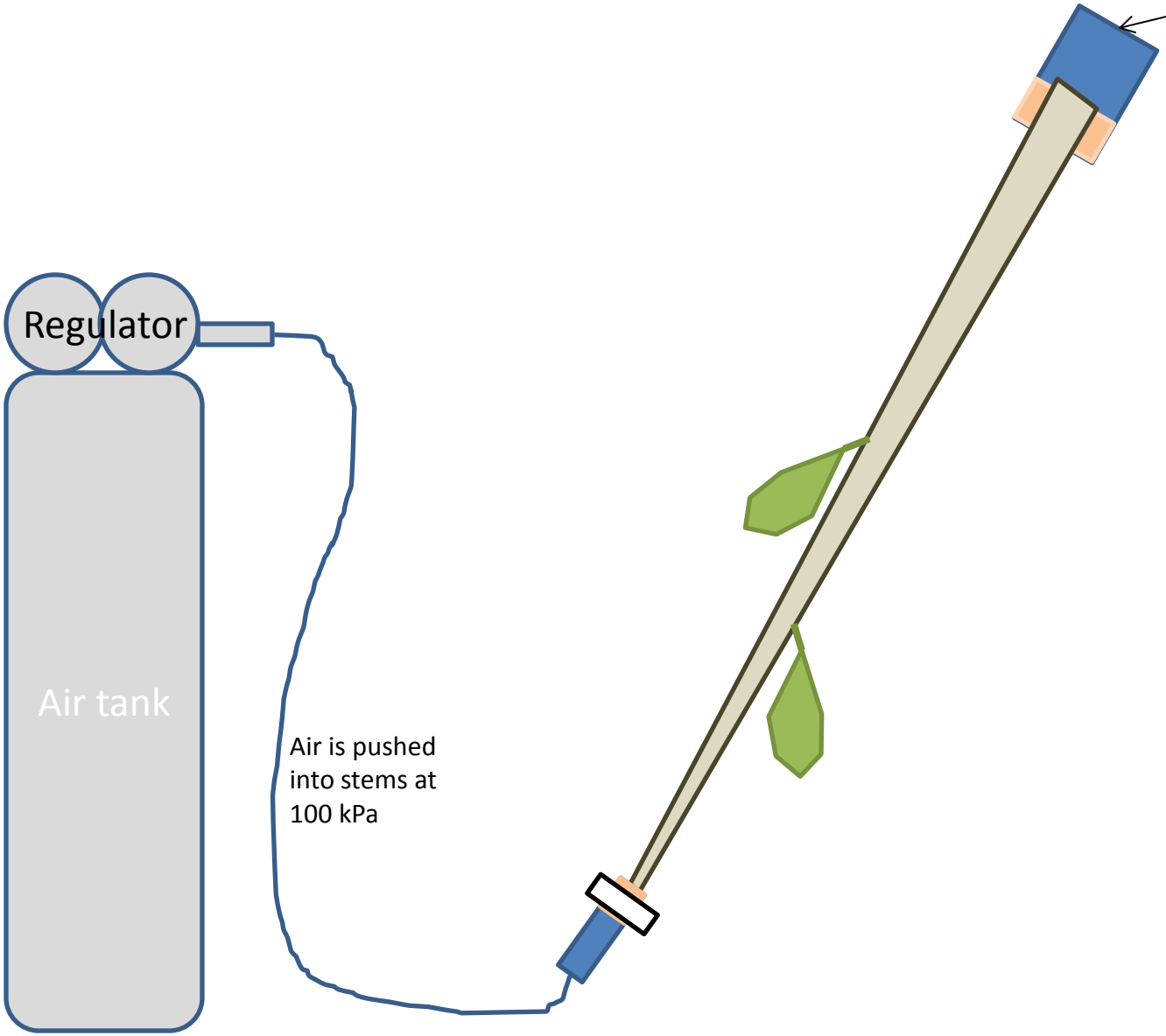
A GLOBAL ANALYSIS OF XYLEM VESSEL LENGTH IN WOODY PLANTS[1]

ANNA L. JACOBSEN[2,5], R. BRANDON PRATT[2], MICHAEL F. TOBIN[2], UWE G. HACKE[3], AND FRANK W. EWERS[4]

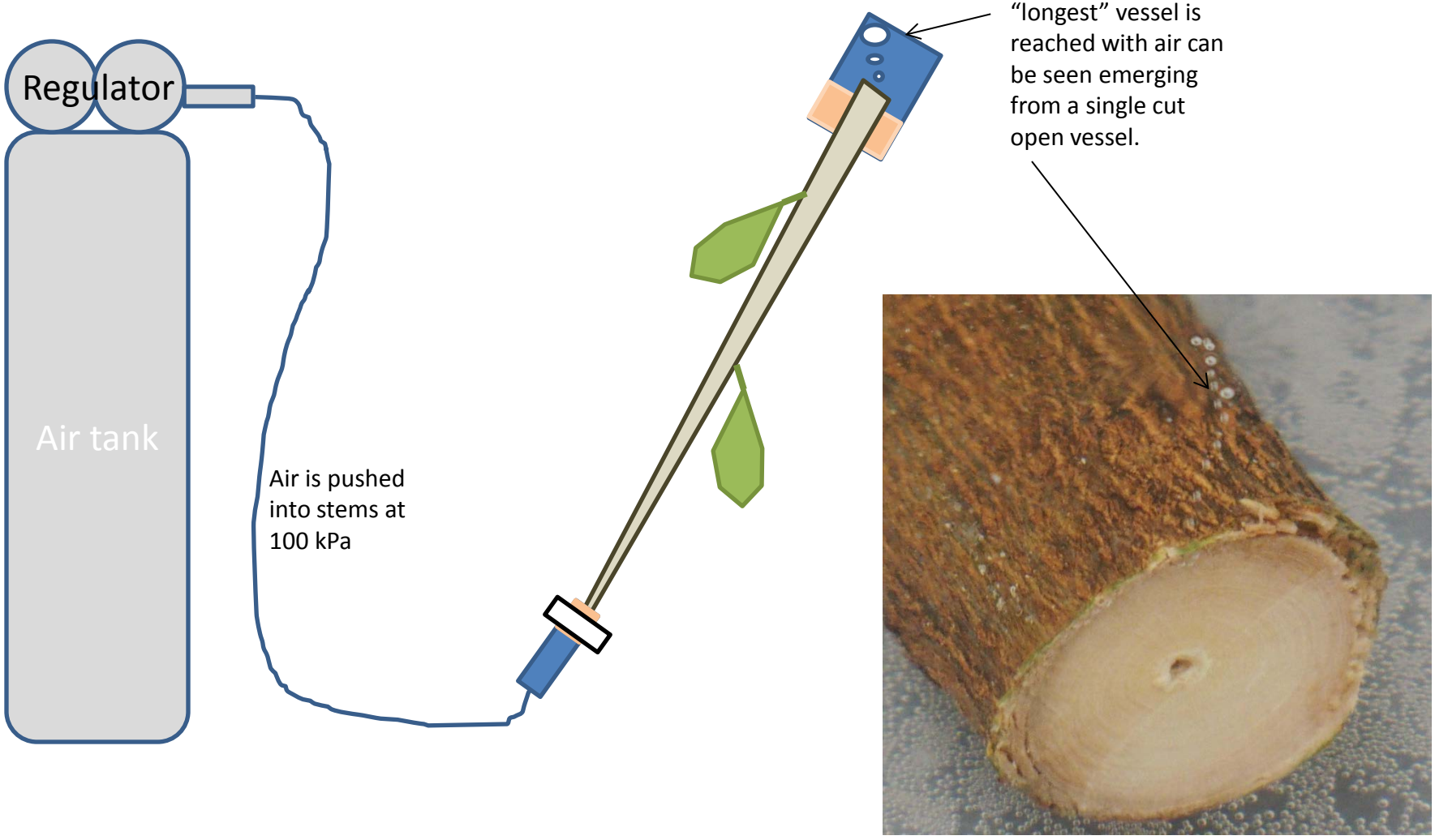
Jacobsen, 2011
(modified 2014)



Jacobsen, 2011
(modified 2014)



Jacobsen, 2011
(modified 2014)



A note on this technique:

We have found that this technique produces different maximum vessel lengths when different pressures are used for the air-injection (i.e. using 30 kPa instead of 100 kPa results in shorter vessel length estimates and 500 kPa results in much longer estimates).

This suggests that this technique is not measuring the length of the longest vessel *per se*, but is rather measuring the longest (multiple-)vessel pathway through which air can travel at a given pressure. **Thus, the length of the "longest" vessel measured with this technique is most likely the length of more than a single vessel.** Air is probably able to move through a very large pit pore or a damaged pit membrane at these relatively modest pressures (these conduits would probably not be functional in the intact plant because they would not be able to maintain flow under negative pressure).

This technique still gives you an estimate of how far air could move through sample, even if it is not telling you the exact longest vessel length and maximum vessel length measured with this technique correlates well to other measures of mean vessel length (see Jacobsen et al. 2012 AJB). In my lab, we have found that maximum vessel lengths measured using this pressure are predictive of (but much longer than) mean vessel lengths as measured using the silicon injection technique.

Even with this pressure sensitivity, the most commonly used (and therefore, the "standard") pressure is 100 kPa for stems and some researchers report using 50 kPa for roots.