

# The Flowering Process in Apple

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Acknowledgements:

Peter Hirst, Dick Unrath, Emily Hoover, Toshi Foster, Duane Greene, Tory Schmidt

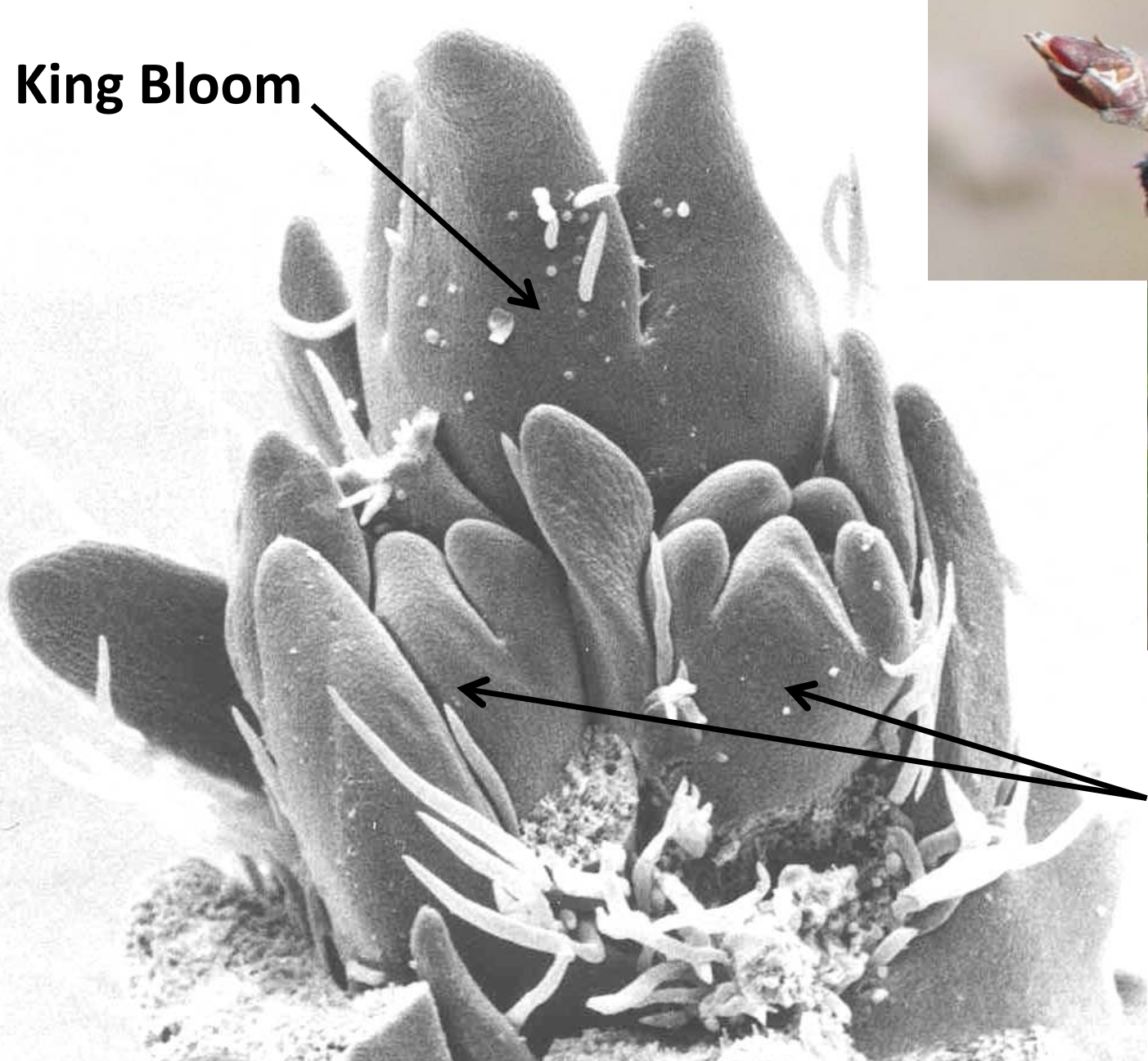
**NC STATE UNIVERSITY**







**King Bloom**

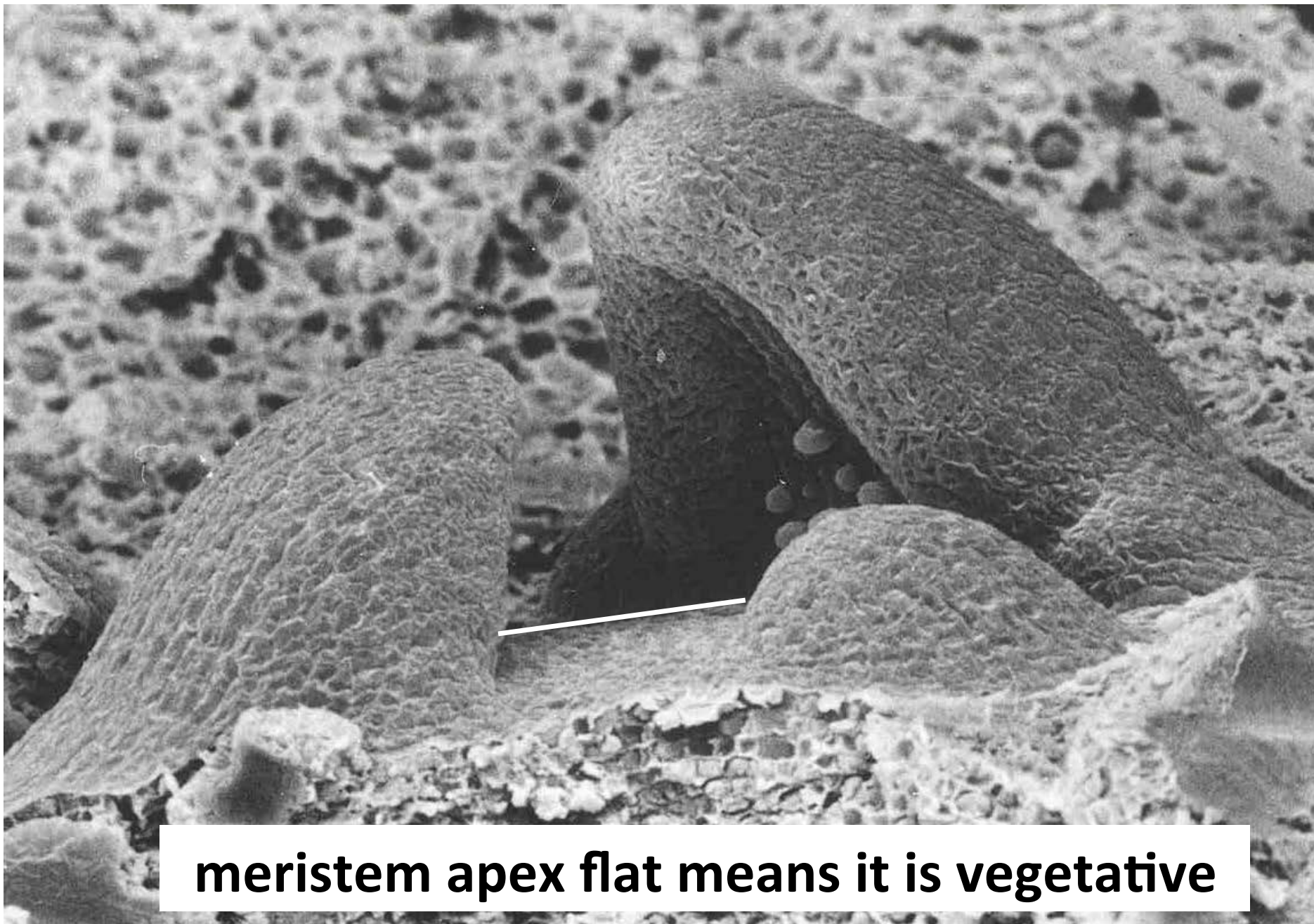


**Lateral Blooms**

Courtesy Toshi Foster



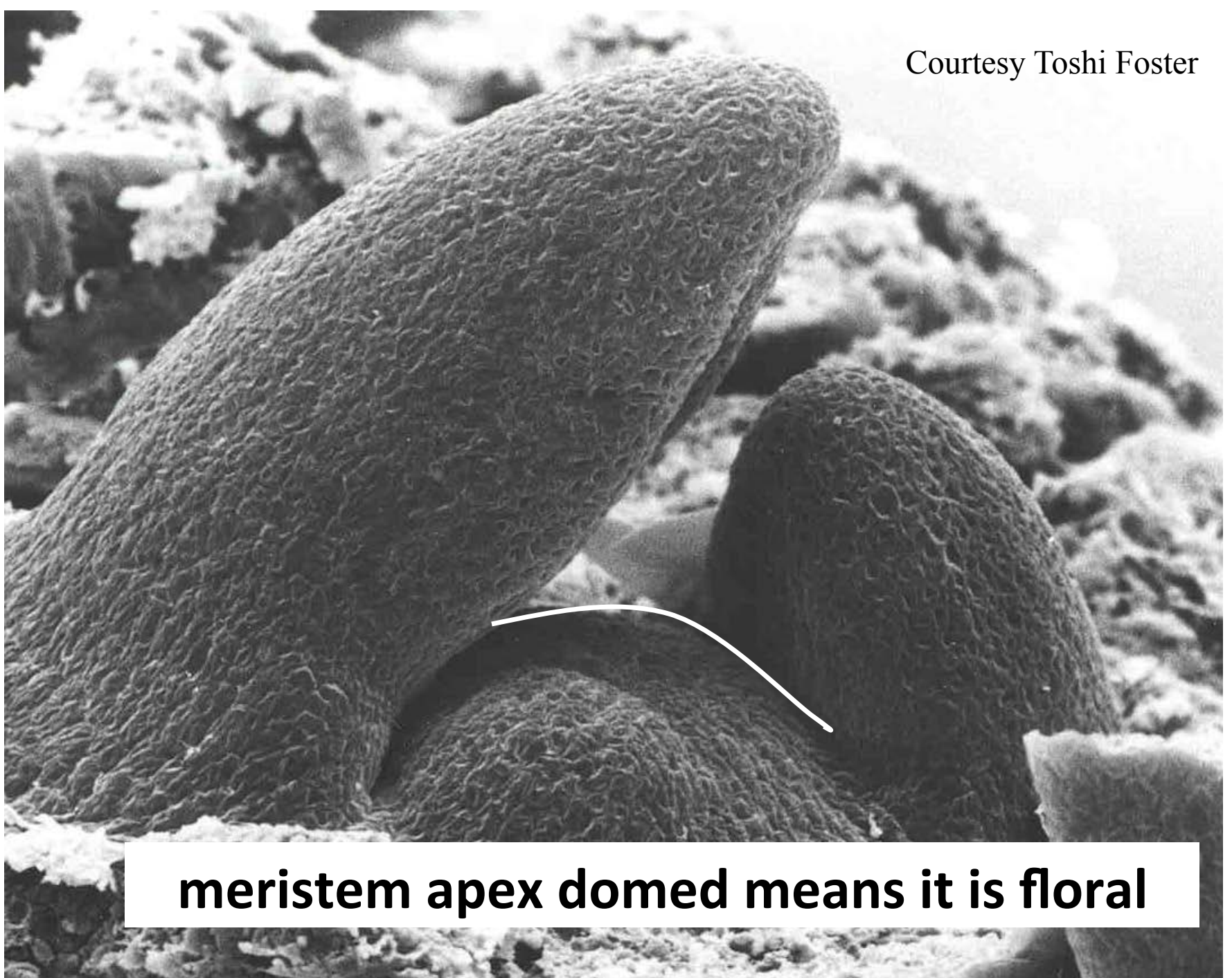




**meristem apex flat means it is vegetative**

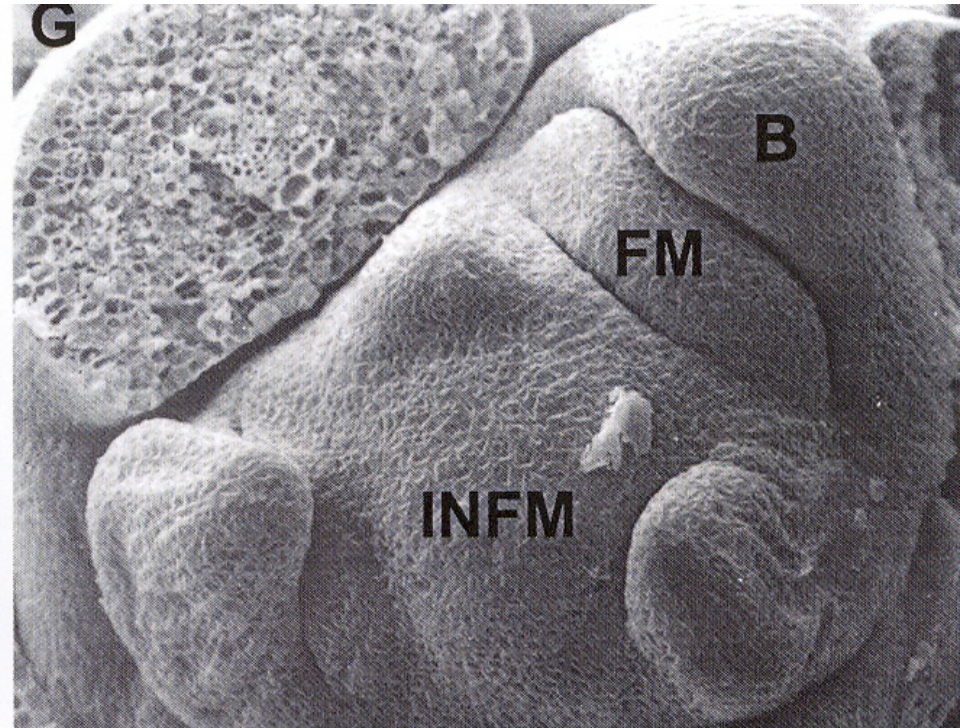
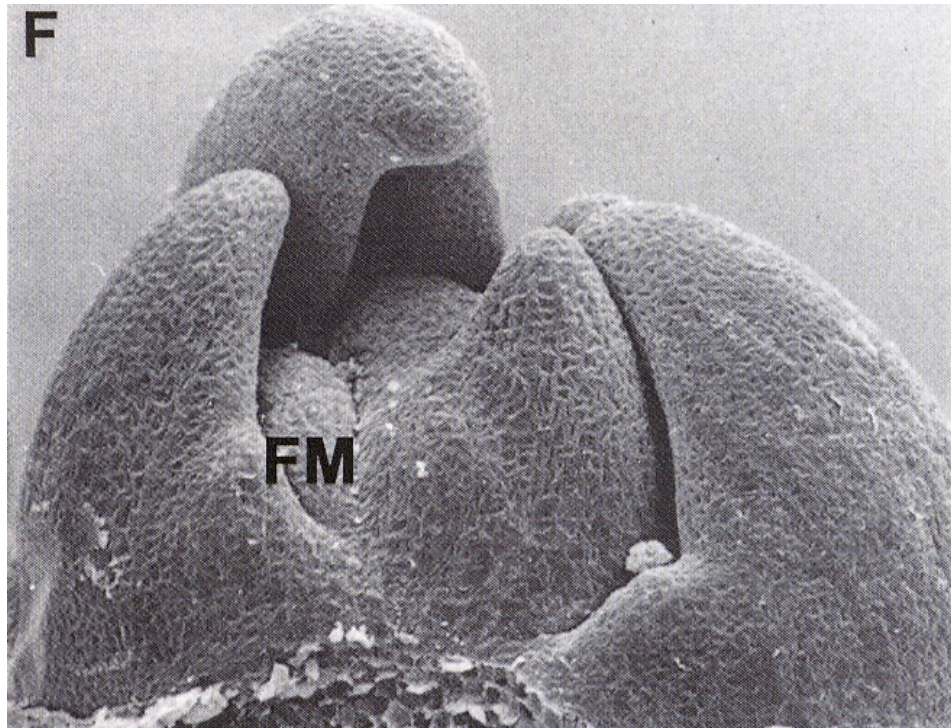
Courtesy Toshi Foster

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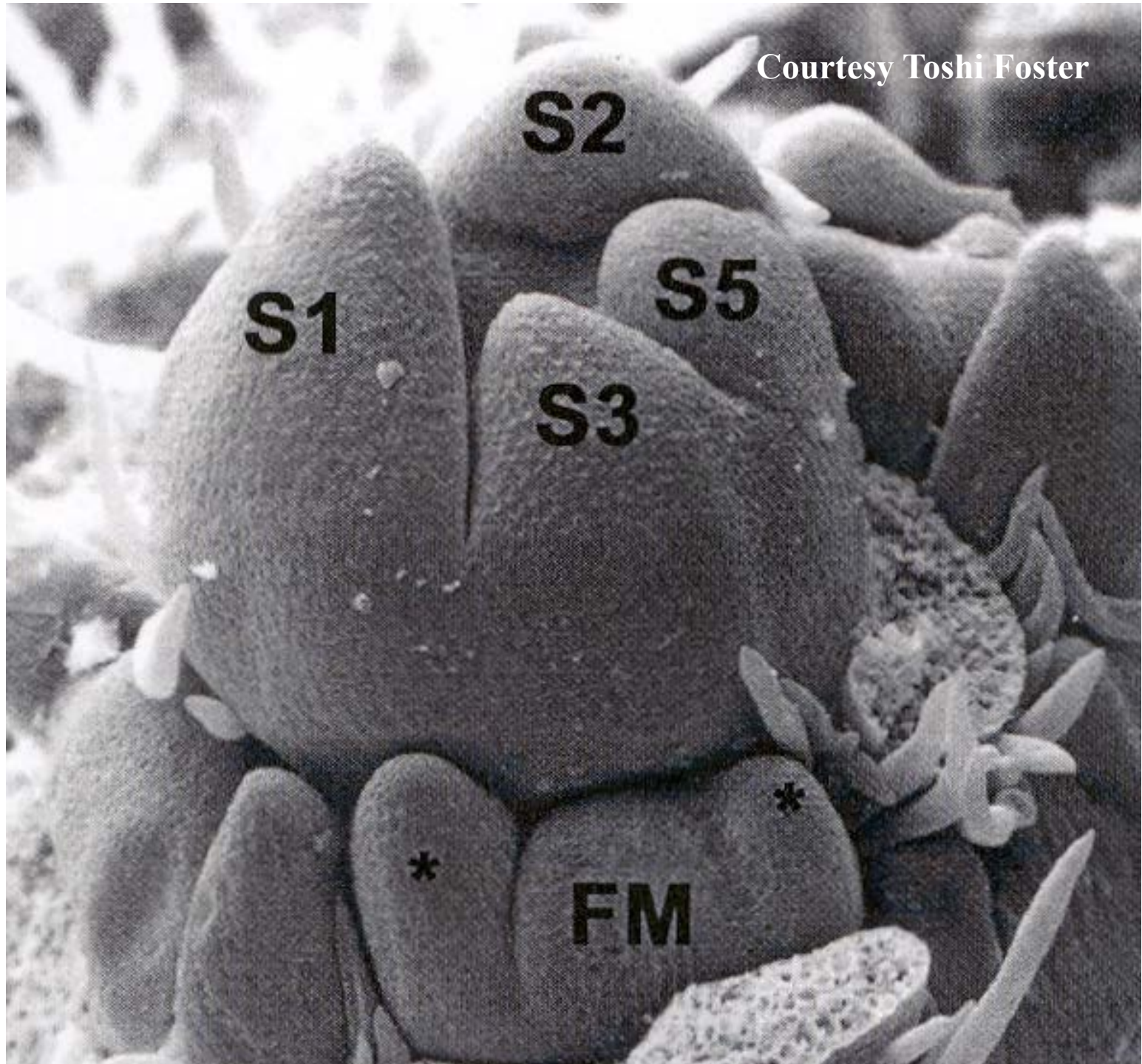
**meristem apex domed means it is floral**



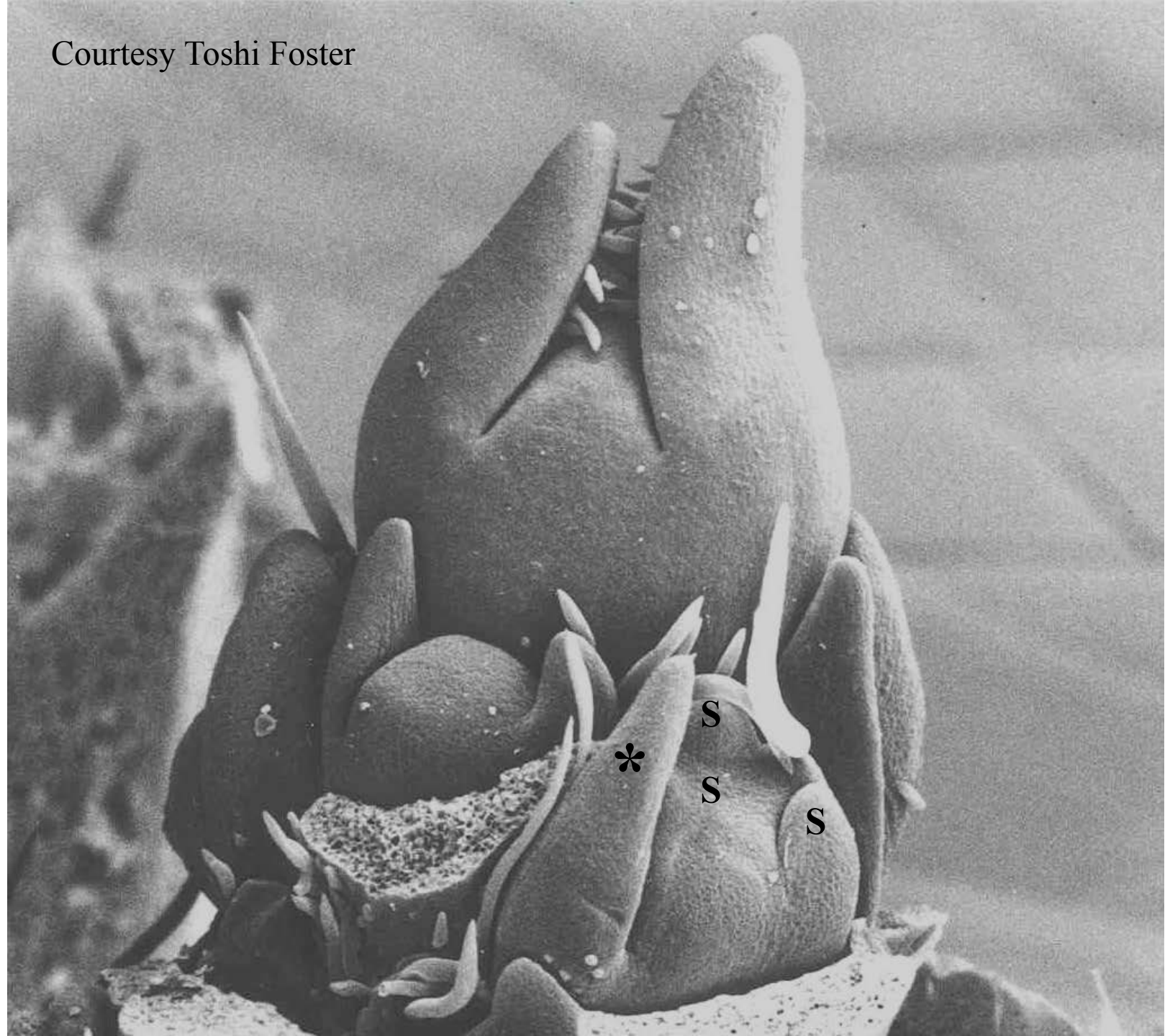


Courtesy Toshi Foster

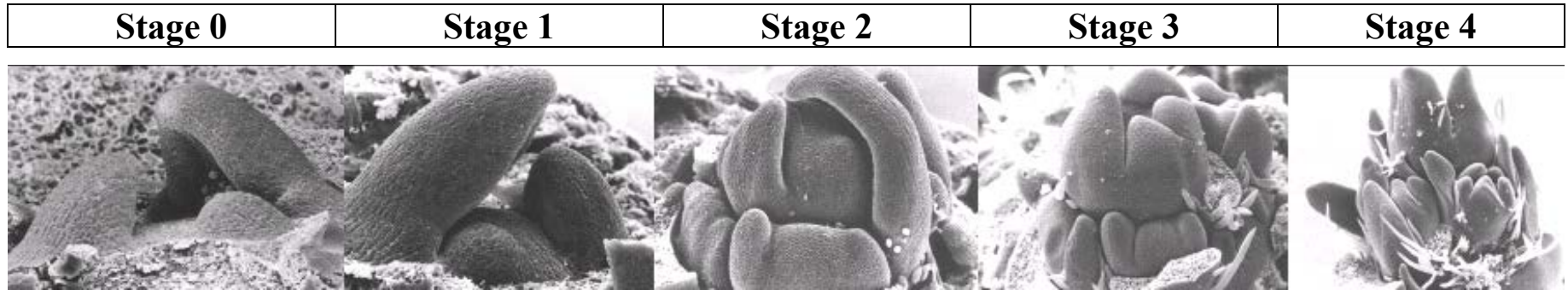
Courtesy Toshi Foster



Courtesy Toshi Foster



# Stages of Floral Development in Apple Buds



**Stage 0: meristem flat**

**Stage 1: meristem domed**

**Stage 2: bractlets developing on the terminal floral meristem**

**Stage 3: sepals clearly differentiated on terminal floral meristem**

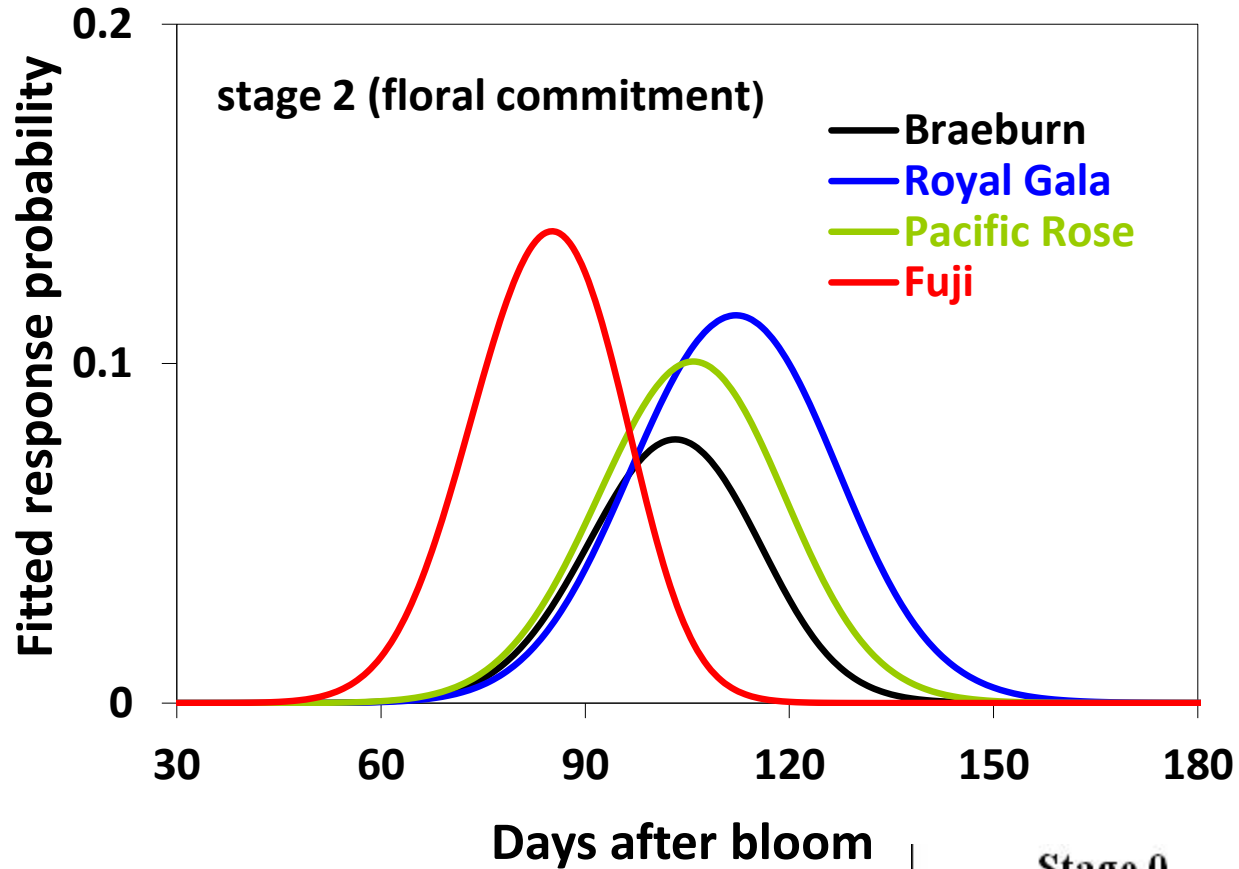
**Stage 5: Sepals clearly differentiated on the lateral floral meristems**

(After Hoover et al)

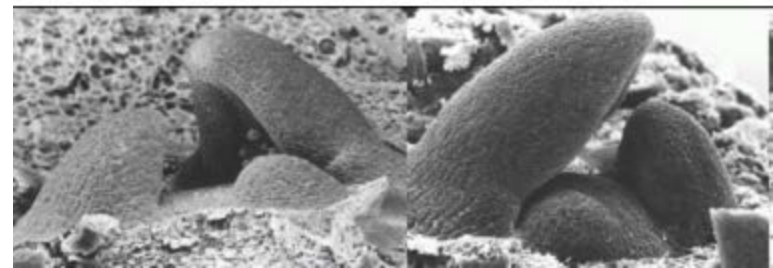
Courtesy Toshi Foster



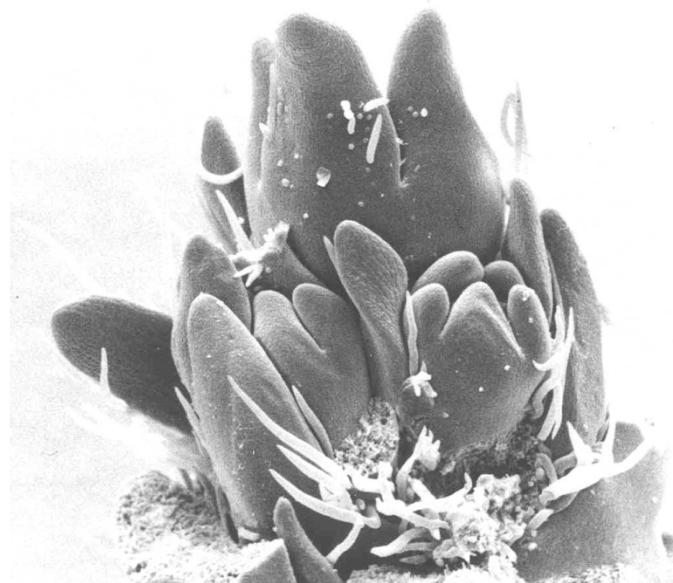
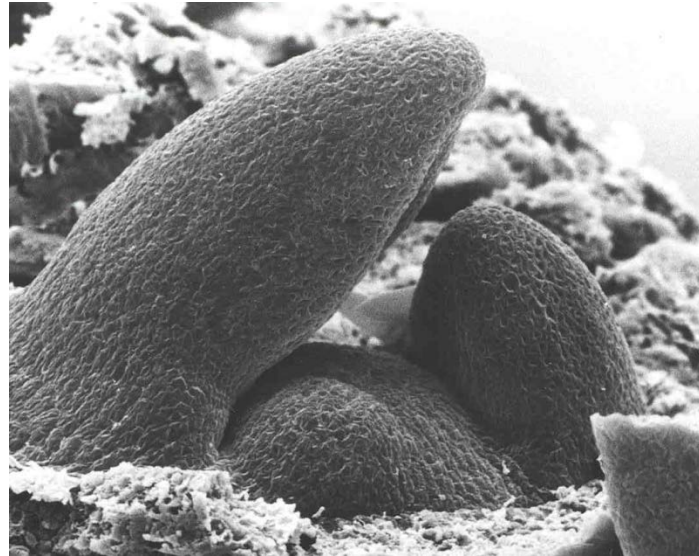
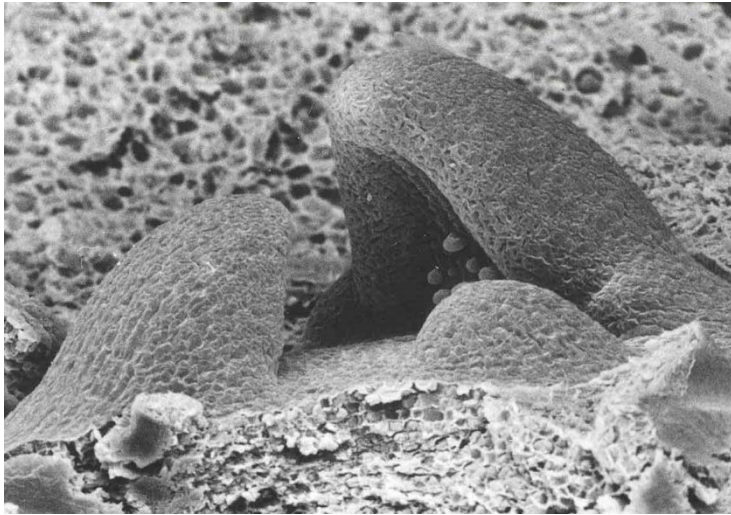
# Does Doming Occur at the Same Time in all Apple Varieties?



(Source: Hoover et al)



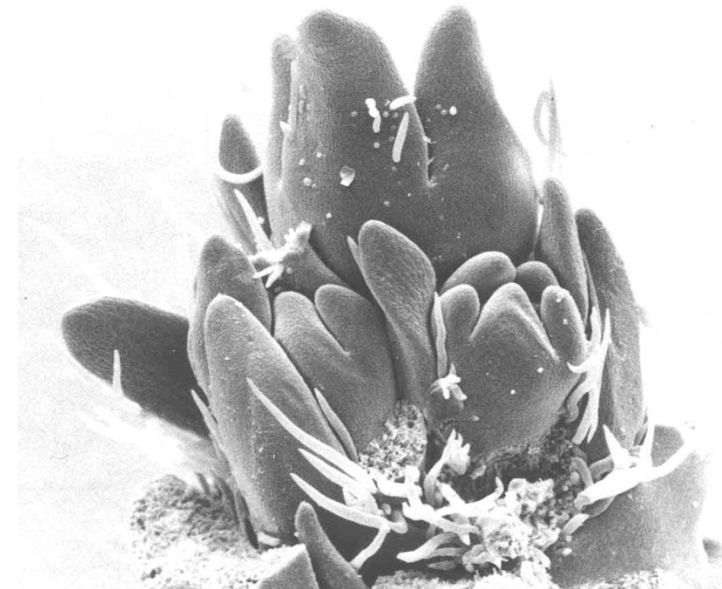
# Differentiation of Flowers Proceeds Rapidly After Doming



**Doming starts 60-100 days after bloom**

**Stage 4 (sepals on lateral blooms) is first seen approx. 30 days after doming**

# Spur leaf area is needed for flower bud formation



\* Spurs were defoliated 26 days after bloom (Harley et al., 1924)



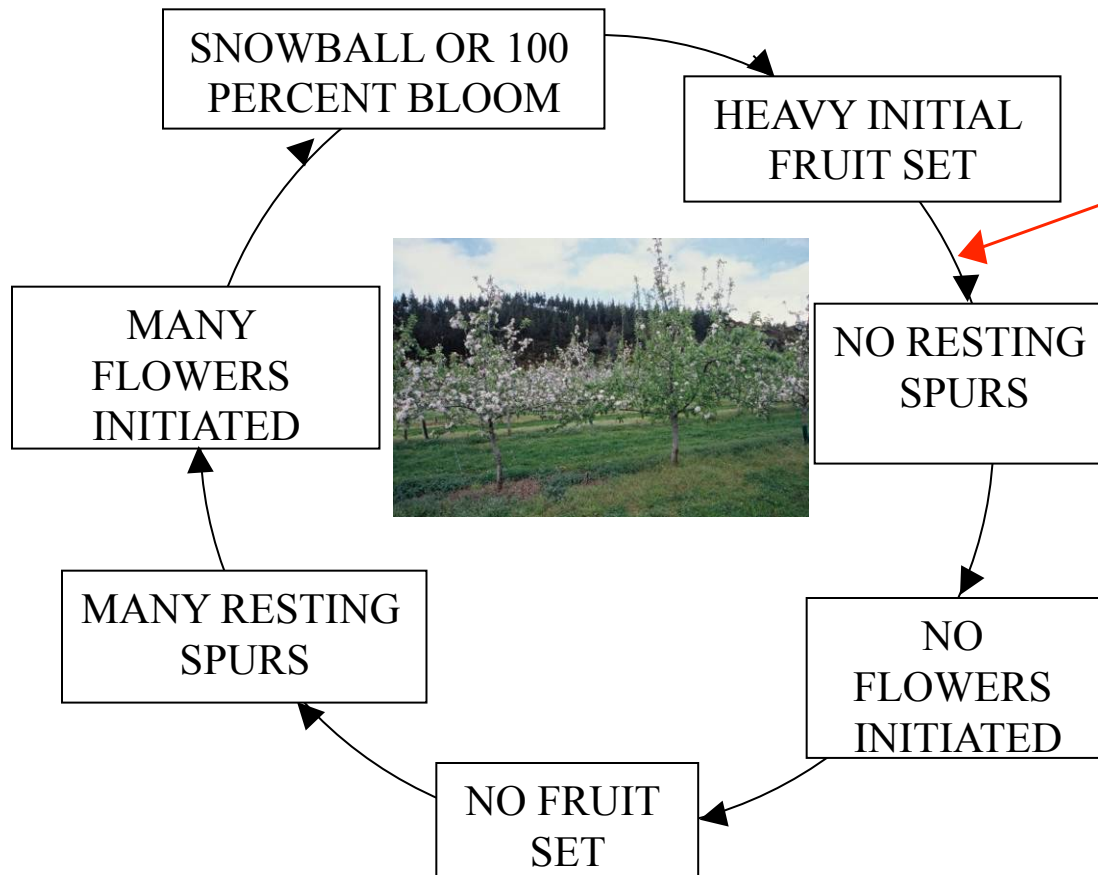
**4% Eugenol on 'Royal Gala' (source: Steve Miller)**





# The Biennial Bearing Cycle

Williams and Edgerton, 1981



**Increase flower bud formation in the on year**

**chemical thinning  
Ethrel  
NAA**



**Immature seeds produce gibberellins that diffuse to the developing bud to inhibit flower formation**



# **NAA Programs for Return Bloom**

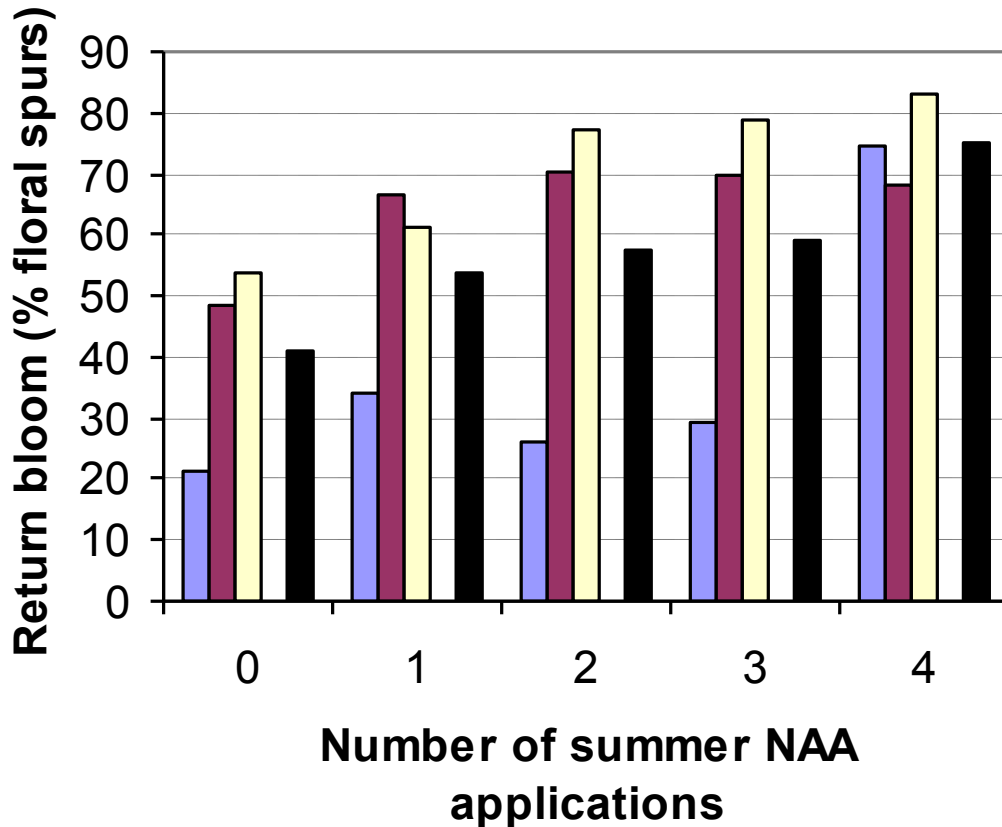
## **Summer NAA**

**Four bi-weekly applications of 5 ppm NAA beginning in mid-June**

## **Preharvest NAA**

**Four, weekly applications of 5 ppm NAA beginning one month prior to anticipated harvest. Primarily applied for stop drop control.**

# How Many NAA Sprays are Needed?



1 application: 6/7

2 applications: 6/7, 6/21

3 applications: 6/7, 6/21, 7/2

4 applications: 6/7, 6/21, 7/2, 7/16

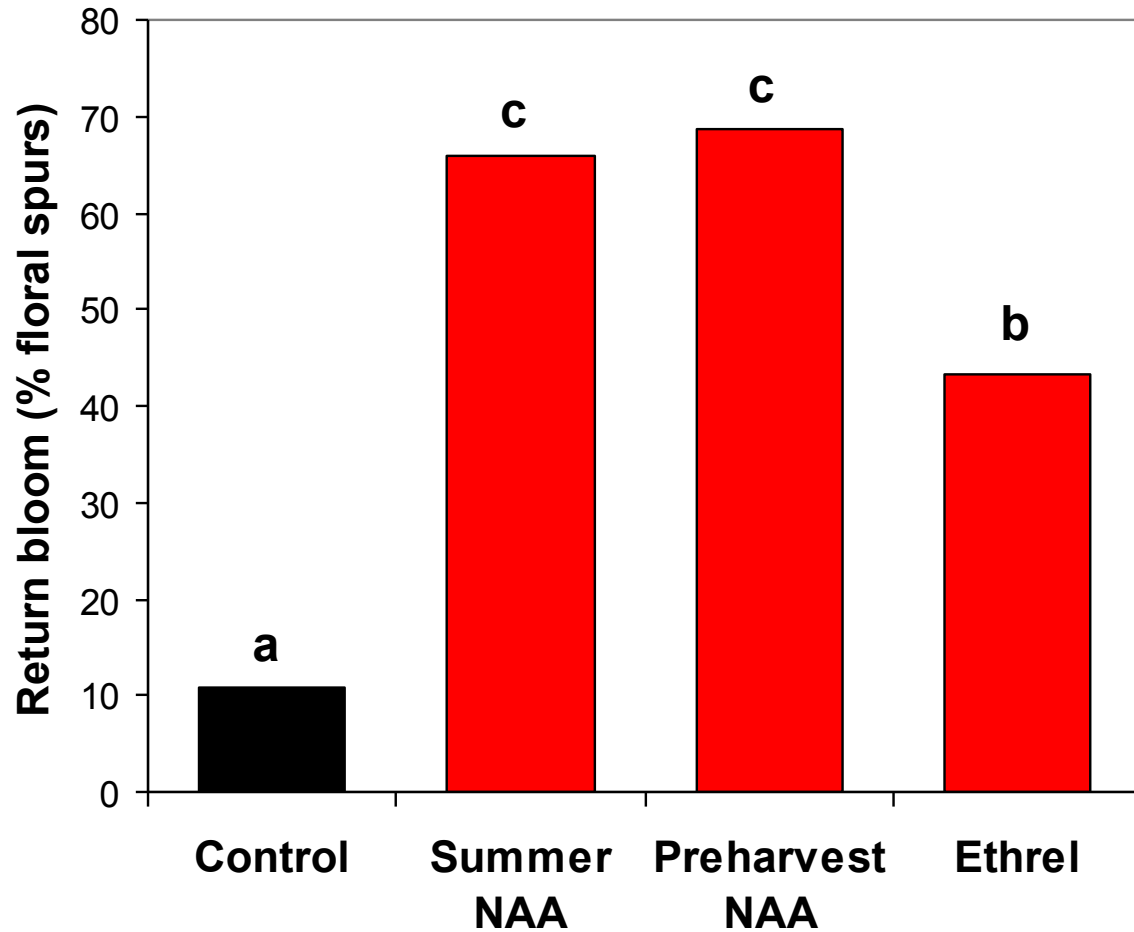
# Comparison of NAA and Ethrel programs for return bloom

	<b>Summer NAA</b>	<b>Ethrel</b>
<b>Timing:</b>	Start program in late June.	Make one application 5-6 weeks after bloom when the thinning window is over.
<b>Frequency:</b>	Four bi-weekly applications.	Usually only one application is needed.
<b>Rate:</b>	5 ppm NAA (Fruitone L) for all varieties.	Rate is variety dependent. 16-24 oz/acre: Gala, Rome, Red Delicious 24-48 oz/acre: Golden Delicious 48-72 oz/acre: Fuji, Cameo
<b>Notes:</b>	Can be included with cover sprays.	Not recommended on early season varieties prone to pre harvest drop eg. Honeycrisp.



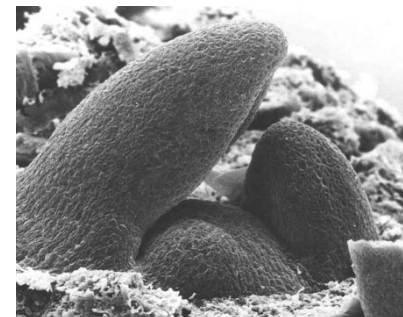
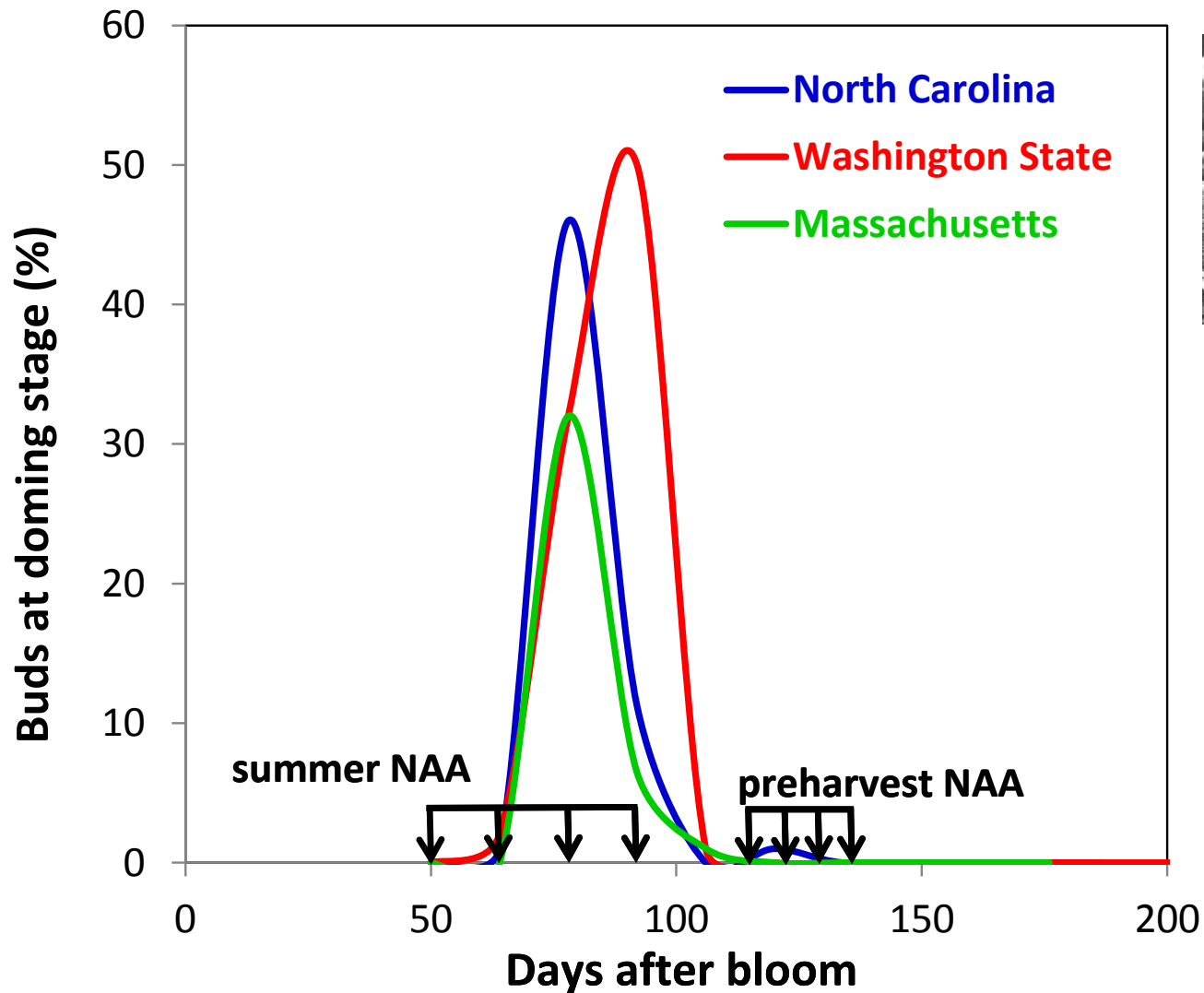
# Ethrel and NAA treatments for Return Bloom

( 'Golden Delicious' , 2006 )



# Preharvest NAA sprays are applied after doming is over???

Buds were sampled from non-flowering spurs on two year old or older wood





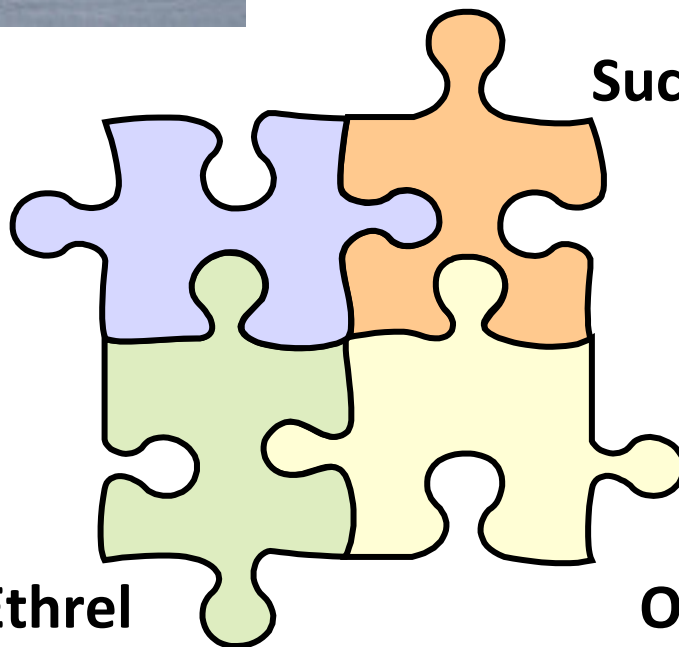




When it comes to having a good bloom every year -  
**There is no such thing as a silver bullet!**

**Initial Fruit Set**

**Success of Thinners**



**Summer NAA and Ethrel  
programs**

**Other factors:**

- Nutrition
- Tree vigor
- ???





# How will defoliation caused by *Glomerella* affect your trees?

Tustin et al., (1997) 'Gala'

90 days from harvest to leaf fall of this variety in NZ

- **Leaf photosynthesis** increased by 20% one week after early 50% defoliation
- **Leaf fall** was delayed by 6 days on 50% defoliated trees
- **Bud break** and **bloom** the following spring was delayed by 4-6 days
- Early complete defoliation reduced **spur leaf area**, **fruit set**, and **fruit size** in the following year







