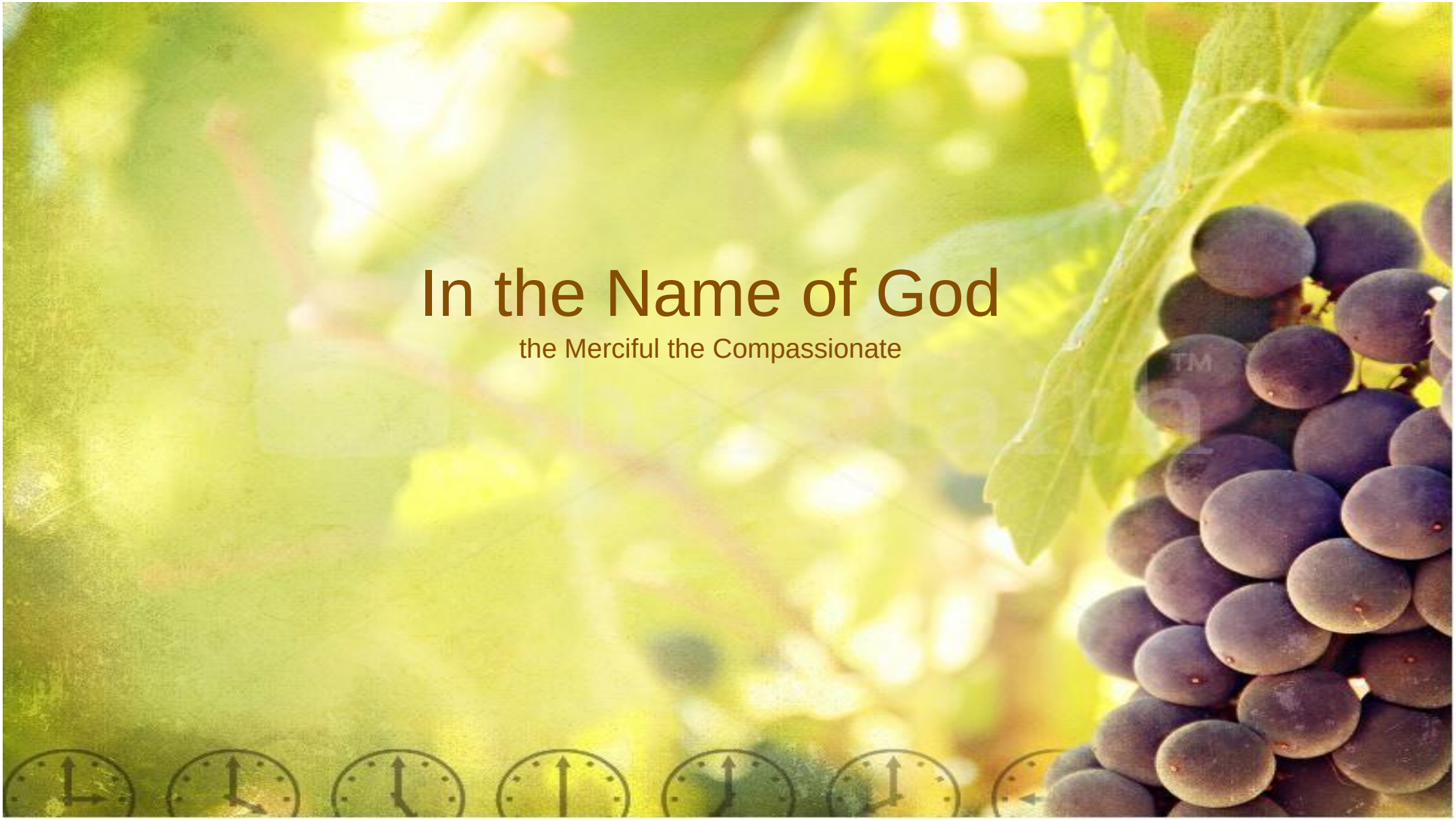
In the Name of God
the Merciful the Compassionate

Small Fruits (advanced)

M. Gholami

GRAPES

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A catalogue record for this book is available from the British Library, London, UK.

Library of Congress Cataloging-in-Publication Data

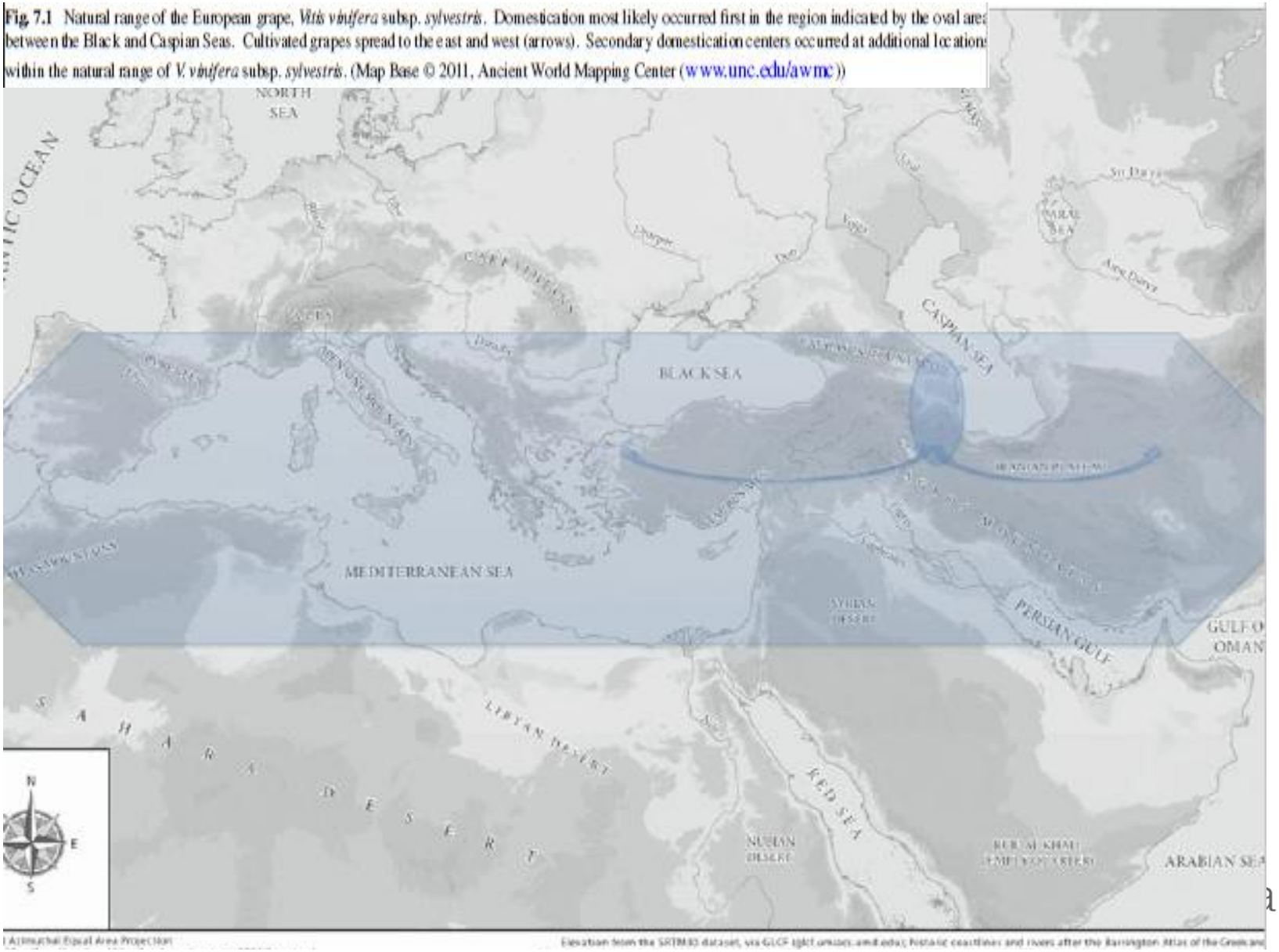

Fig. 7.1 Natural range of the European grape, *Vitis vinifera* subsp. *sylvestris*. Domestication most likely occurred first in the region indicated by the oval area between the Black and Caspian Seas. Cultivated grapes spread to the east and west (arrows). Secondary domestication centers occurred at additional locations within the natural range of *V. vinifera* subsp. *sylvestris*. (Map Base © 2011, Ancient World Mapping Center (www.unc.edu/awmc))

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Plate 1. *Vitis riparia* grapes growing wild in the North East of the United States. The berries are densely coloured and strong of flavour.

Fig. 1.1. *Vitis riparia* smothering a tree in an upstate New York winter.

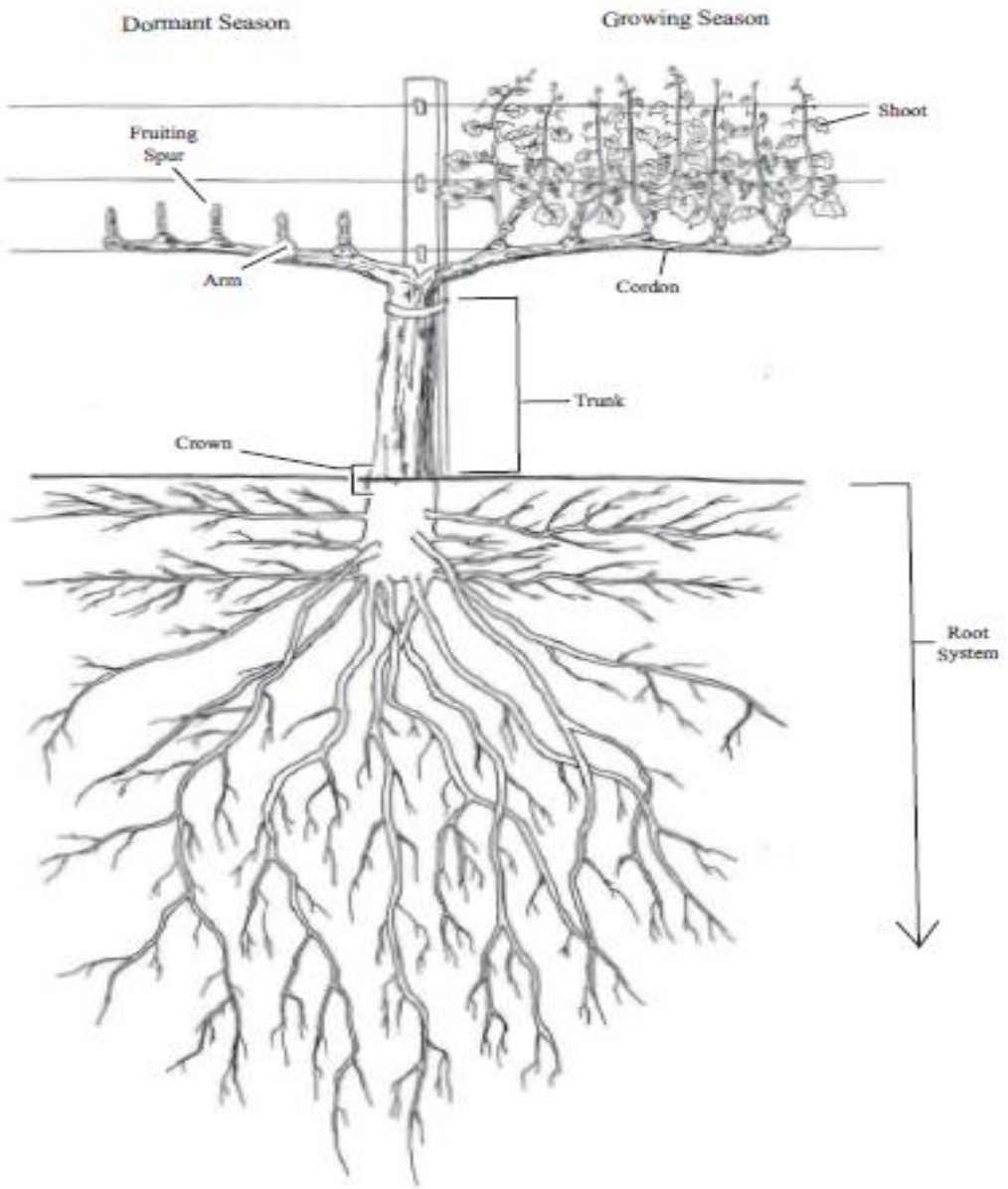


Figure 2. Grapevine structures and features: self-rooted vine. Drawing by Scott Snyder.

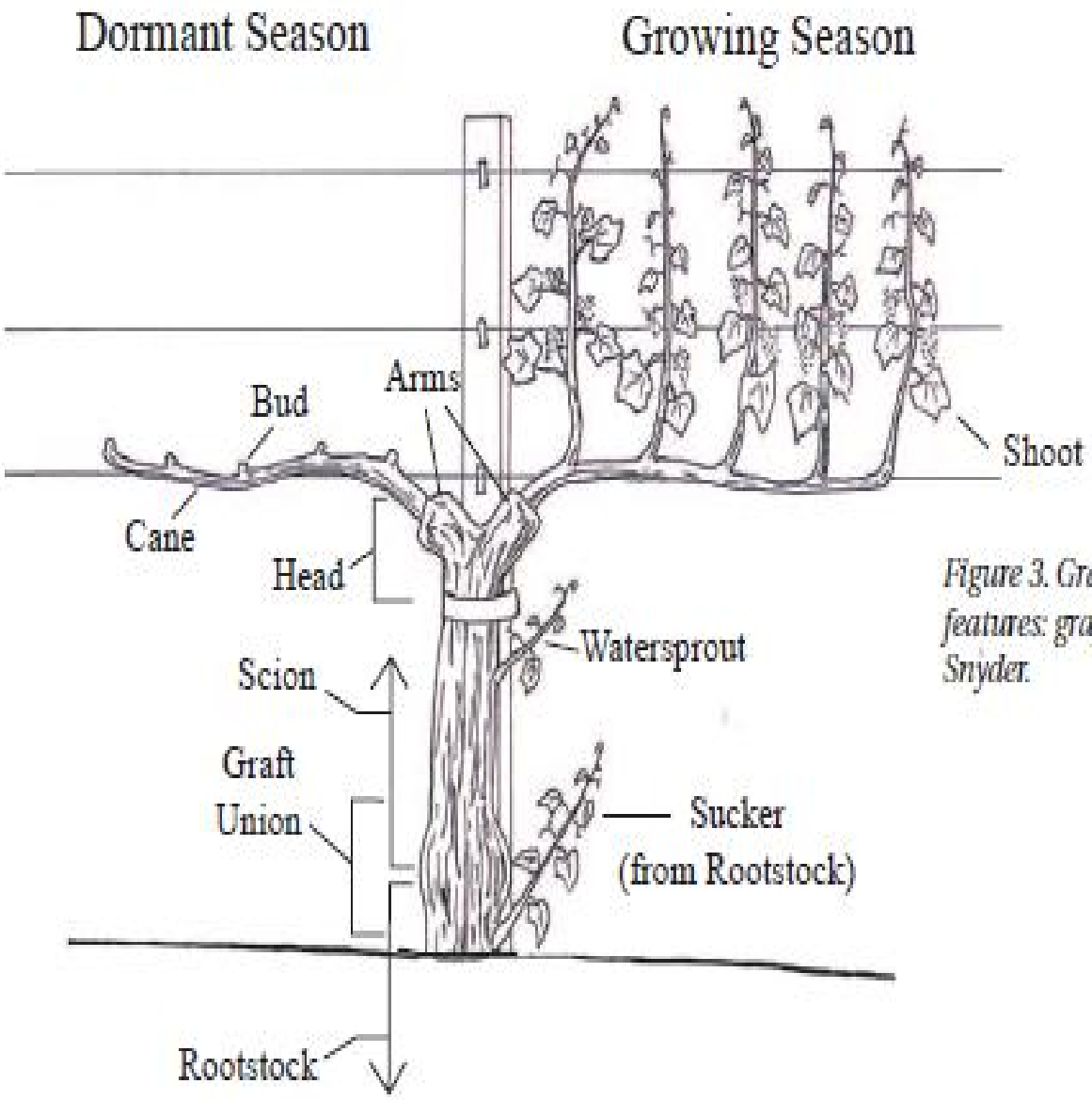
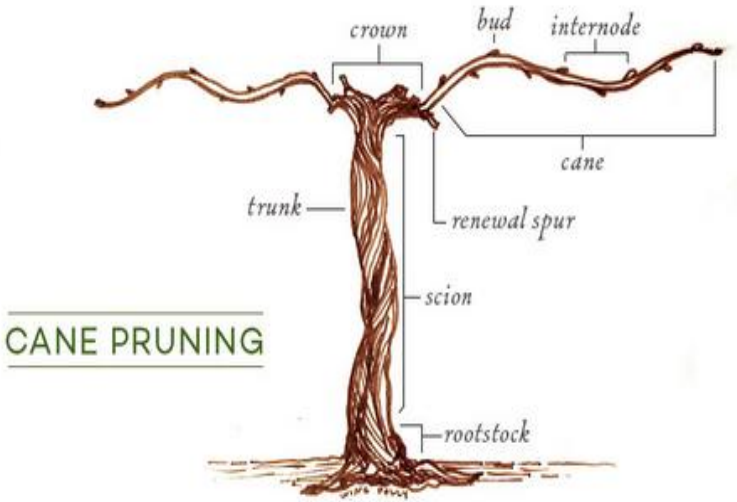
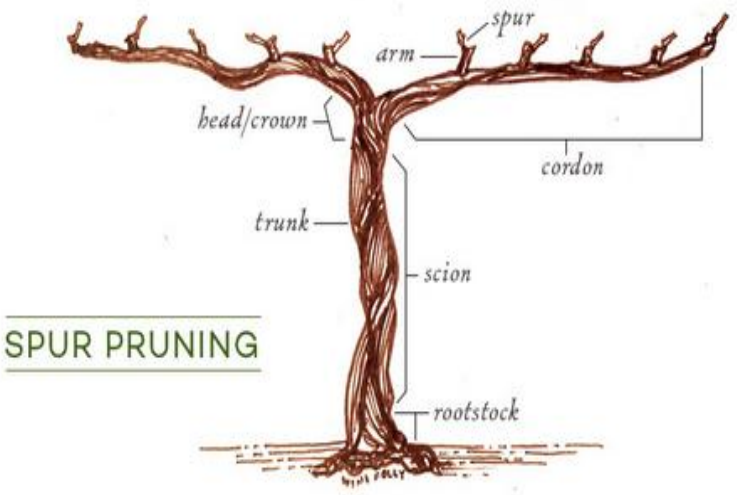


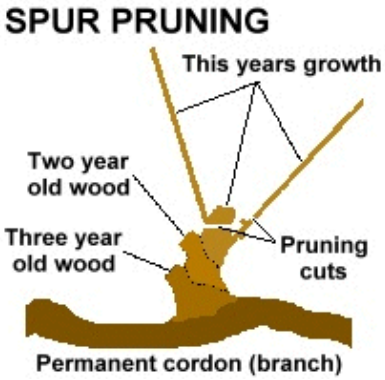
Figure 3. Grapevine structures and features: grafted vine. Drawing by Scott Snyder.



CANE PRUNING



SPUR PRUNING



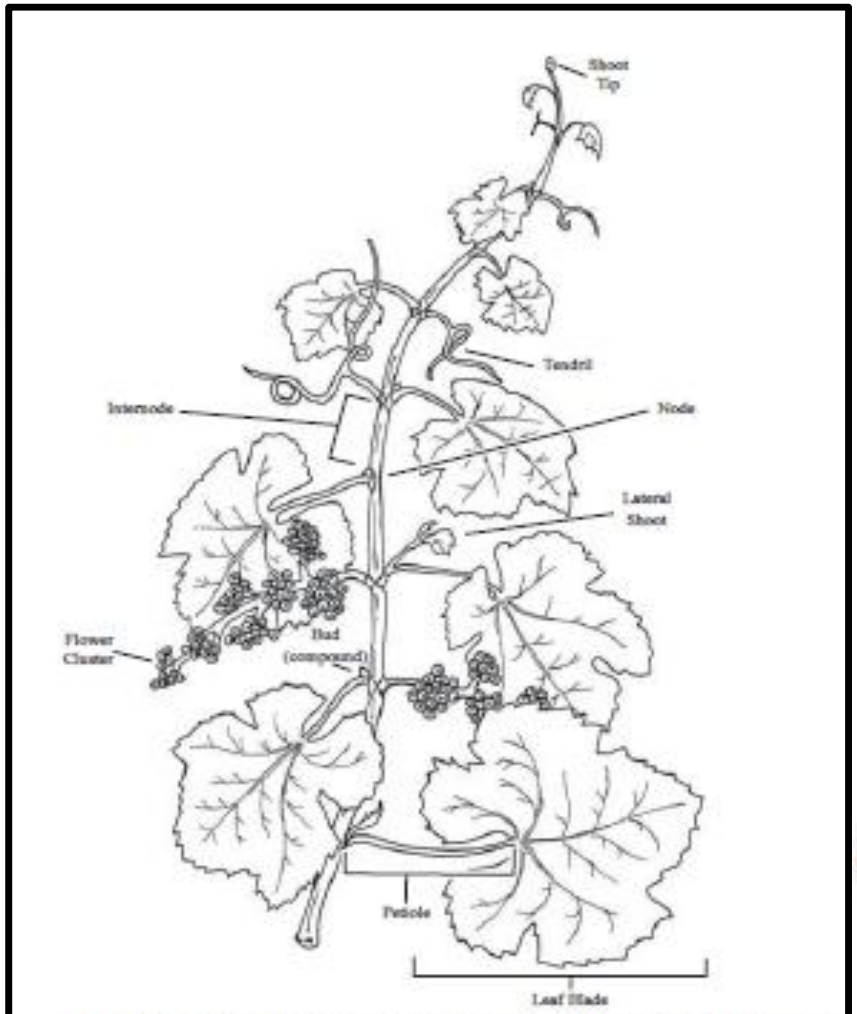
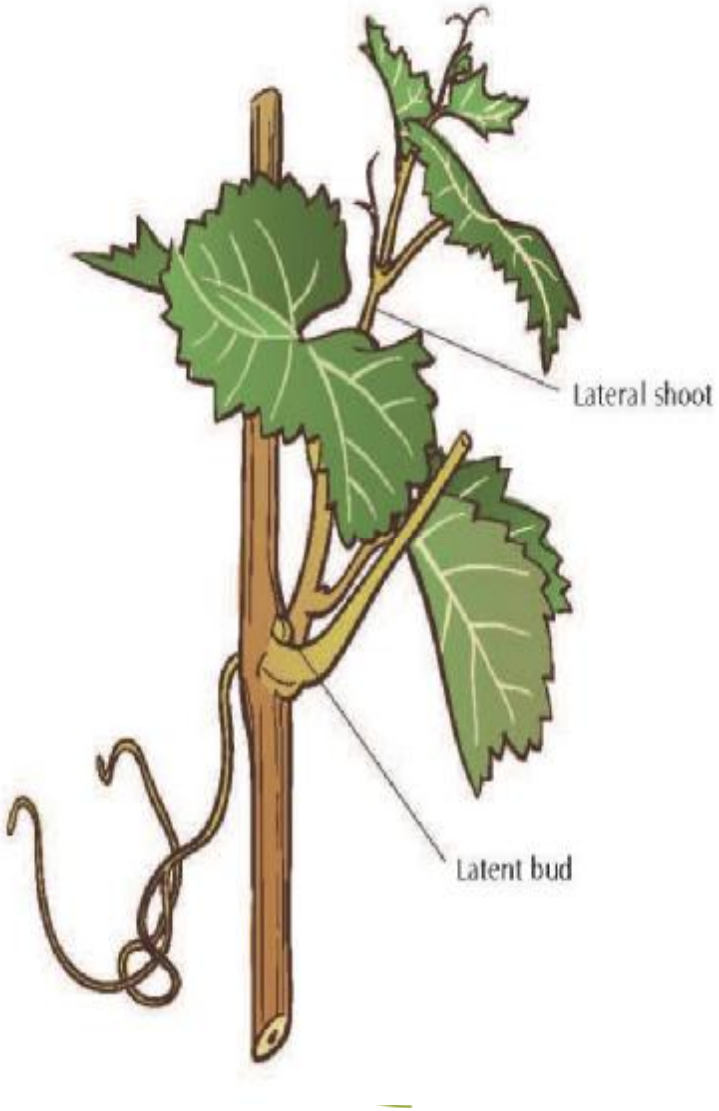
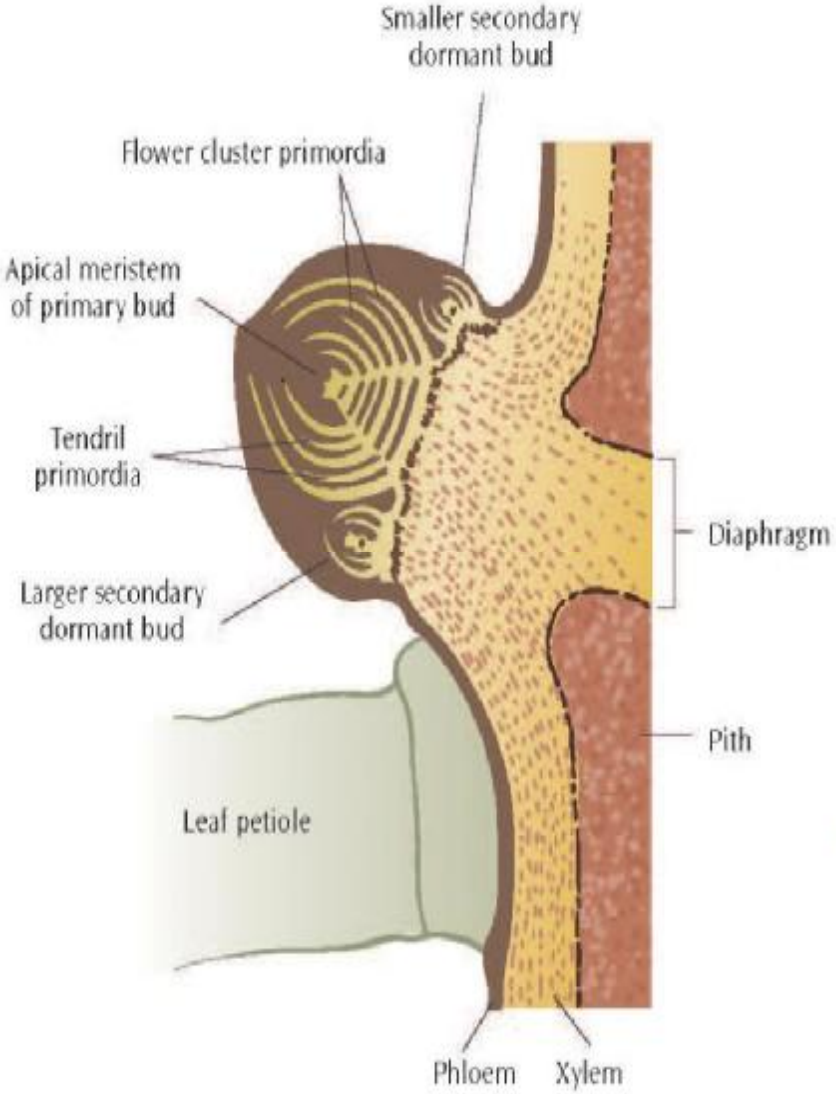
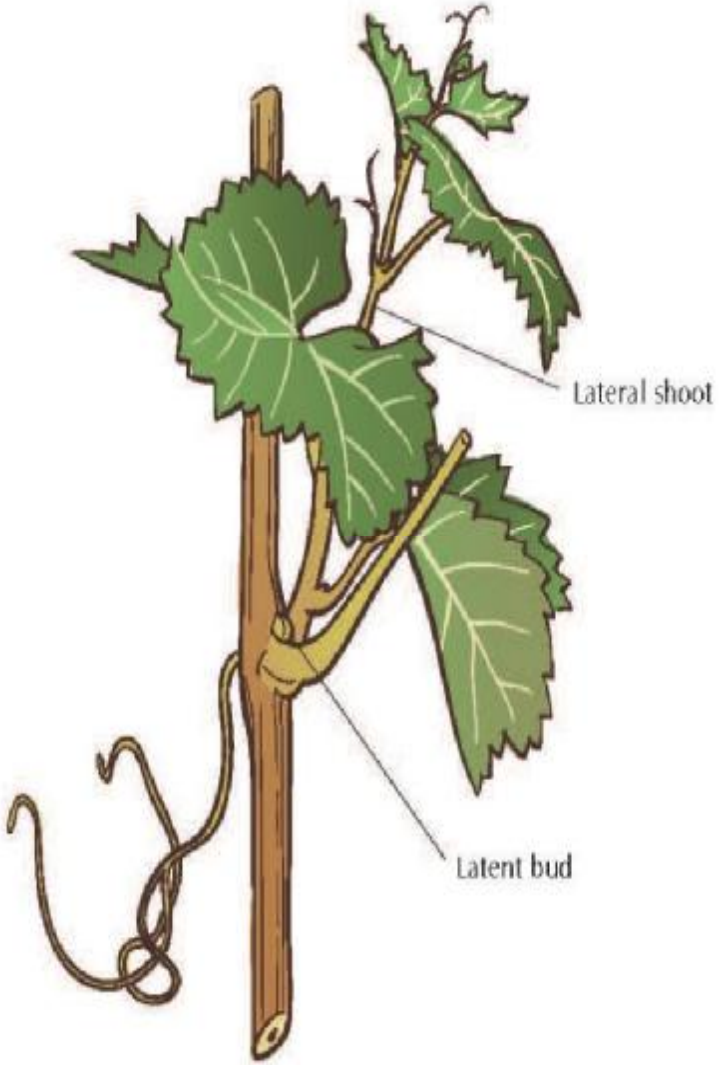


Figure 4. Principal features of a grapevine shoot prior to bloom. Drawing by Scott Snyder.







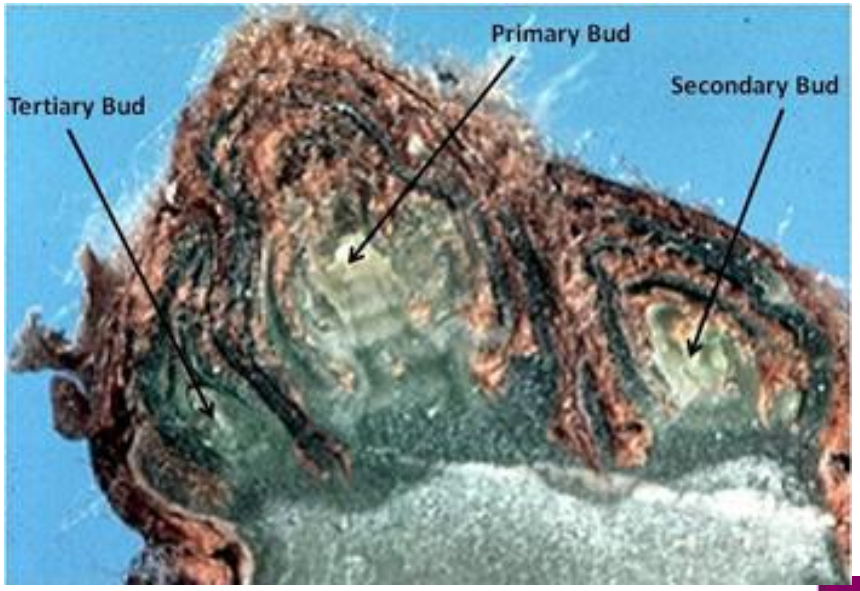


Figure 2b

2

Plate 2. Grape cluster showing individual florets, some of which have their fused petals (calyptra) separating from the basal part of the flower (top and left).

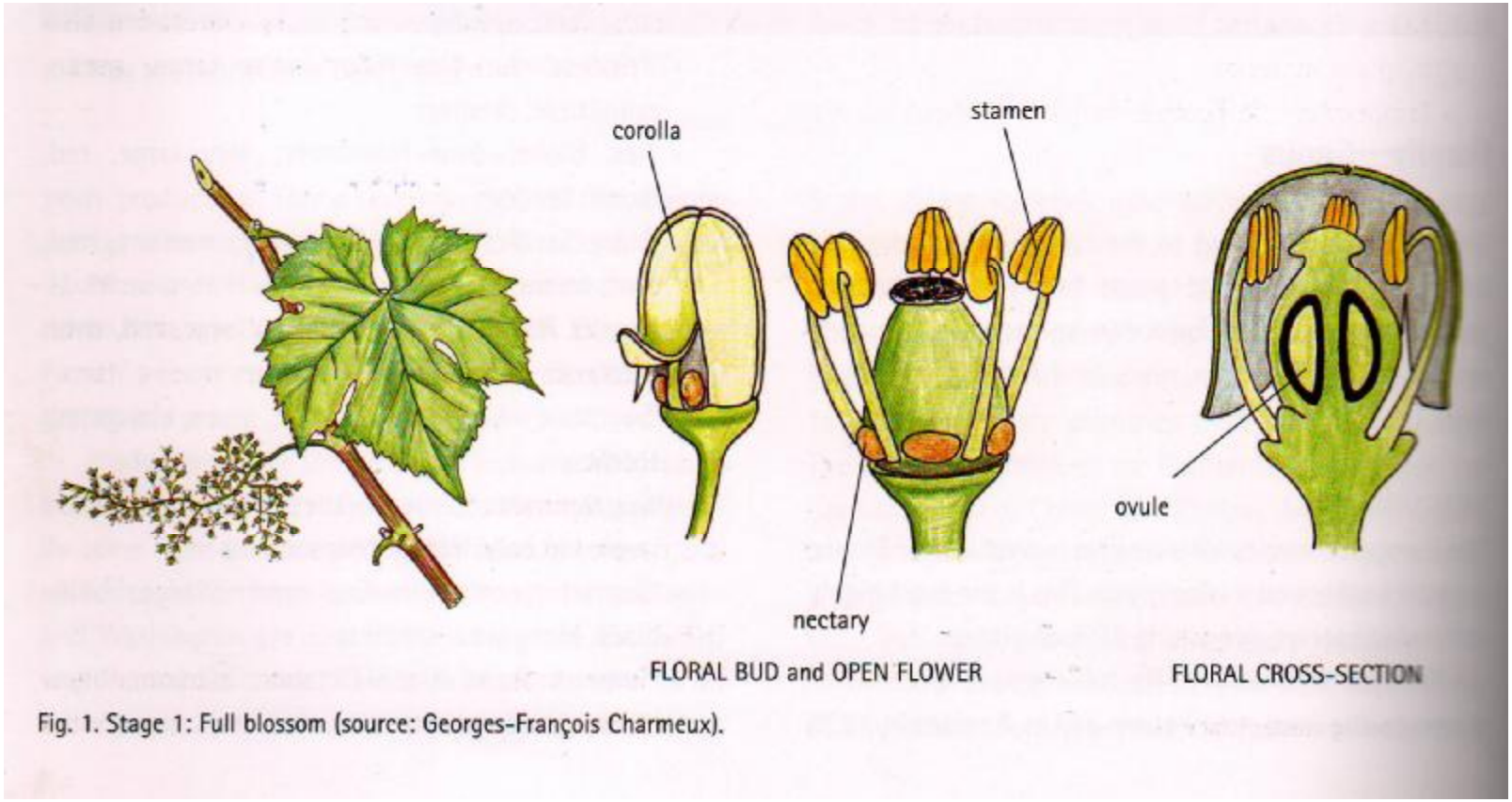


Fig. 1. Stage 1: Full blossom (source: Georges-François Charmeux).

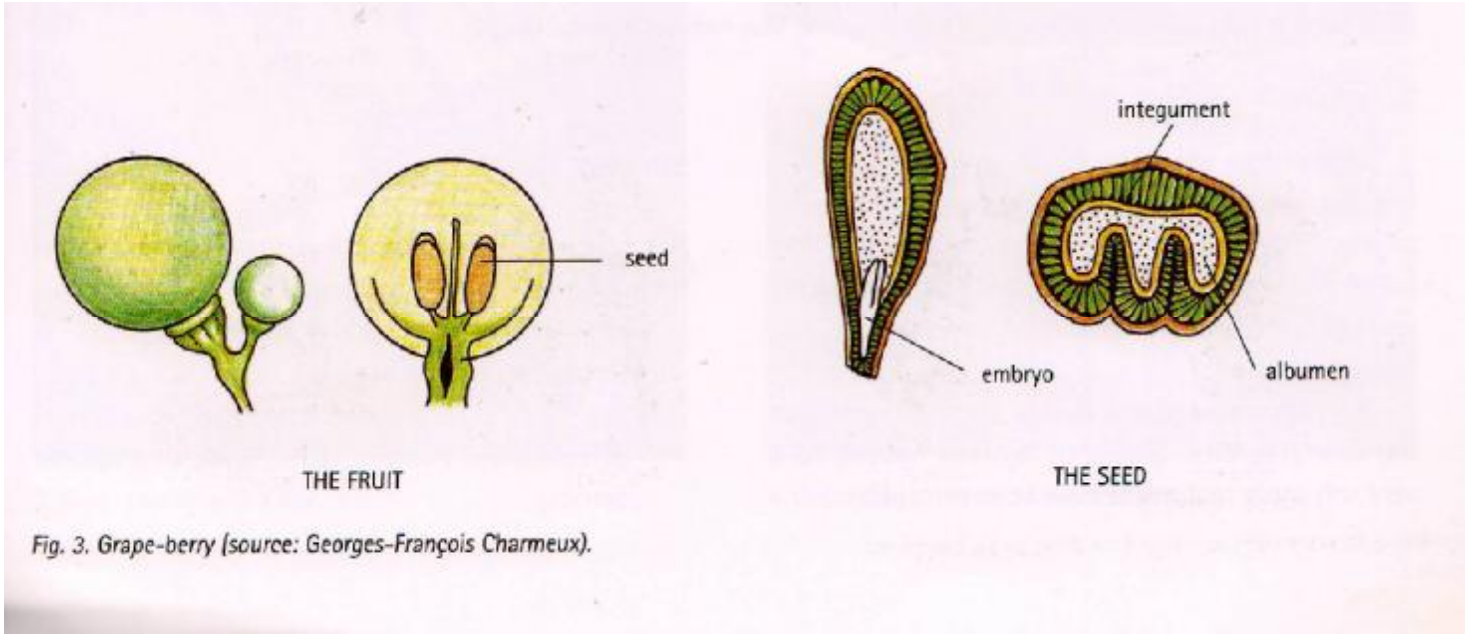


Fig. 3. Grape-berry (source: Georges-François Charmeux).

3

Plate 3. Examples of Sultana (left; also known as Thompson Seedless. This cluster has not been grown for commercial table grape production and so the berries are smaller than those found on clusters in a shop) and Einset Seedless (right; a French-American hybrid grape) clusters.

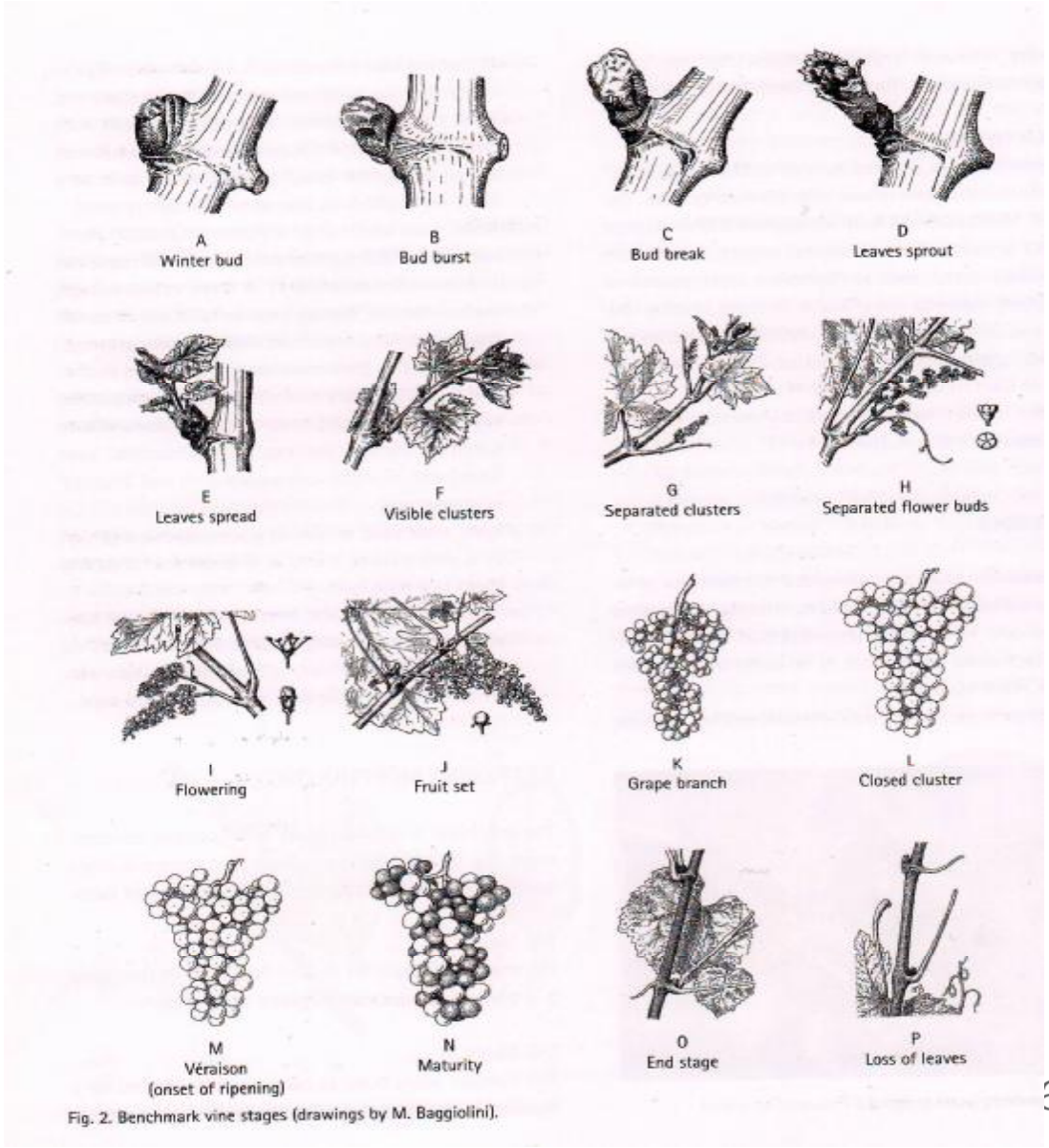
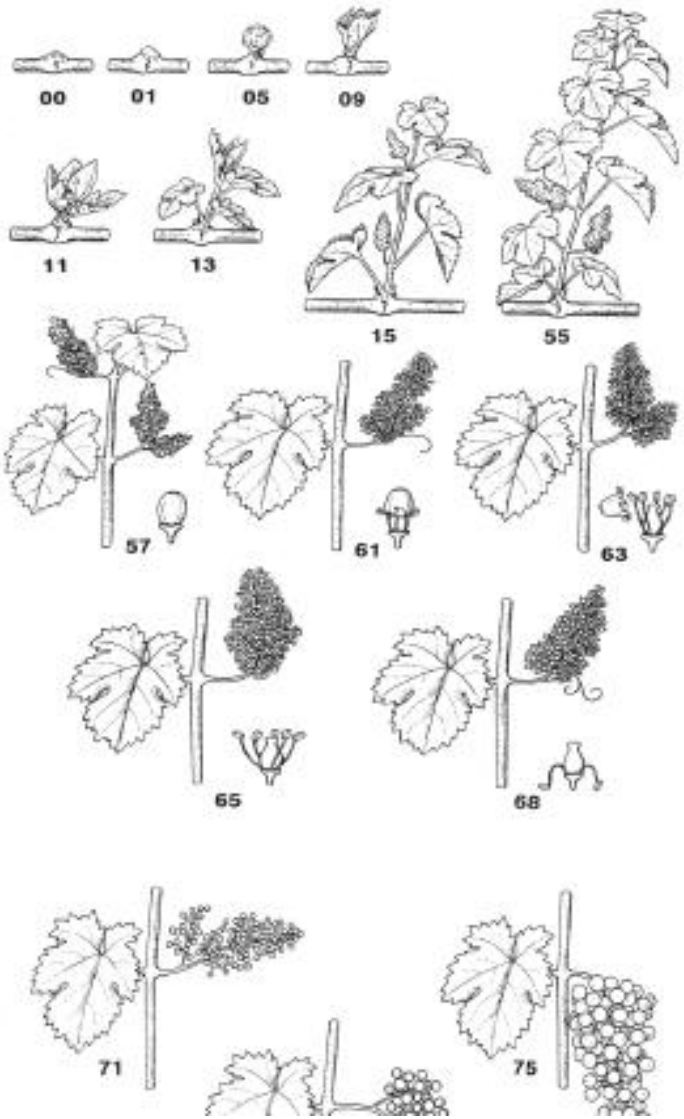


Fig. 2. Benchmark vine stages (drawings by M. Baggiolini).



Principal growth stage 0: Sprouting/Bud development

00	Dormancy: buds pointed to round, light or dark brown according to variety; bud scales more or less closed according to variety
01	Beginning of bud swelling: buds begin to expand inside the bud scales
03	End of bud swelling: buds swollen, but not green
05	"Wool Stage": brown wool clearly visible
07	Beginning of bud burst: green shoot tips just visible
08	Bud burst: green shoot tips clearly visible

Principal growth stage 1: Leaf development

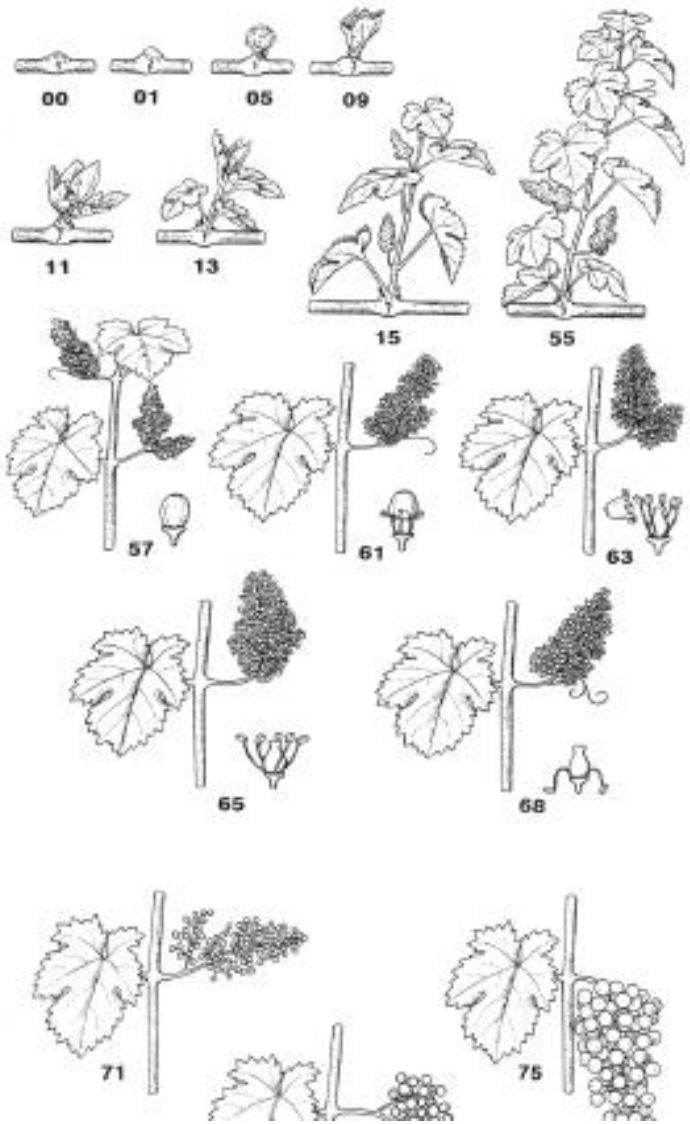
11	First leaf unfolded and spread away from shoot
12	2nd leaves unfolded
13	3rd leaves unfolded
14	Stages continuous until...
19	9 or more leaves unfolded

Principal growth stage 5: Inflorescence emerge

53	Inflorescences clearly visible
55	Inflorescences swelling, flowers closely pressed together
57	Inflorescences fully developed; flowers separating

Principal growth stage 6: Flowering

60	First caps detached from the receptacle
61	Beginning of flowering: 10% of caps fallen
62	20% of caps fallen
63	Early flowering: 30% of caps fallen
64	40% of caps fallen
65	Full flowering: 50% of caps fallen
66	60% of caps fallen
67	70% of caps fallen
68	80% of caps fallen
69	End of flowering



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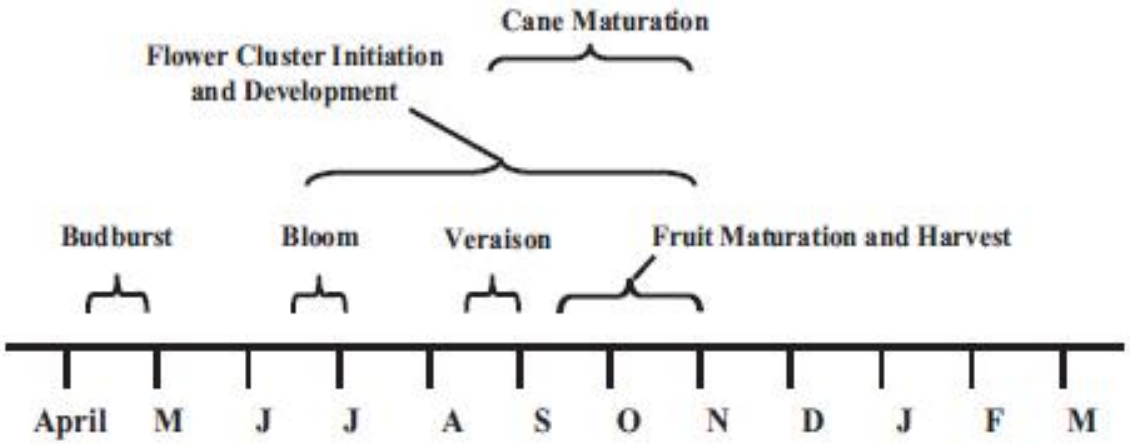

Figure 8. Annual cycle of grapevine growth.Figure by Ed Hellman.

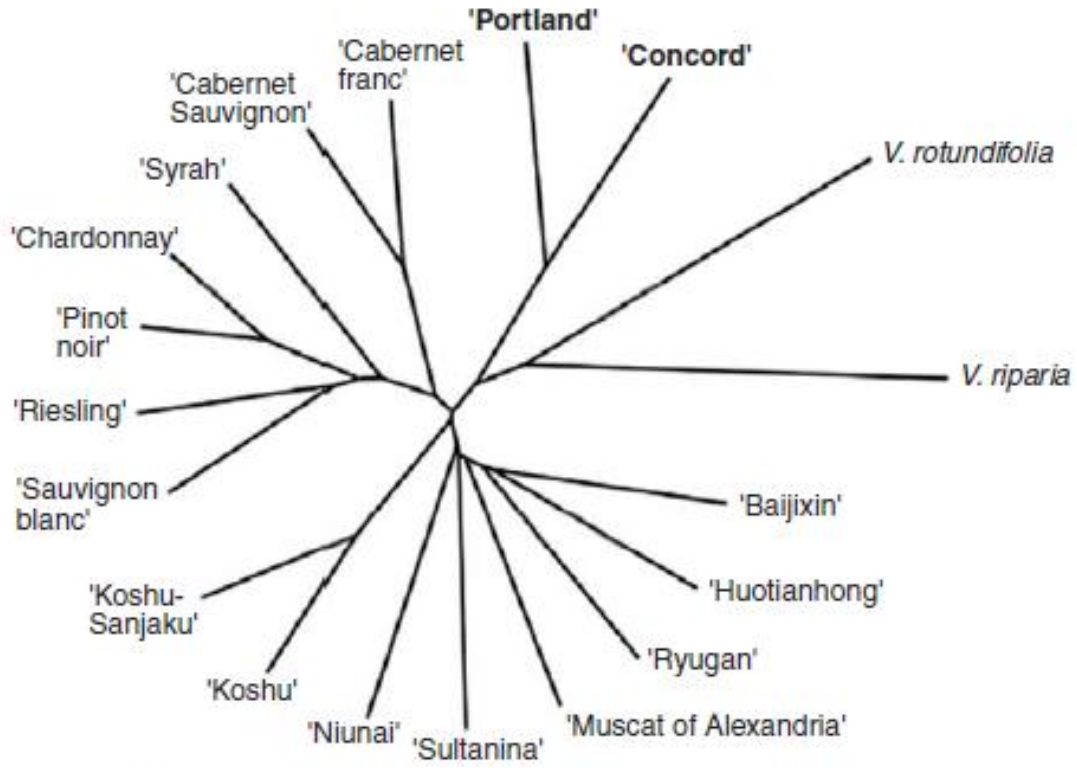

Fig. 2.1. A diagram representing the genetic similarity of grape species and cultivars through the length of the lines between them (reproduced with permission from Goto-Yamamoto *et al.*, 2006).

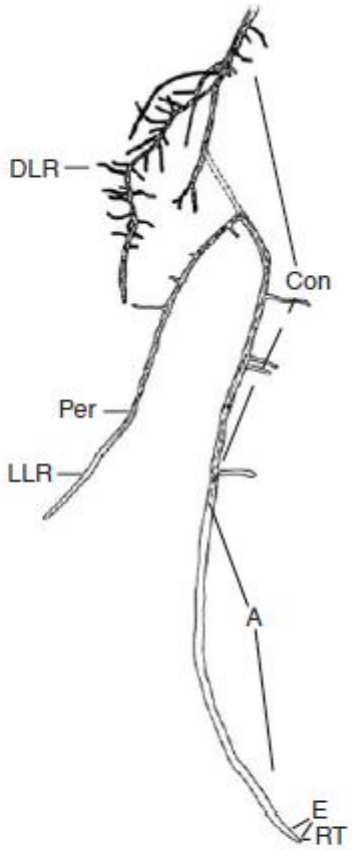

Fig. 2.2. Root of *Vitis vinifera* ('White Riesling') showing actively growing and inactive or dead portions. A, zone of absorption; Con, zone of conduction; DLR, dead lateral root; E, zone of cell elongation; LLR, living lateral root; Per, periderm; RT, root tip (reproduced with permission from Pratt, 1974).

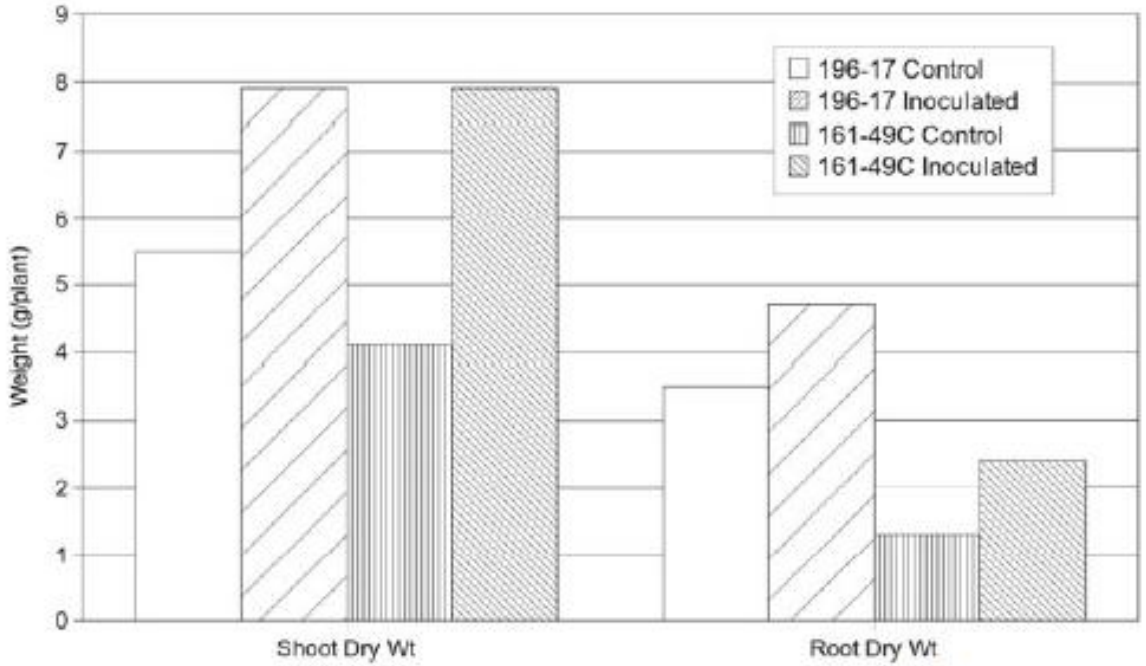

Fig. 2.3. The effect of inoculating two different rootstocks in grafted nursery vines with mycorrhizae. Both shoot dry weight and root dry weight were increased through the use of the mycorrhizal fungus *Glomus aggregatum* (reproduced with permission; redrawn from Aguín *et al.*, 2004).

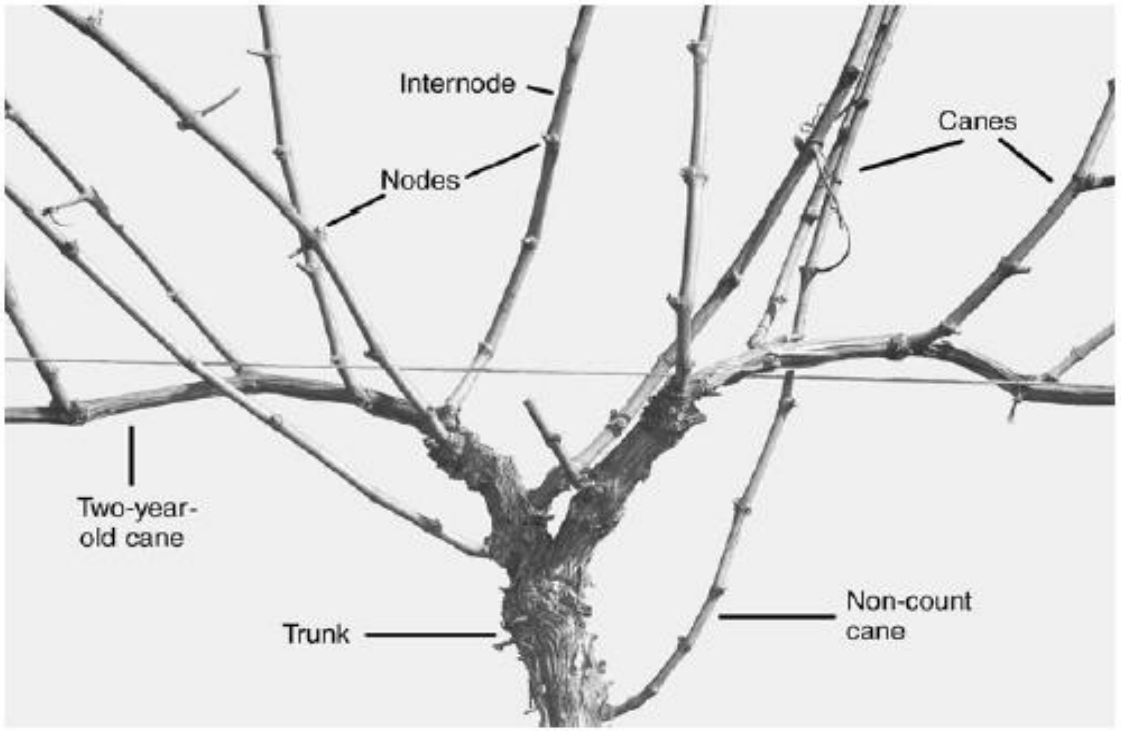

Fig. 2.4. Photograph of a dormant, cane-pruned vine showing the trunk, 2-year old canes, new canes, a non-count cane, nodes and internodes.

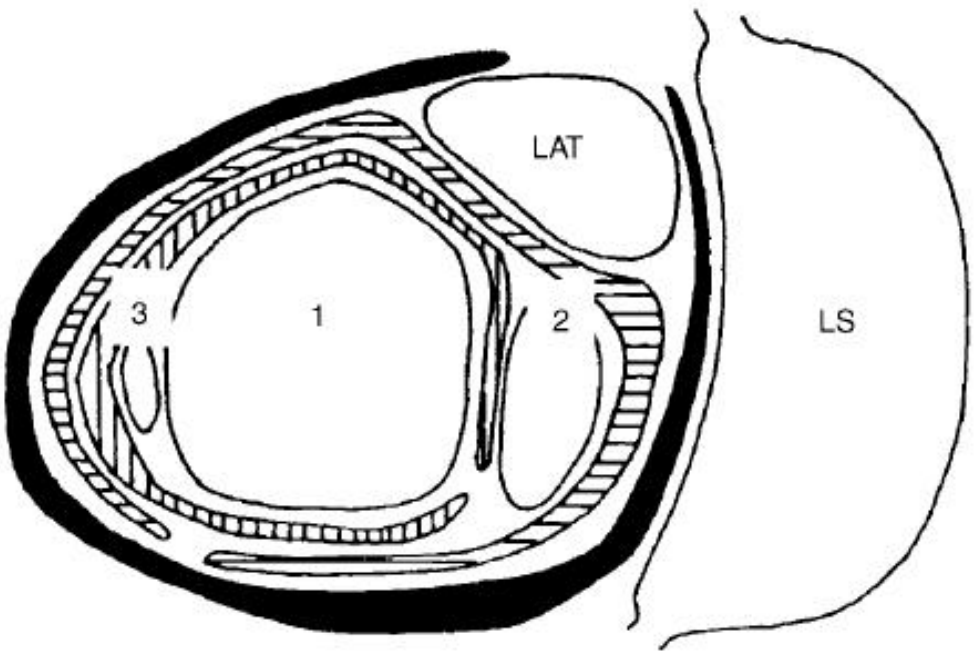

Fig. 2.5. Diagram of a transverse section through a compound bud (eye) of *Vitis labrusca* ('Concord') showing relative positions of leaf scar (LS), lateral shoot (LAT, also known as the axillary bud) and three dormant buds (1, 2 and 3) (reproduced with permission from Pratt, 1974).

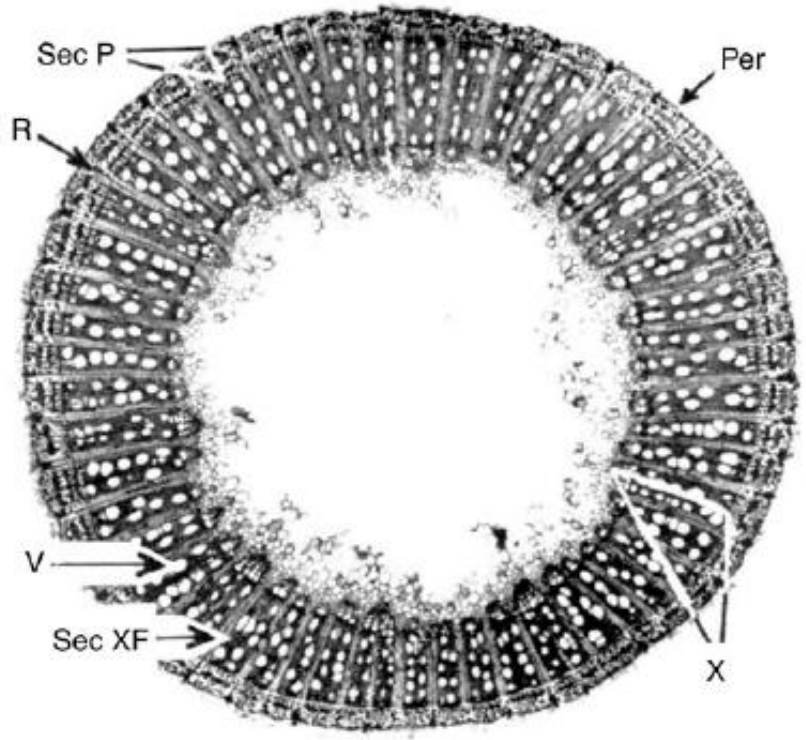

Fig. 2.6. Cross-section of a 1-year-old grapevine shoot of *V. vinifera*. Per, periderm; Sec P, secondary phloem; X, primary xylem; Sec XF, secondary xylem fusiform cell; R, ray; V, xylem vessel. Note that the centre of the shoot is open – the cortical cells have collapsed (reproduced with permission from Pratt, 1974).

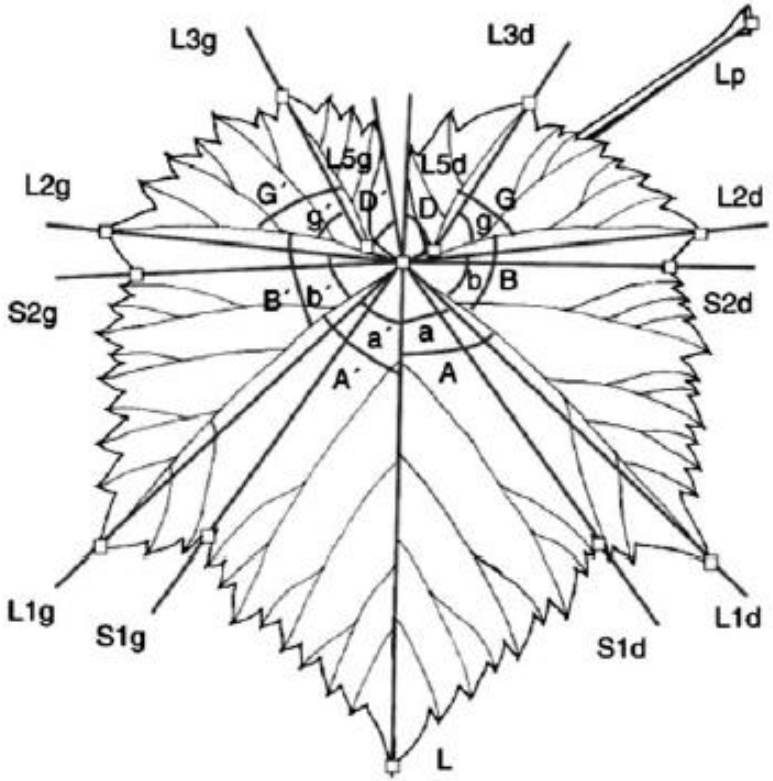

Fig. 2.9. An example of ampelographic measurements that can be made on mature grape leaves. Abbreviations correspond to parameters as set out by the OIV (Office International de la Vigne et du Vin (OIV, 1983)) (reproduced with permission from Santiago *et al.*, 2005).

Fig. 3.1. Part of a vine trunk cut with a saw late in the dormancy period. Xylem sap, flowing from the roots and the cut vessels, oozes out; it contains low concentrations of sugars (Bennett, 2002) – in the range of 5–6mg/ml, which supports the proliferation of fungi and bacteria, making the sap here appear white.

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Plate 7. A series of photos showing early bud growth, from dormant, Stage 1 (top left); budswell, Stage 2 (top middle); wooly bud, Stage 3 (top right); green tip, Stage 4 (bottom left); rosette of first leaves visible, Stage 5 (bottom right). Stages of development are labelled according to the Modified E-L System (Coombe 1995).

Fig. 3.2. Young shoot showing the first leaves and two flower clusters. Individual florets have already differentiated by this stage.

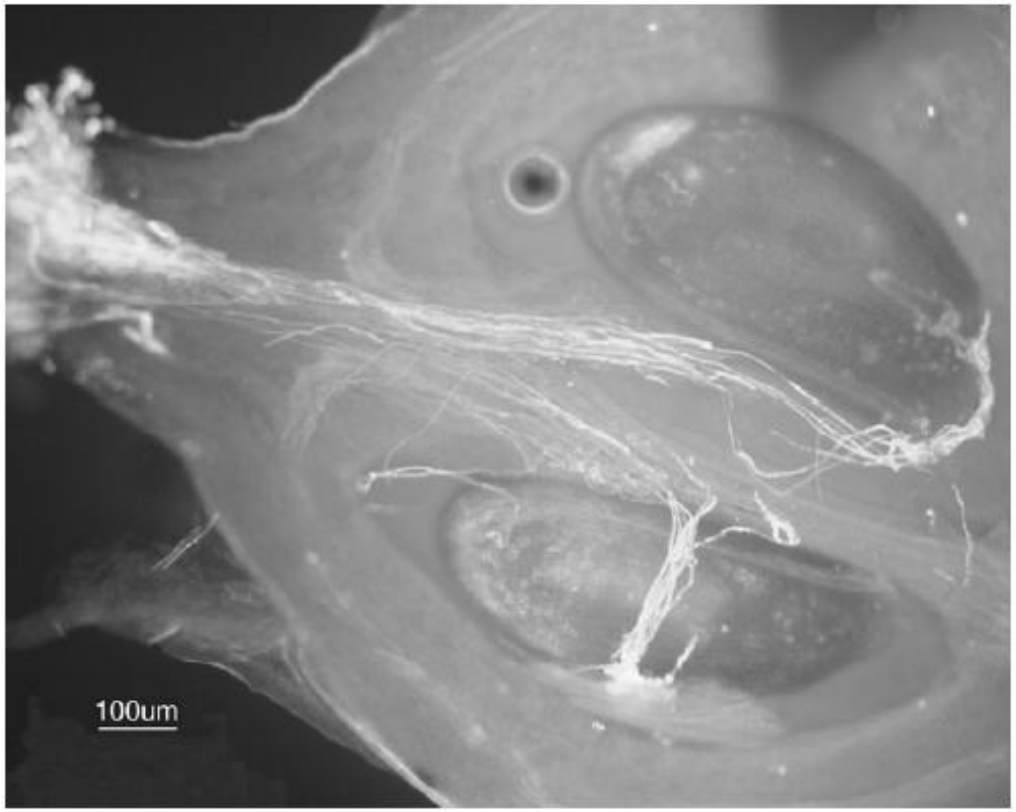

Fig. 3.3. Growth of pollen tubes (lighter paths through the style) from stigmatic surface to the micropyle, shown using a fluorescent dye (image courtesy of M. Longbottom).

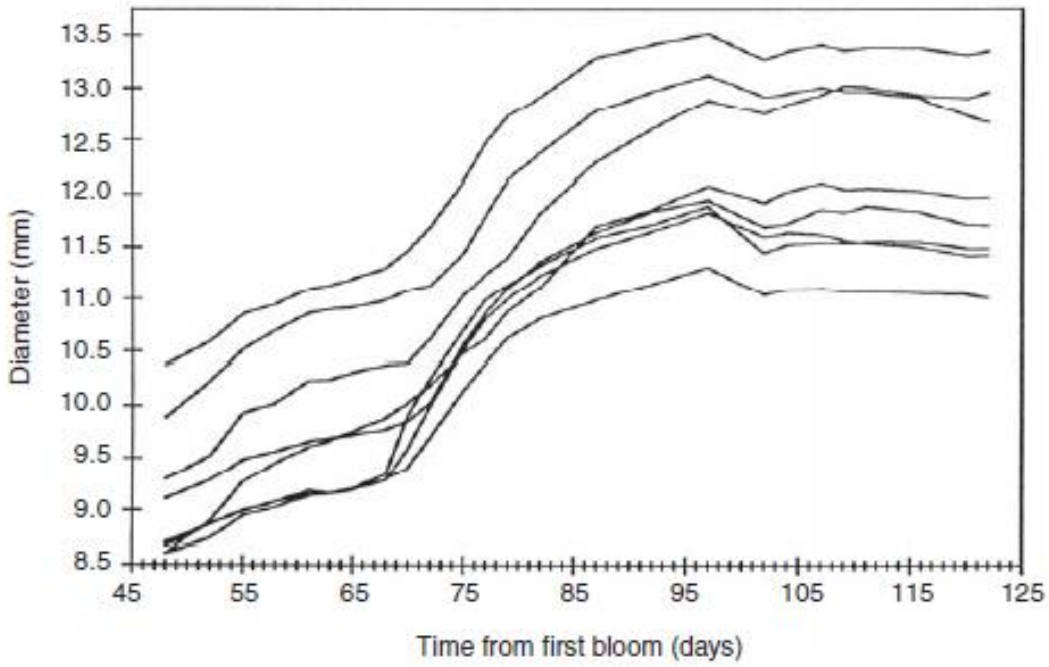

Fig. 3.4. Individual growth curves (by measurement of diameter) for eight grape berries, demonstrating the double-sigmoid shape characteristic of seeded fruit (from Creasy, 1991).

9

Plate 9. A dormant tendril that had wrapped around a foliage wire during the growing season. Tendrils such as these can be quite woody and difficult to remove at pruning, which demonstrates their role in helping to support the vine.