

UNIVERSITY OF
BIRMINGHAM



Sweetness & Light: Plants & Pressure

U

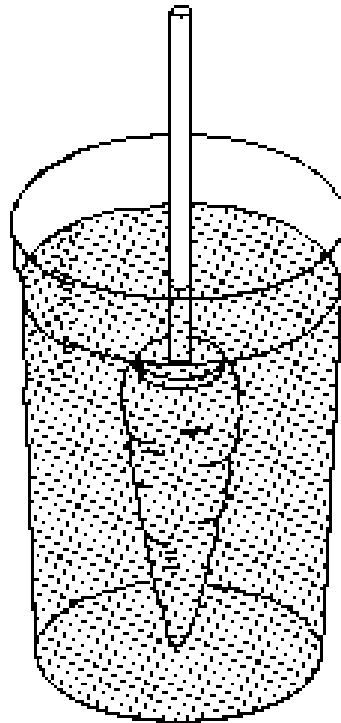


B



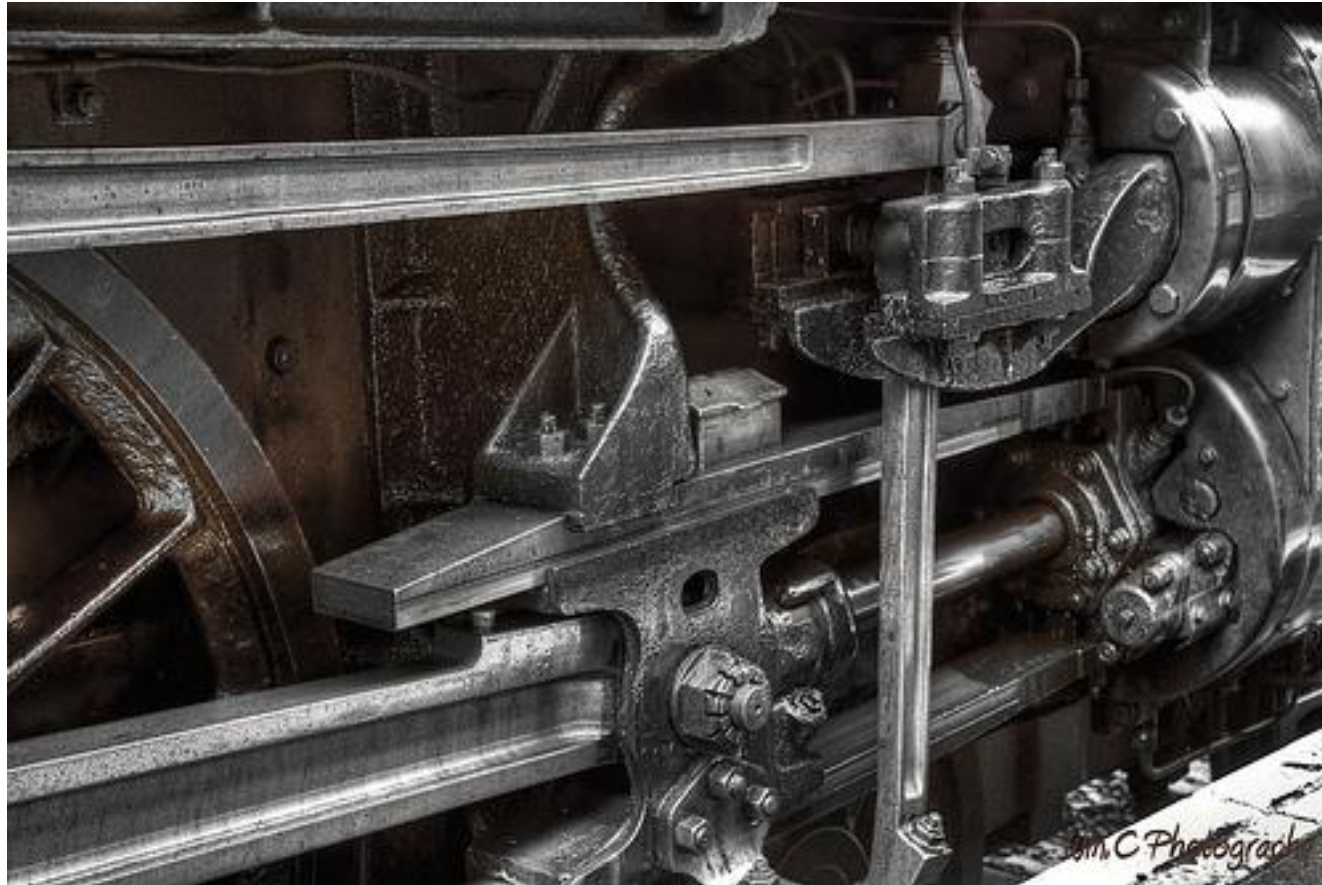
Dr Jeremy Pritchard

9.3.47 Osmosis with a carrot





Plants are hydraulic machines





UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM

Unregistered

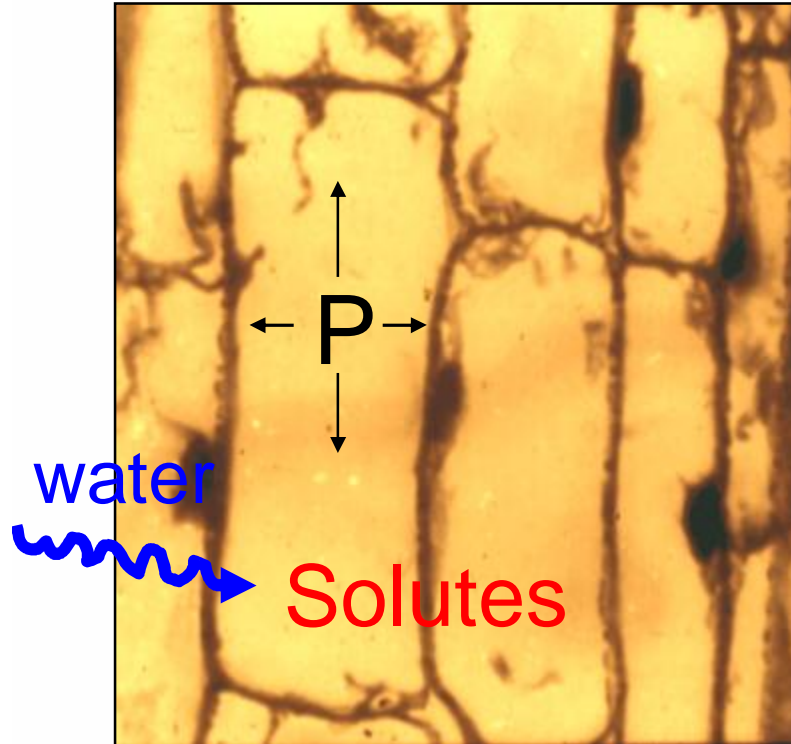


UNIVERSITY OF
BIRMINGHAM

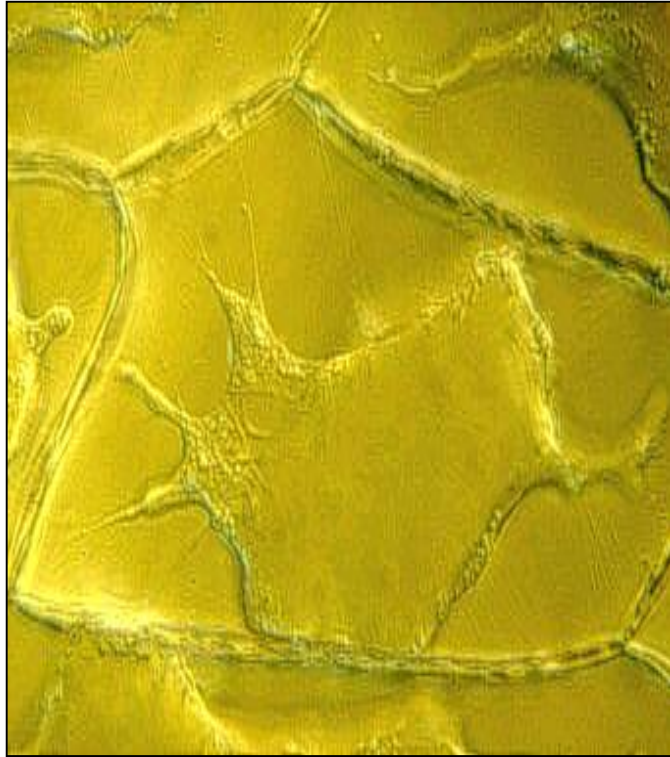


UNIVERSITY OF
BIRMINGHAM

Turgor pressure generation



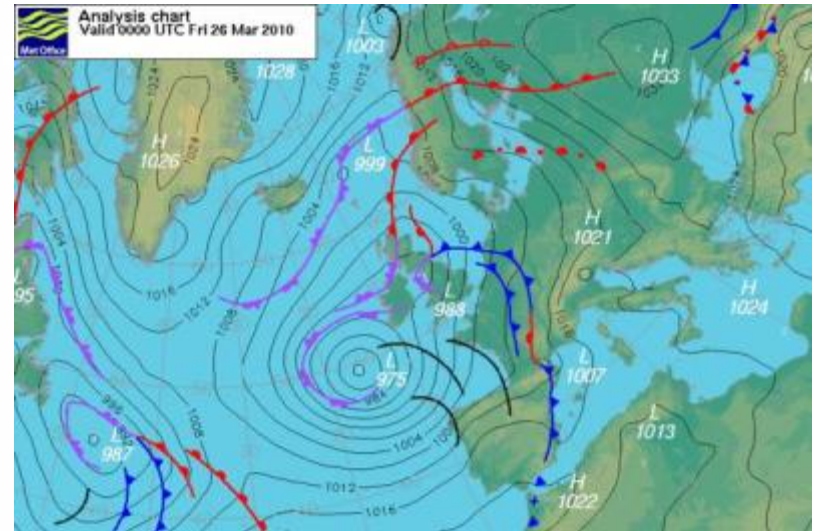
- Salts and sugars are accumulated in the cell
- Water follows by osmosis
- Turgor pushes against cell wall



UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM





Atmosphere

Bars (millibars)

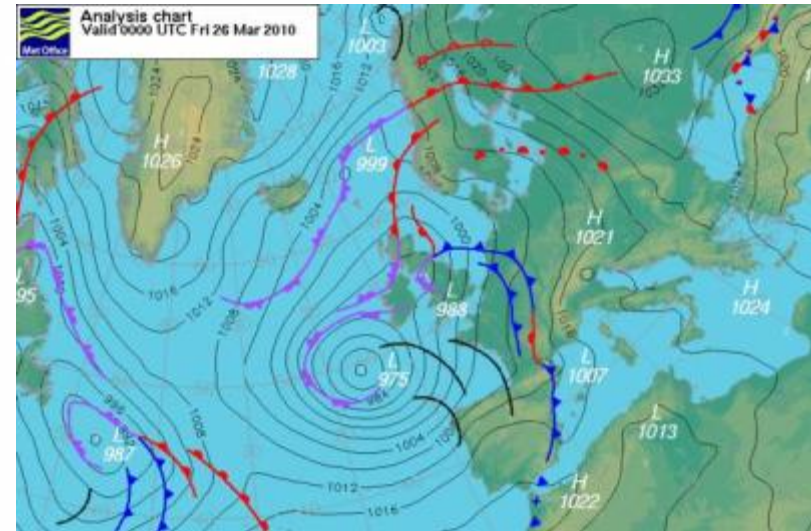
lb in² (PSI)

mm Hg

mm H₂O

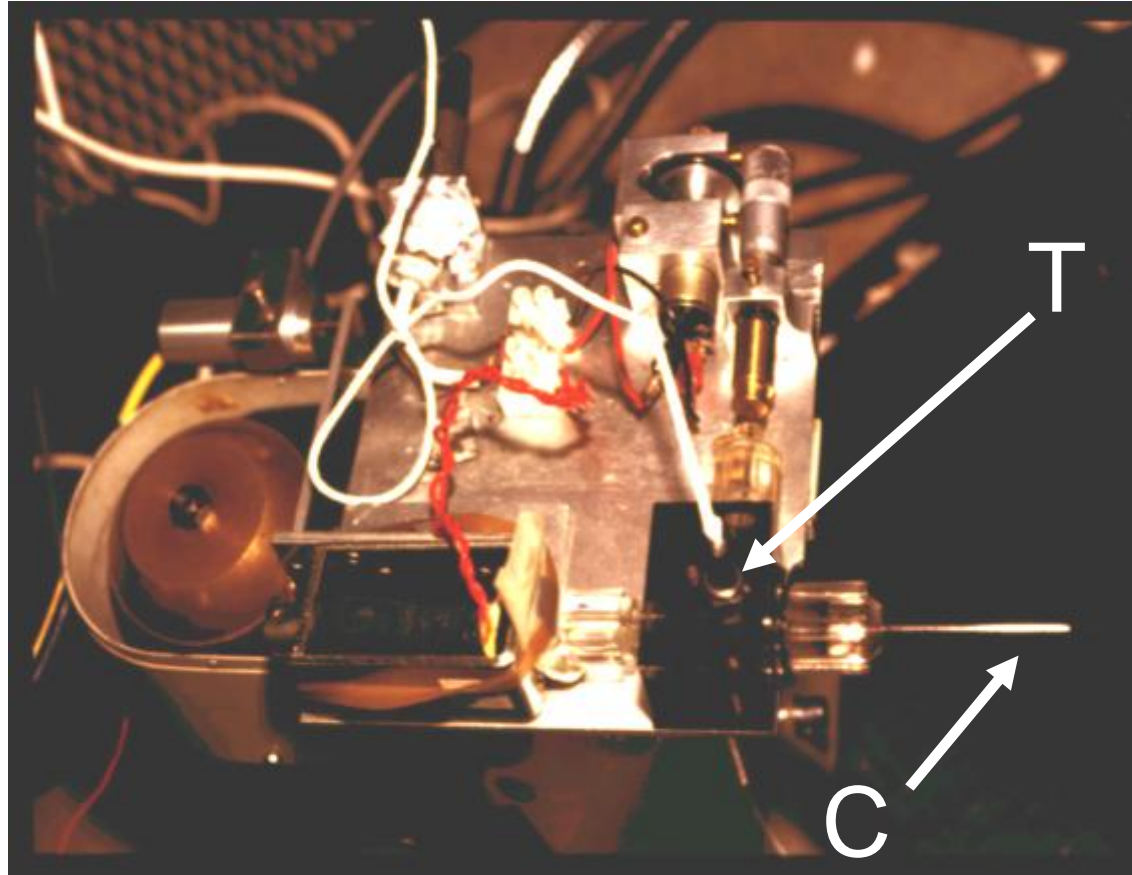
Pascal, (KPa, MPa)

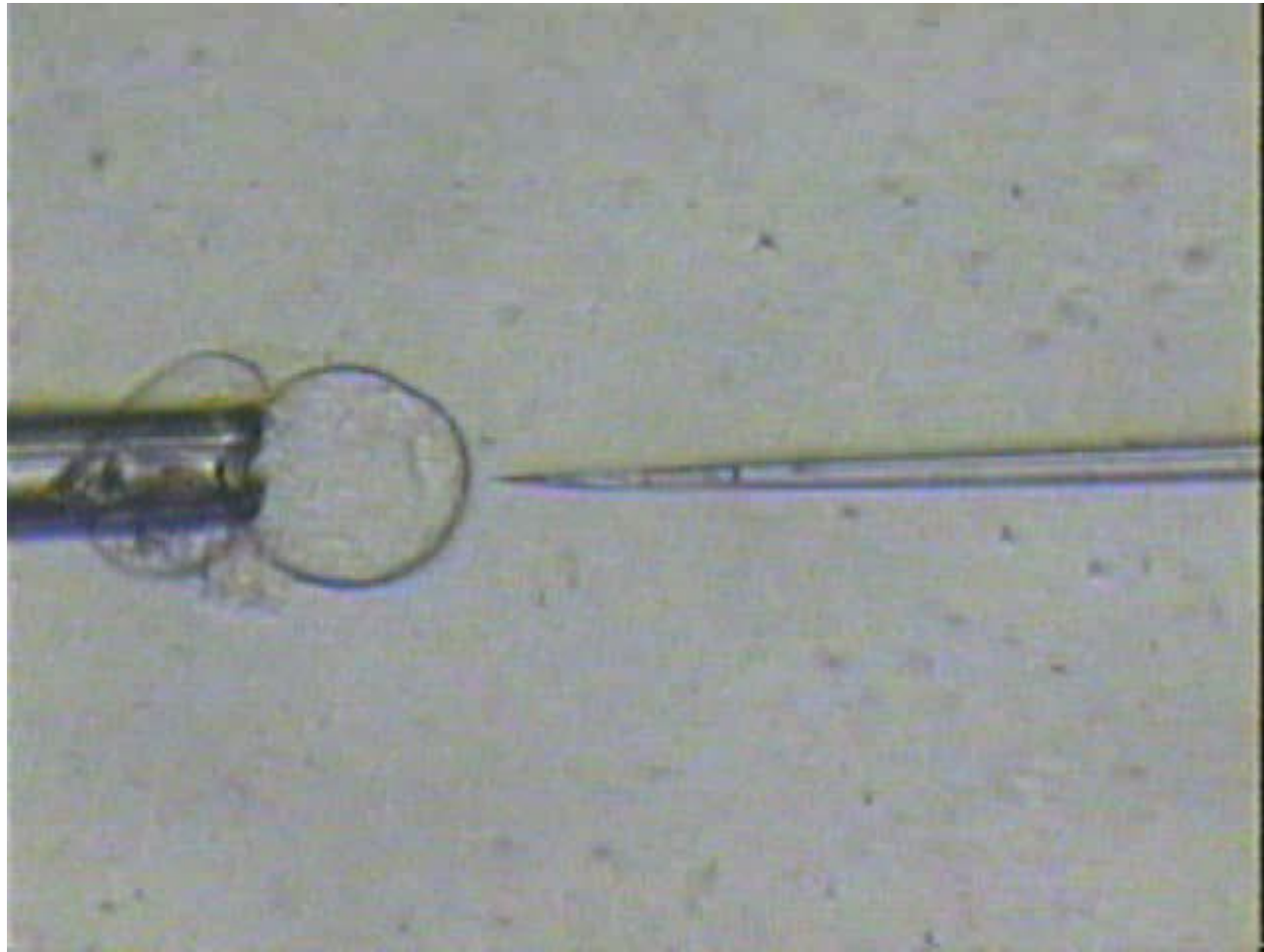
Torr



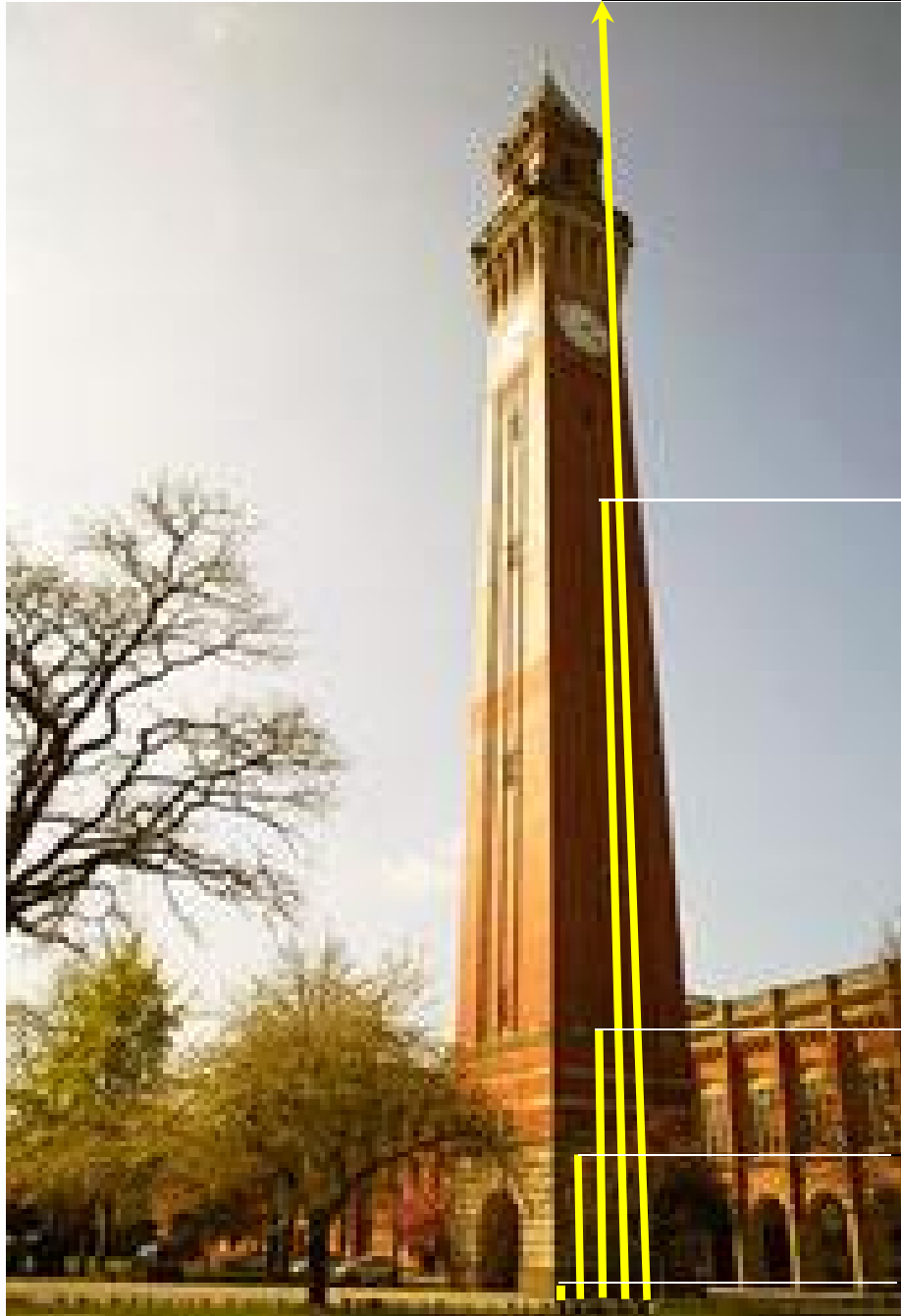
Measuring pressure

The pressure probe can measure turgor in *single* cells





UNIVERSITY OF
BIRMINGHAM



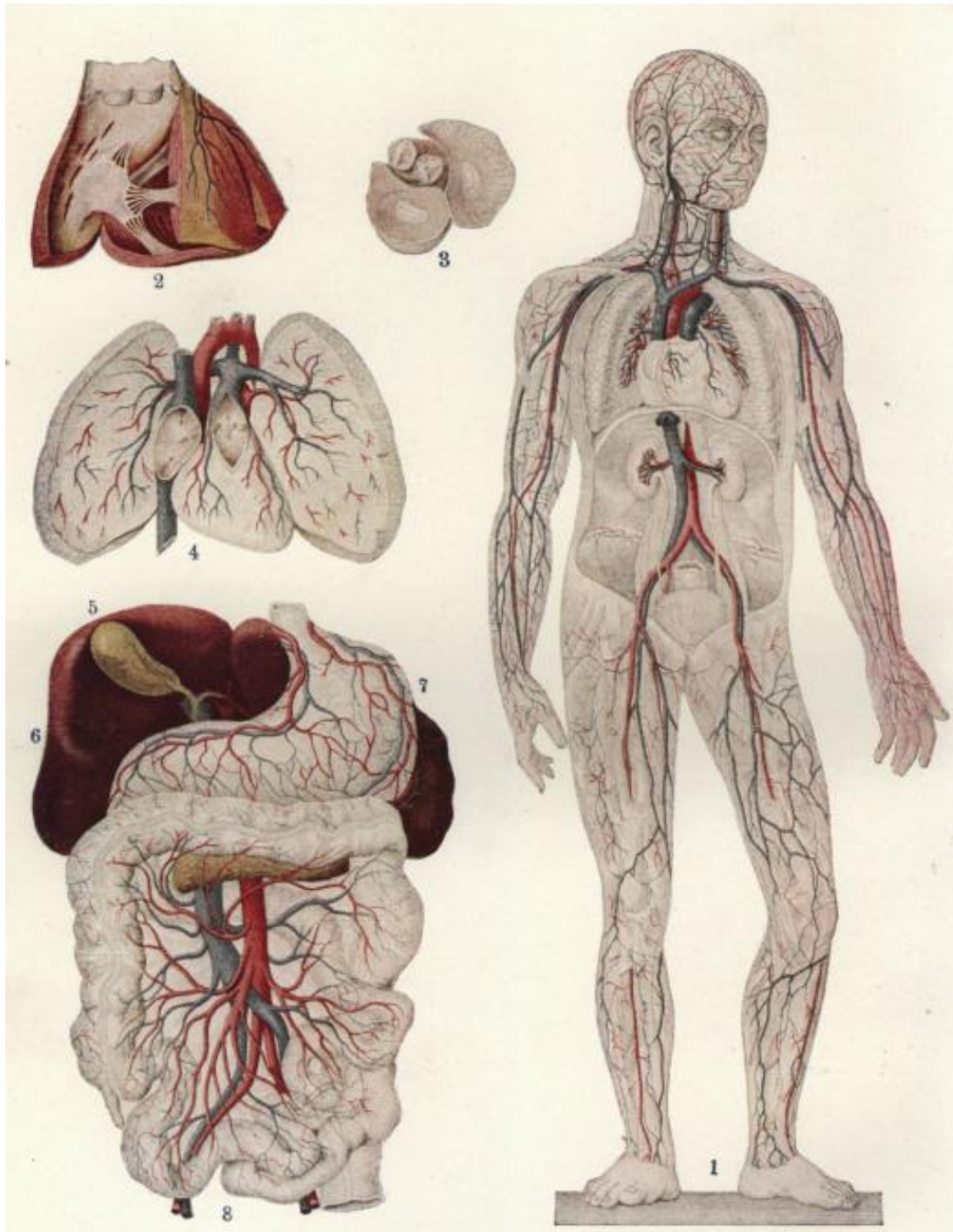
Phloem >20 bars >200 m

Root 6 bars 60 m

Tire 2 bars 20 m

Bottle 1.5 bars 15 m

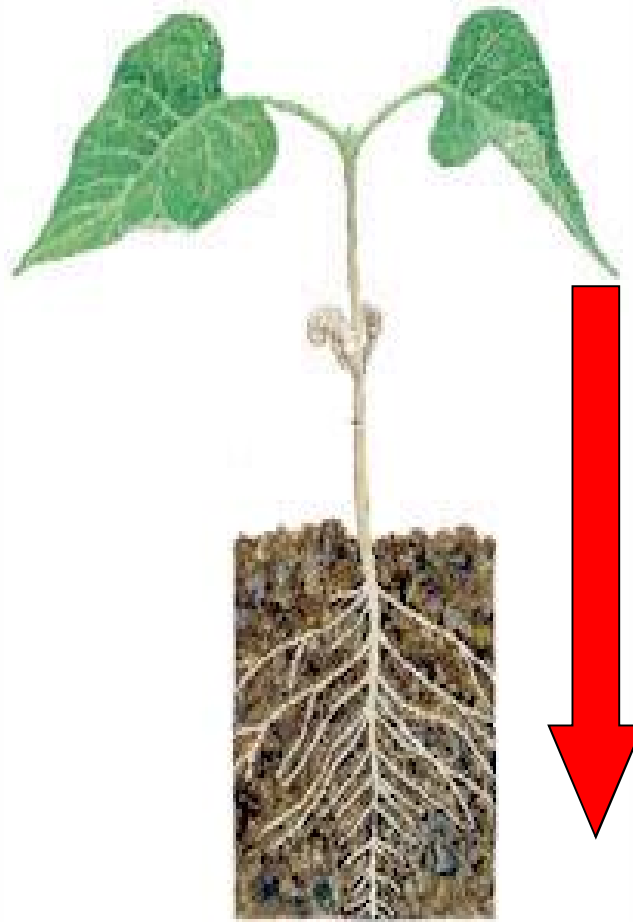
Lungs 0.15 bars 1.5



UNIVERSITY OF
BIRMINGHAM

Phloem

The plant circulation system





Carbon dioxide + Water

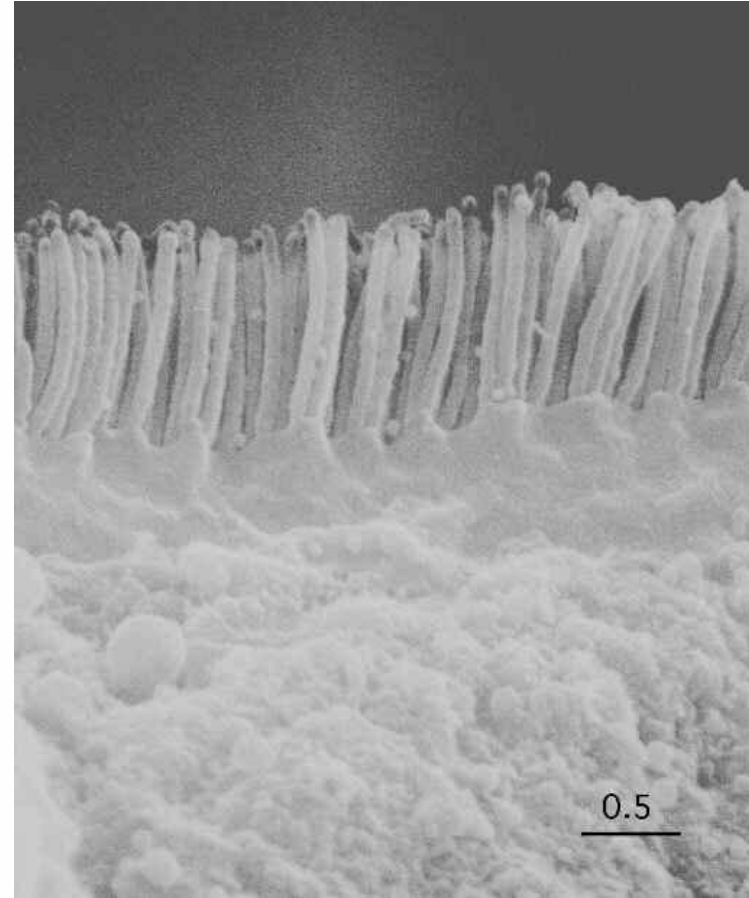
makes

Sugar + Oxygen



UNIVERSITY OF
BIRMINGHAM

The area of a grass field is 10 x that of a solar panel





A football field of maize produces enough oxygen each day for how many football teams?



Premier League table

Sunday, 6 November 2011 18:02 UK

	P	GD	PTS
1 Man City	11	29	31
2 Man Utd	11	16	26
3 Newcastle	11	9	25
4 Chelsea	11	9	22

5 Tottenham	10	6	22

6 Liverpool	11	4	19
7 Arsenal	11	2	19
8 Aston Villa	11	1	15
9 Norwich	11	-2	13
10 Swansea	11	-3	13
11 QPR	11	-10	12
12 Stoke	11	-11	12
13 Wolves	11	-6	11
14 West Brom	11	-7	11
15 Sunderland	11	1	10
16 Fulham	11	-1	10
17 Everton	10	-4	10

18 Bolton	11	-9	9
19 Blackburn	11	-11	6
20 Wigan	11	-13	5

Championship table

Sunday, 6 November 2011 17:03 UK

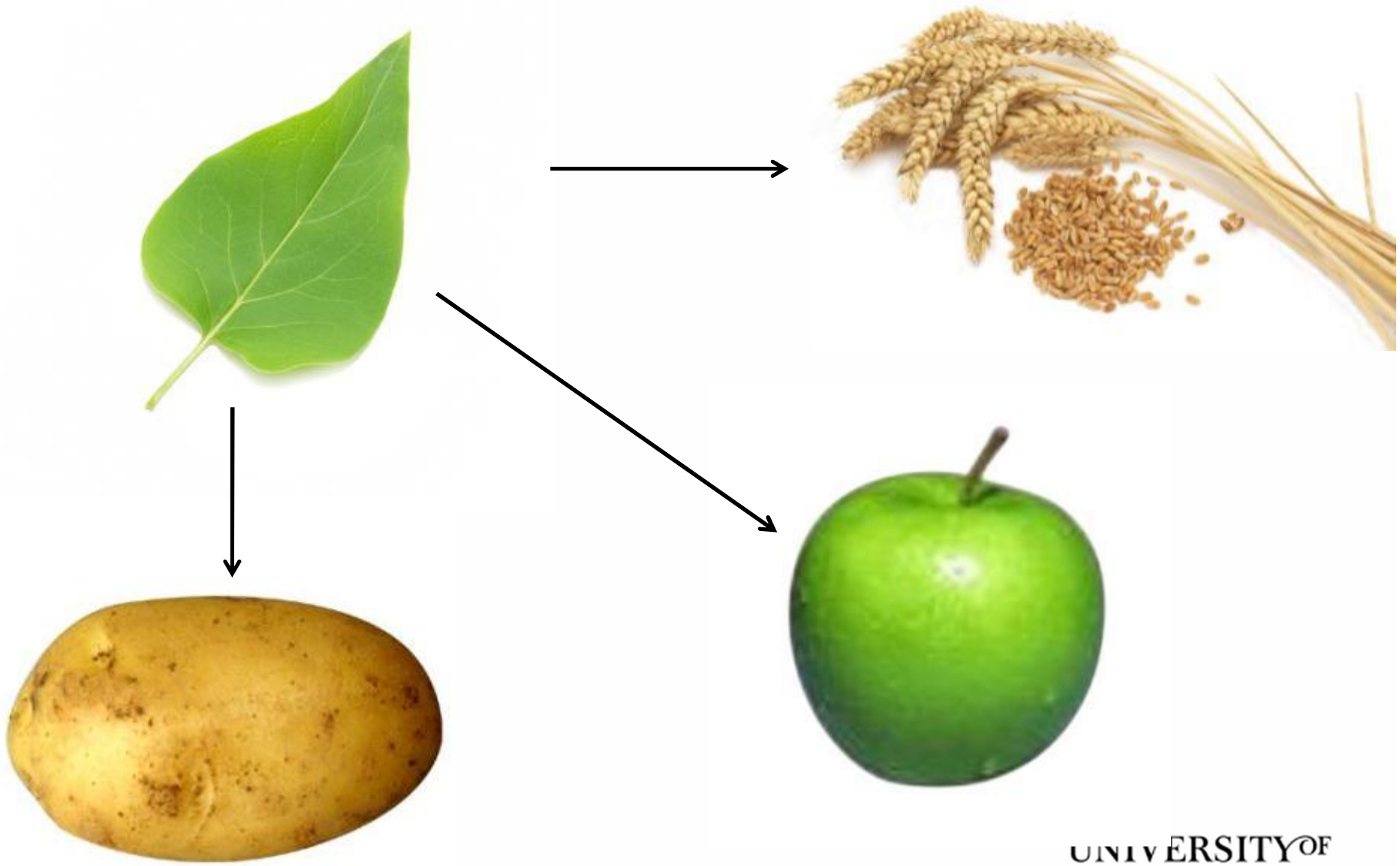
	P	GD	PTS
1 Southampton	16	20	36
2 West Ham	16	15	31

3 Middlesbrough	16	8	30
4 Cardiff	16	9	27
5 Blackpool	16	7	25
6 Crystal Palace	16	4	25

7 Leeds	16	1	25
8 Derby	16	-1	24
9 Hull	15	-1	24
10 Brighton	16	2	23
11 Peterborough	16	3	22
12 Leicester	16	1	22
13 Birmingham	13	4	21
14 Reading	16	1	21
15 Ipswich	15	-6	20
16 Portsmouth	16	1	19
17 Millwall	16	1	18
18 Burnley	15	-3	18
19 Barnsley	16	-4	18
20 Nott'm Forest	16	-12	17
21 Watford	16	-11	16

22 Bristol City	16	-13	13
23 Coventry	16	-11	12
24 Doncaster	16	-15	12

Sugar moves in phloem sap

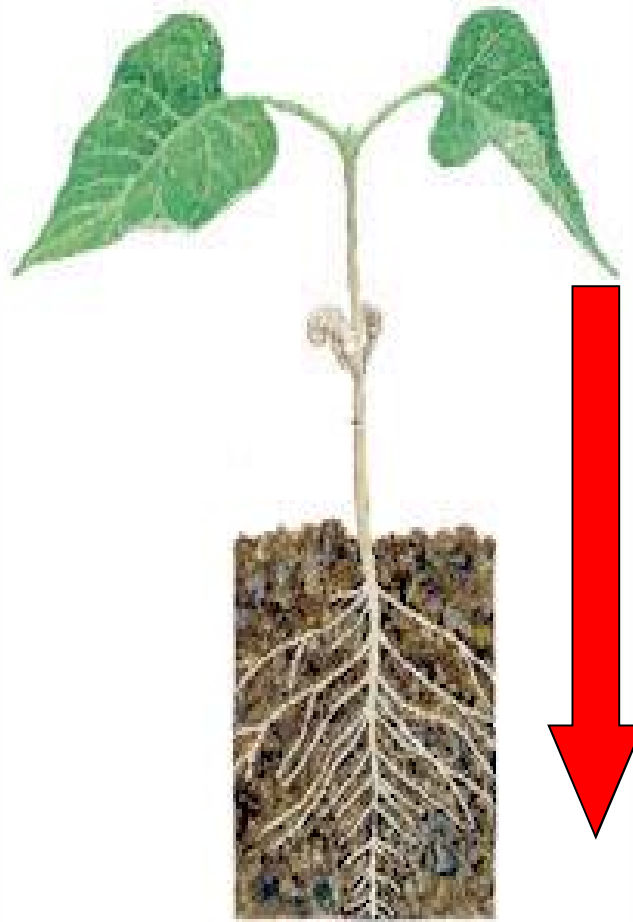


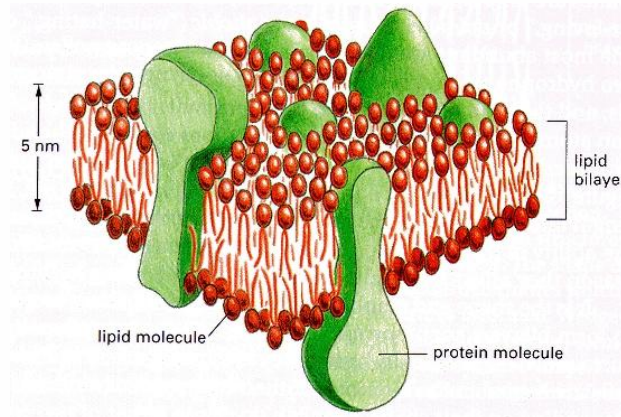
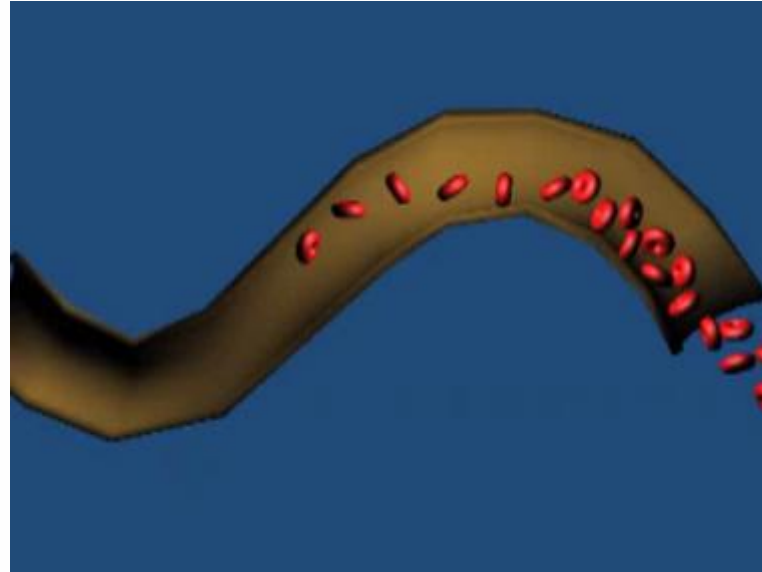
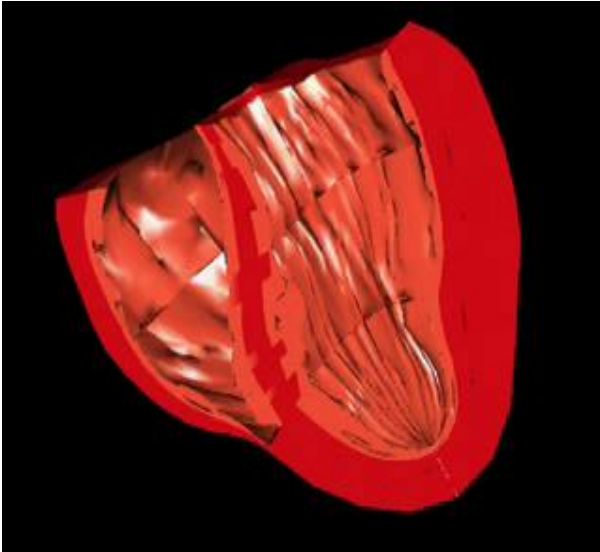


UNIVERSITY OF
BIRMINGHAM

Phloem

The plant circulation system







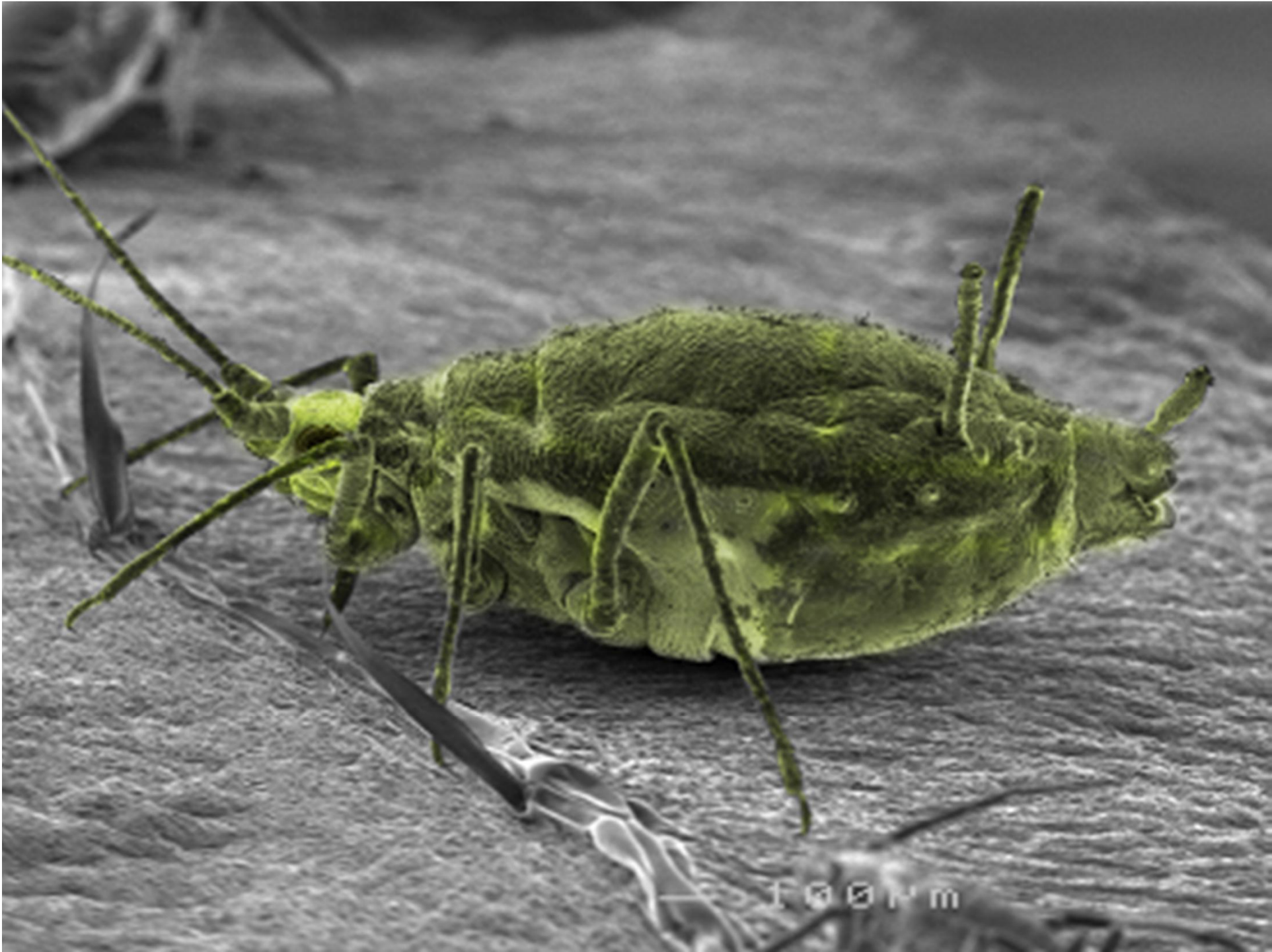
UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM

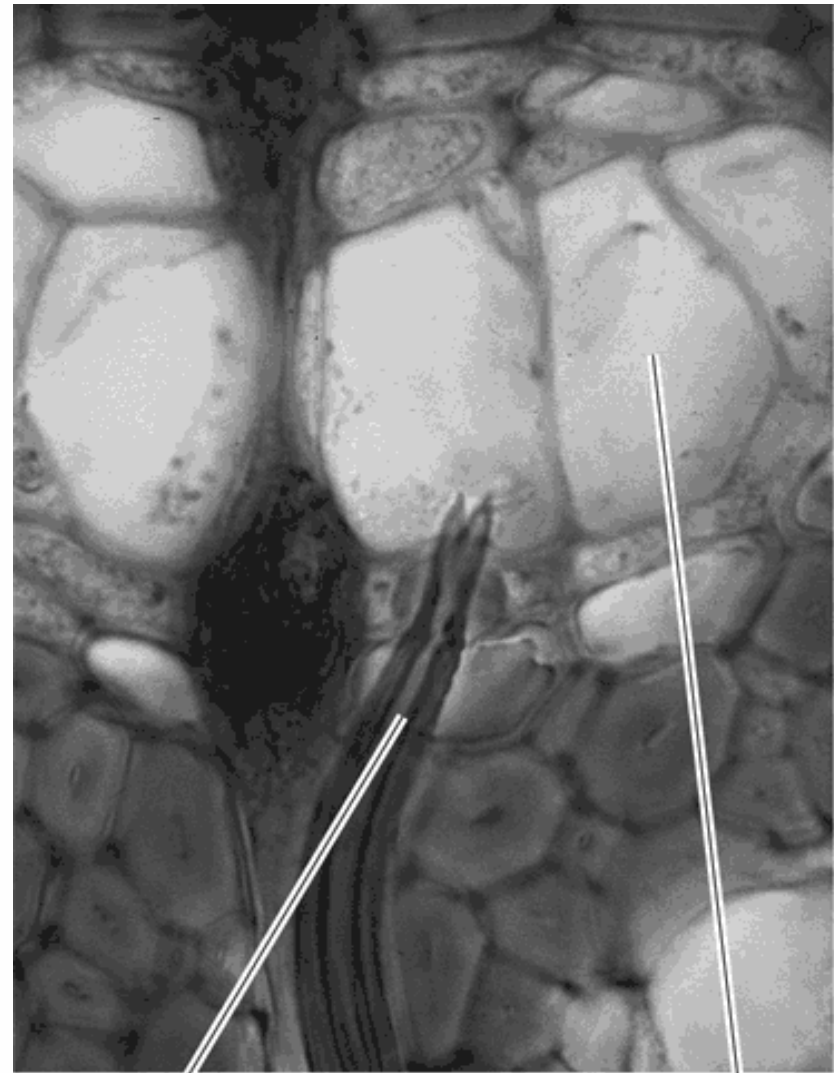
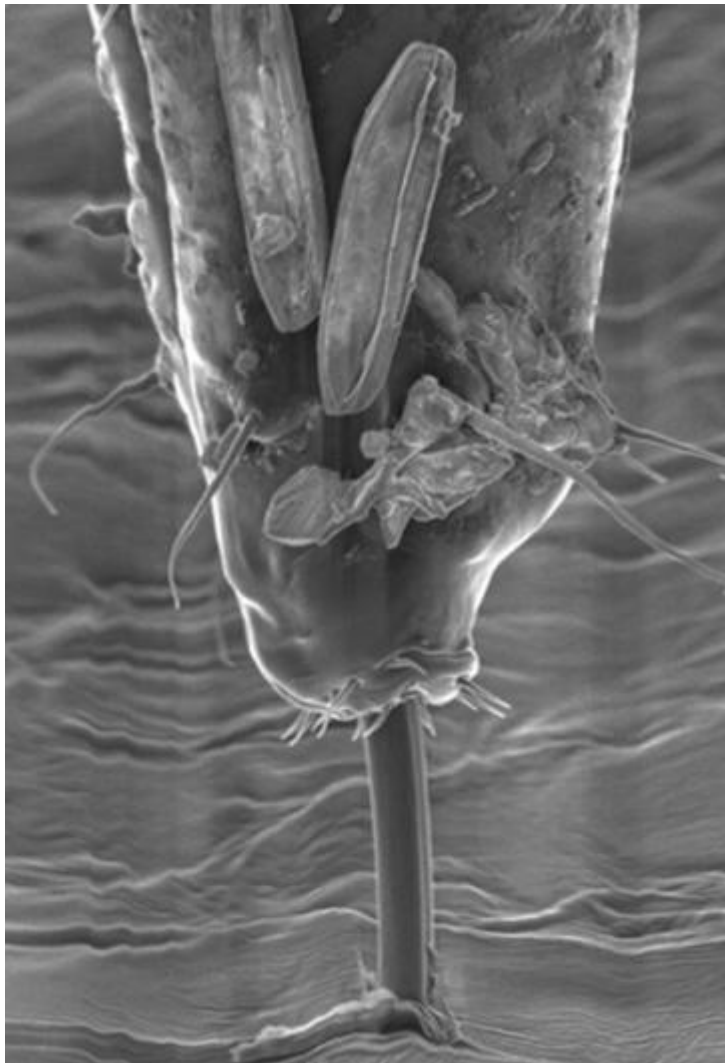


UNIVERSITY OF
BIRMINGHAM





UNIVERSITY OF
BIRMINGHAM



Aphid stylet

Sieve element









UNIVERSITY OF
BIRMINGHAM

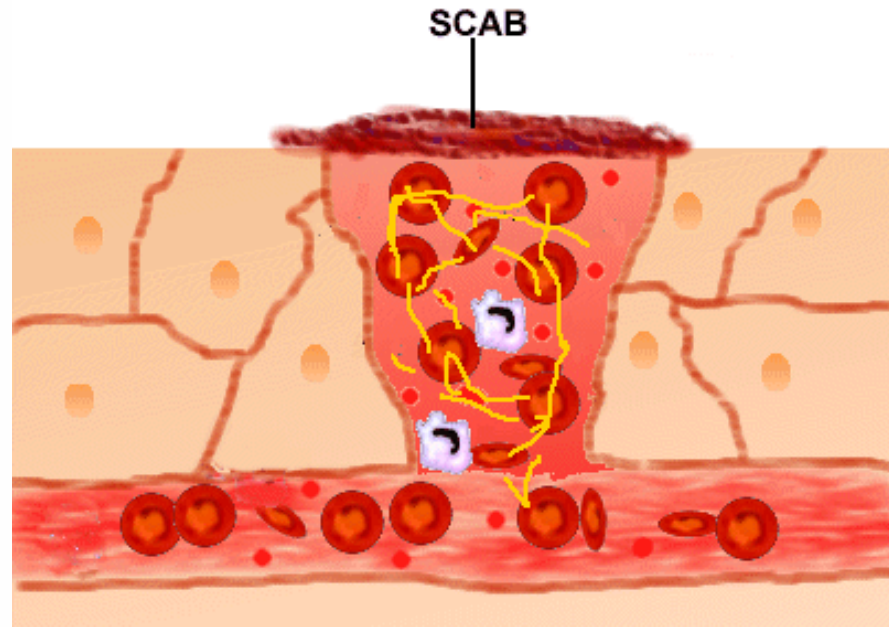


UNIVERSITY OF
BIRMINGHAM

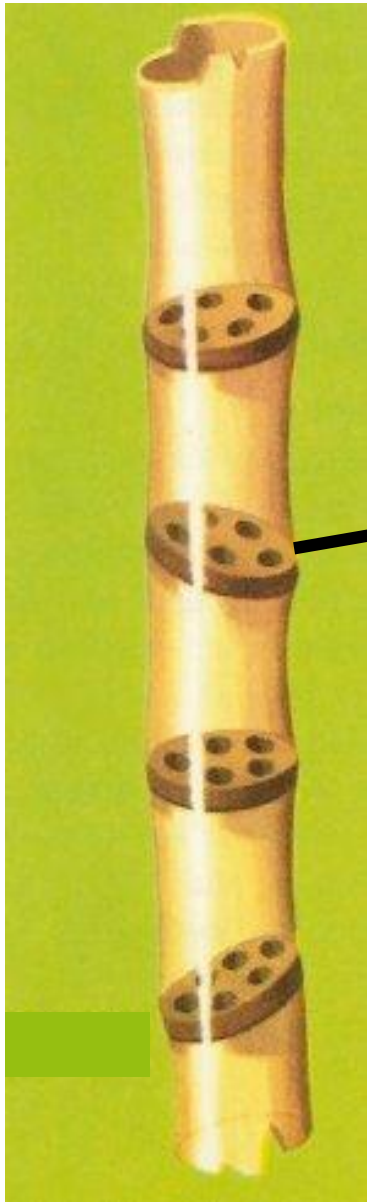
Why does your lawn not bleed to death?

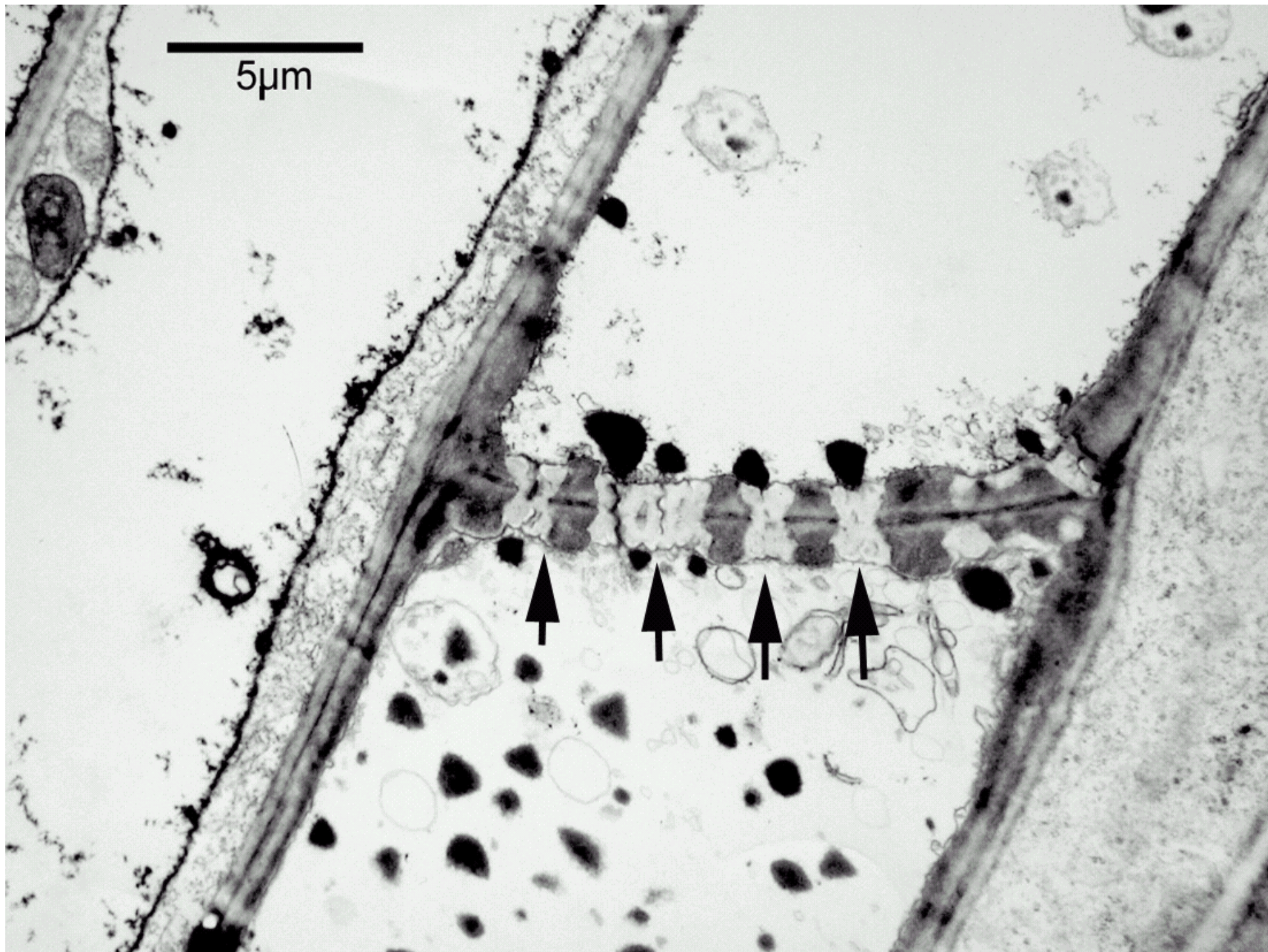


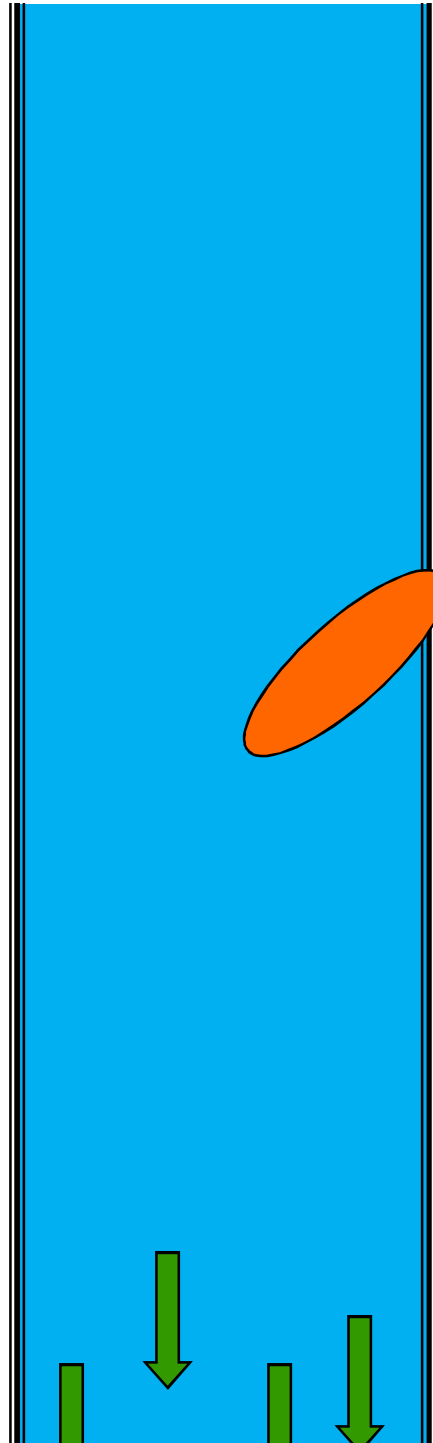
UNIVERSITY OF
BIRMINGHAM



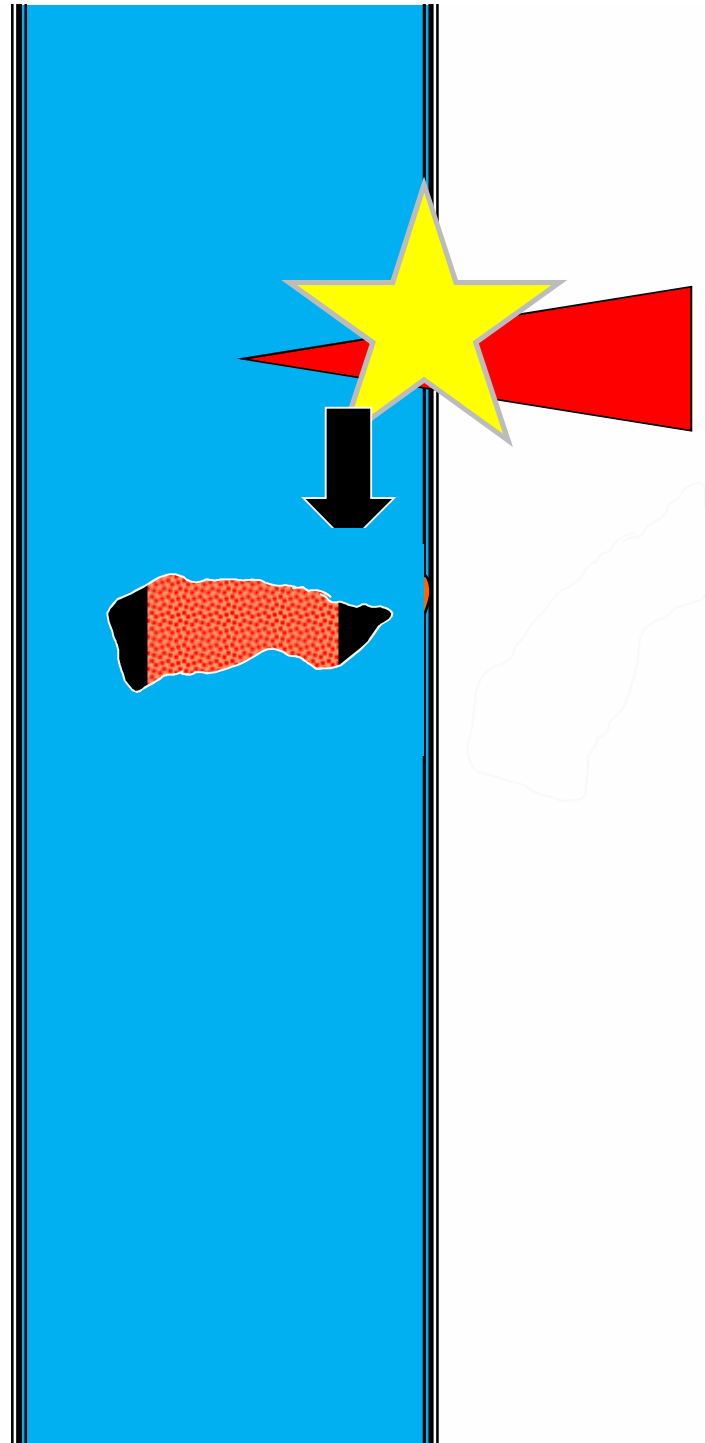
Plant scabs: Slow tube blockage

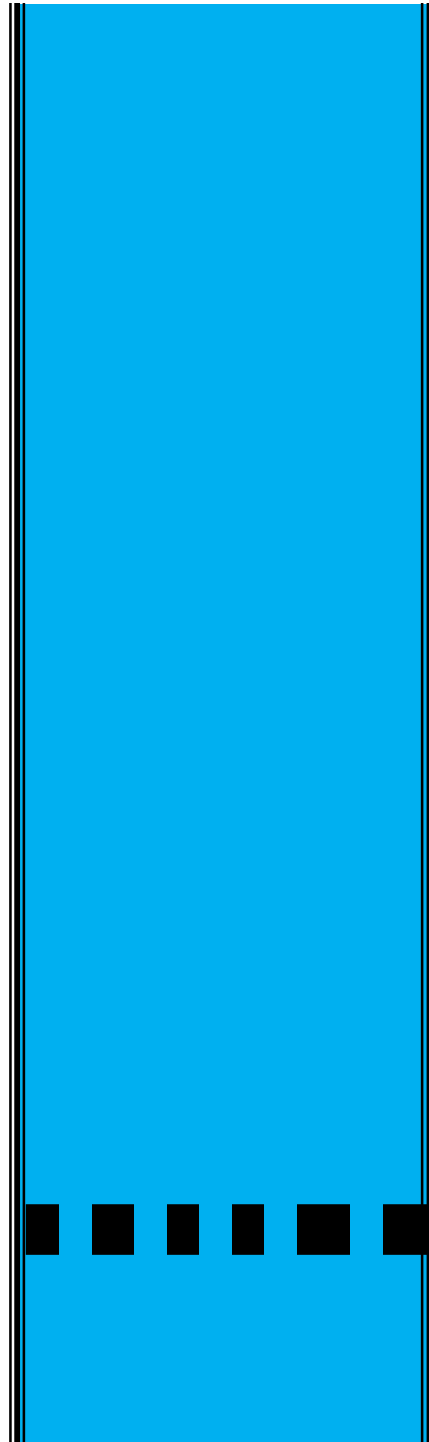




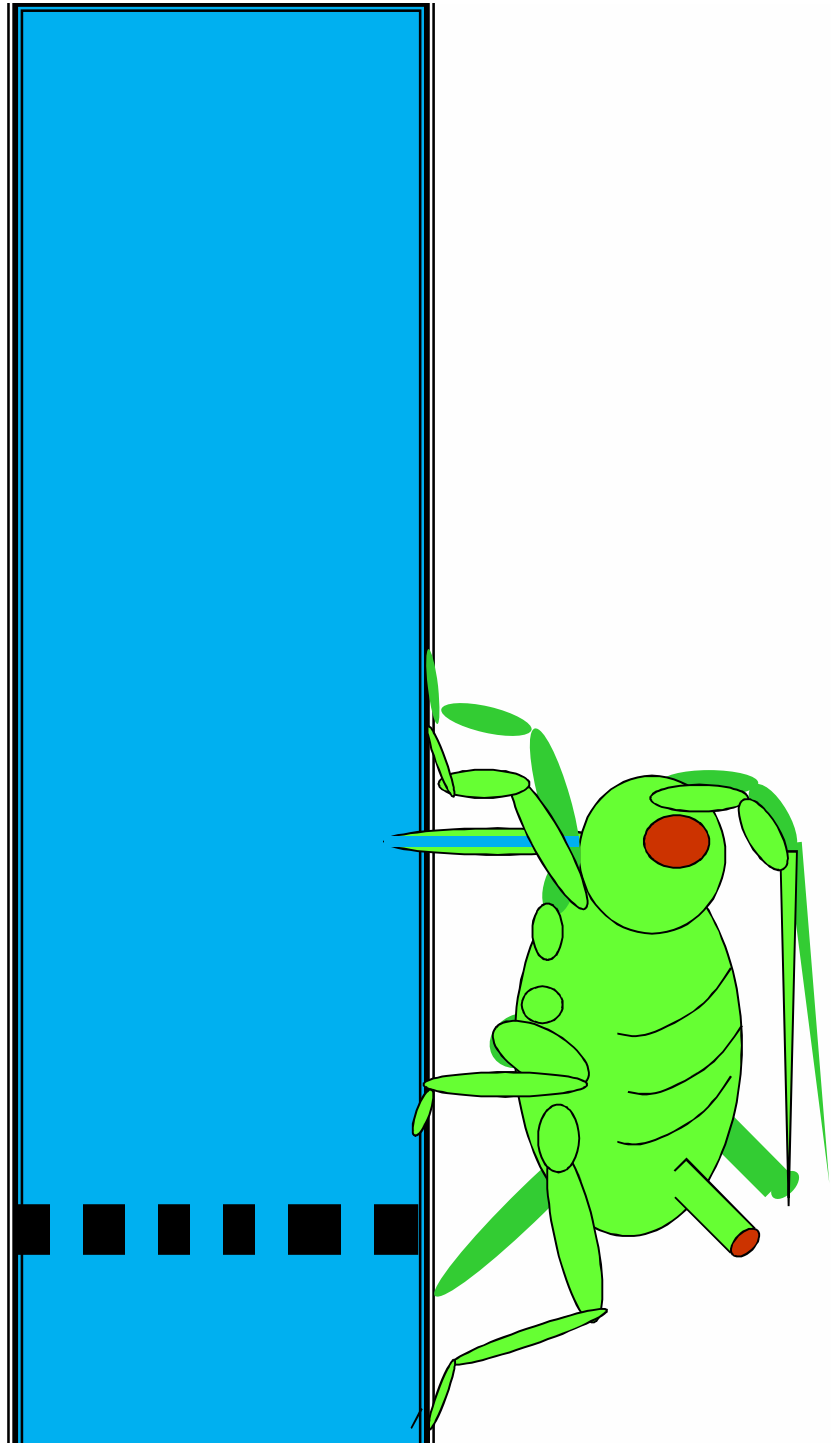


UNIVERSITY OF
BIRMINGHAM

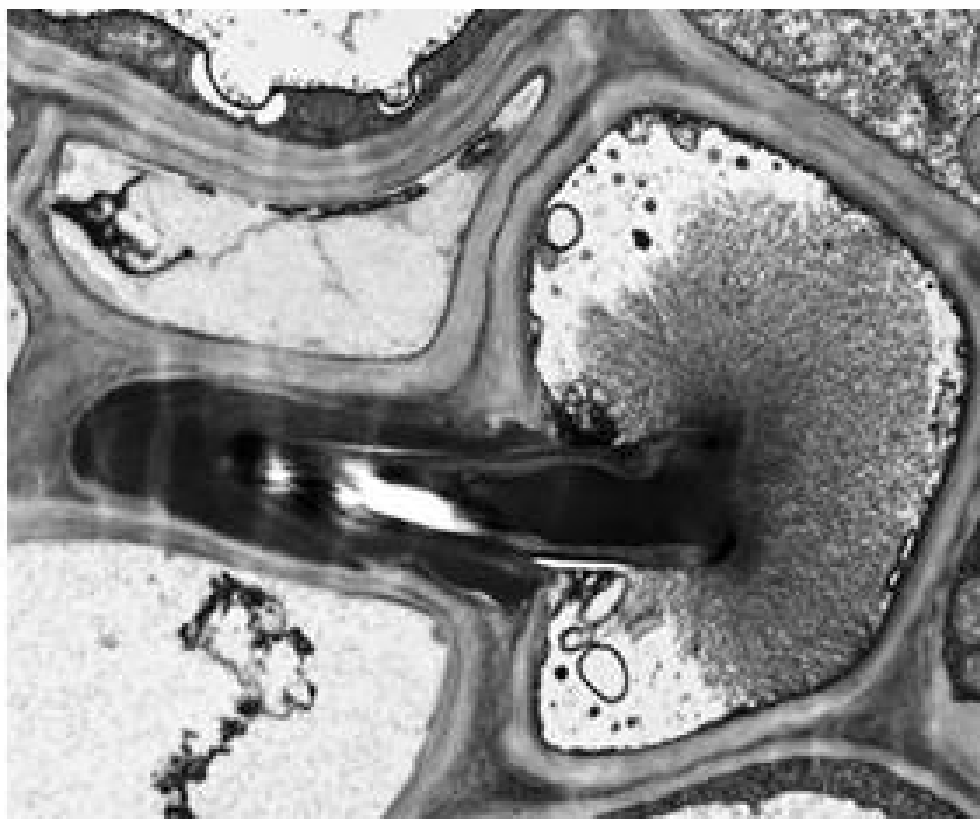




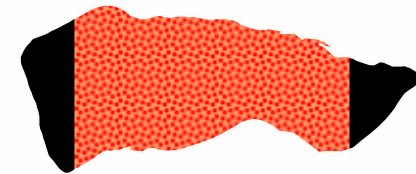
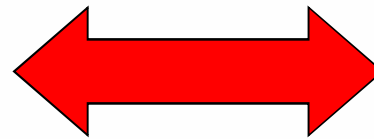
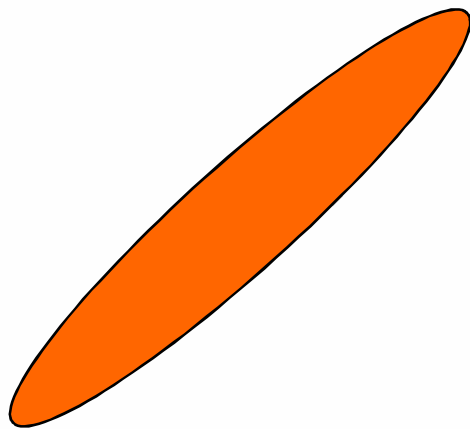
UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM



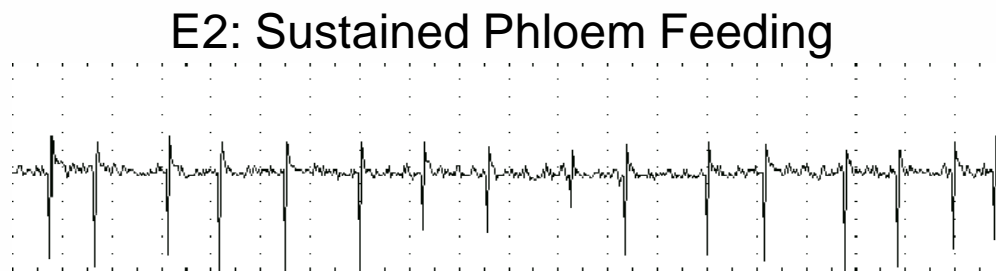
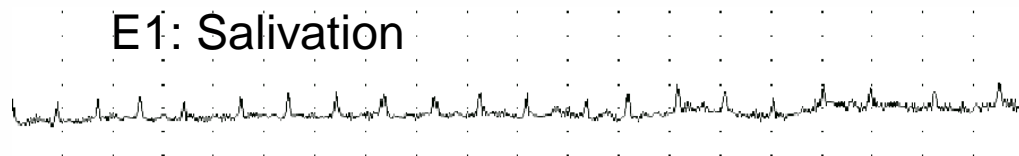
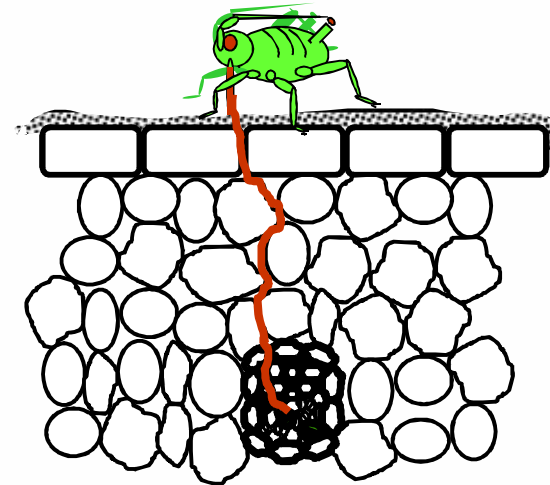
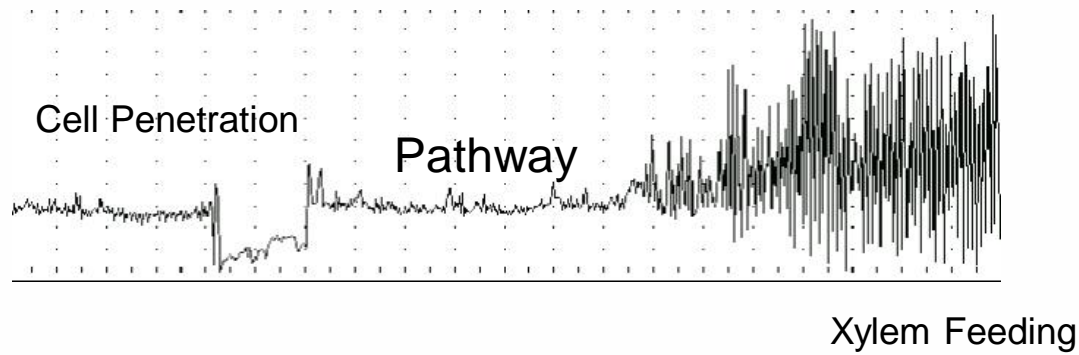
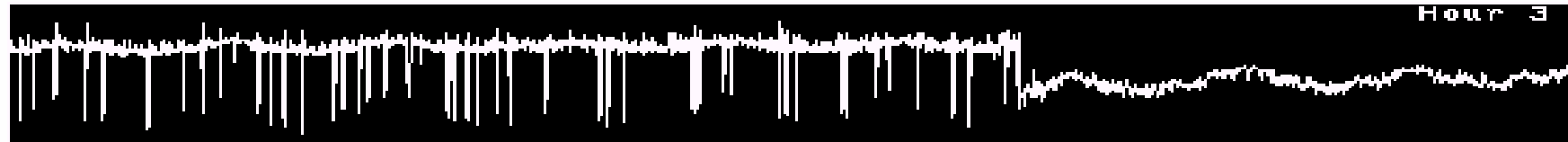
Nano - technology

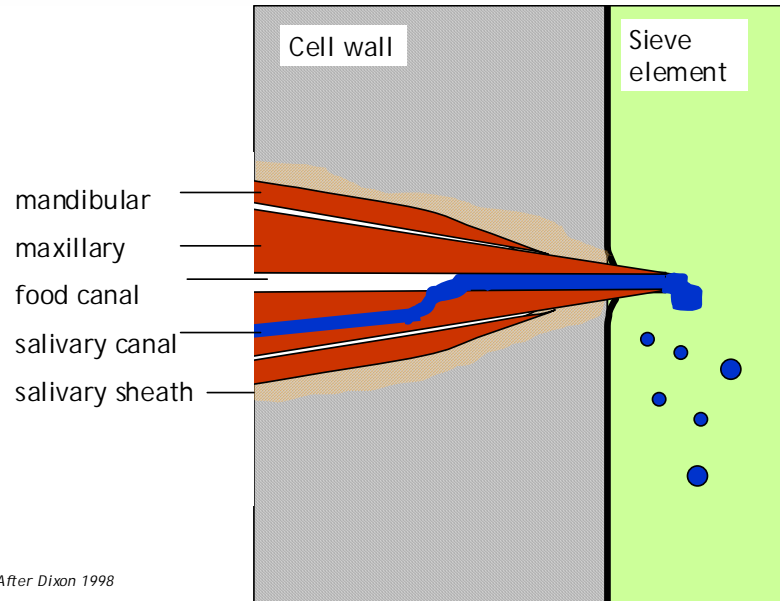
UNIVERSITY OF
BIRMINGHAM

Electronic Penetration Graphs - EPG

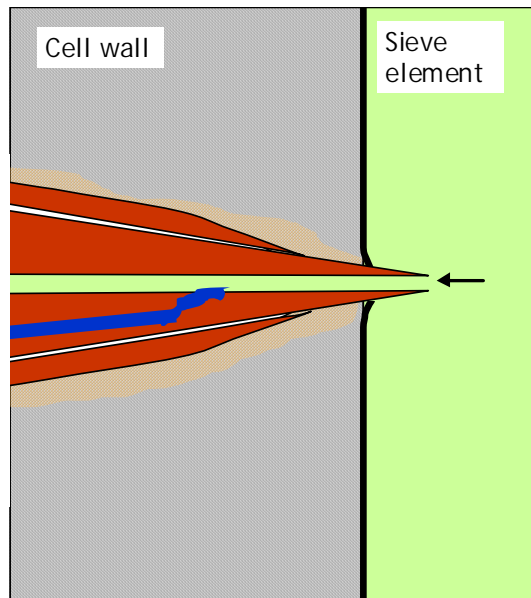


EPG

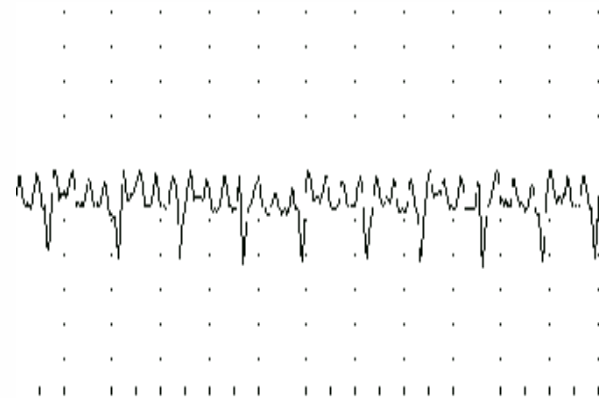




After Dixon 1998



After Dixon 1998





UNIVERSITY OF
BIRMINGHAM

Pilobolus kleinii.

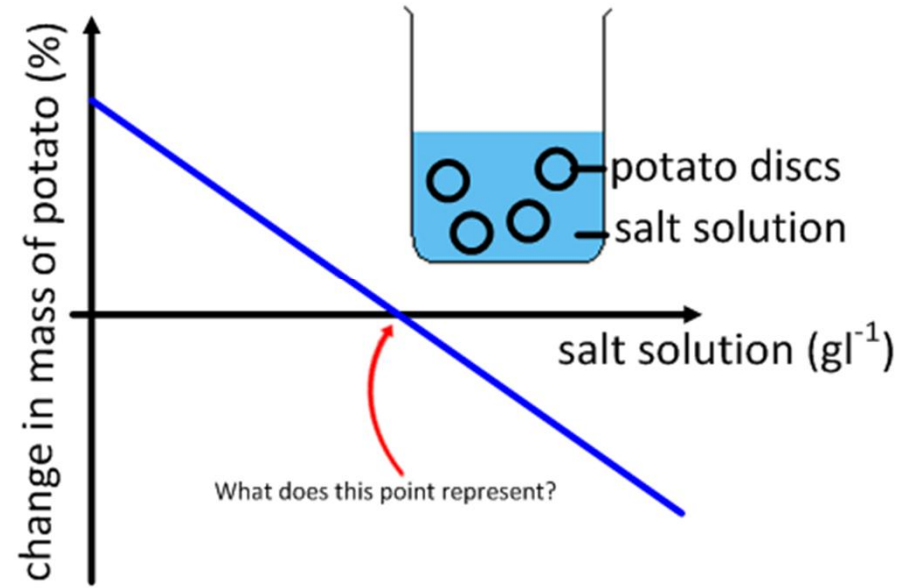


Pilobolus kleinii.





UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM



U



B

Stimulating intellectual
curiosity since 1825.

Challenge what you know.

UNIVERSITY OF
BIRMINGHAM



U



B

Dr Jeremy Pritchard



UNIVERSITY OF
BIRMINGHAM

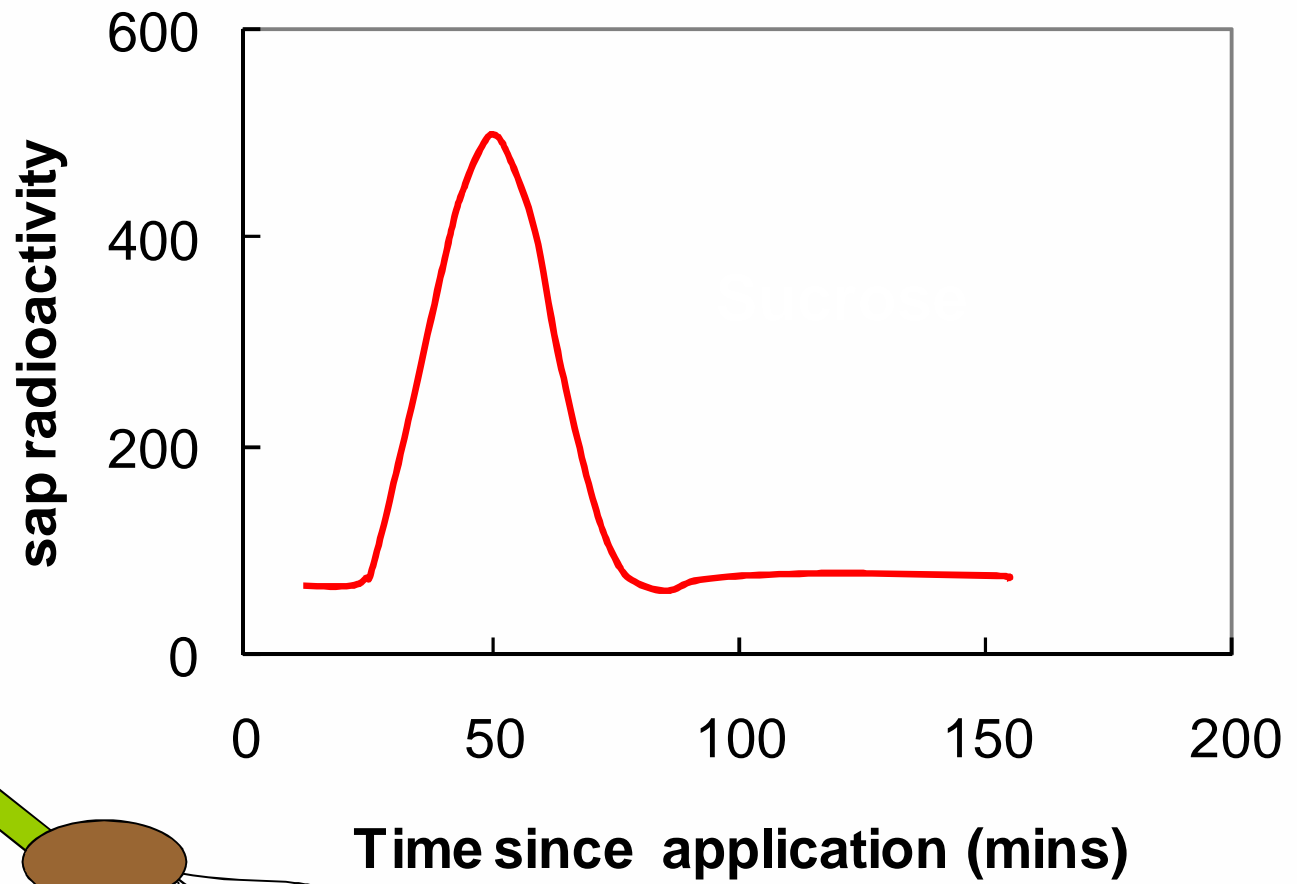
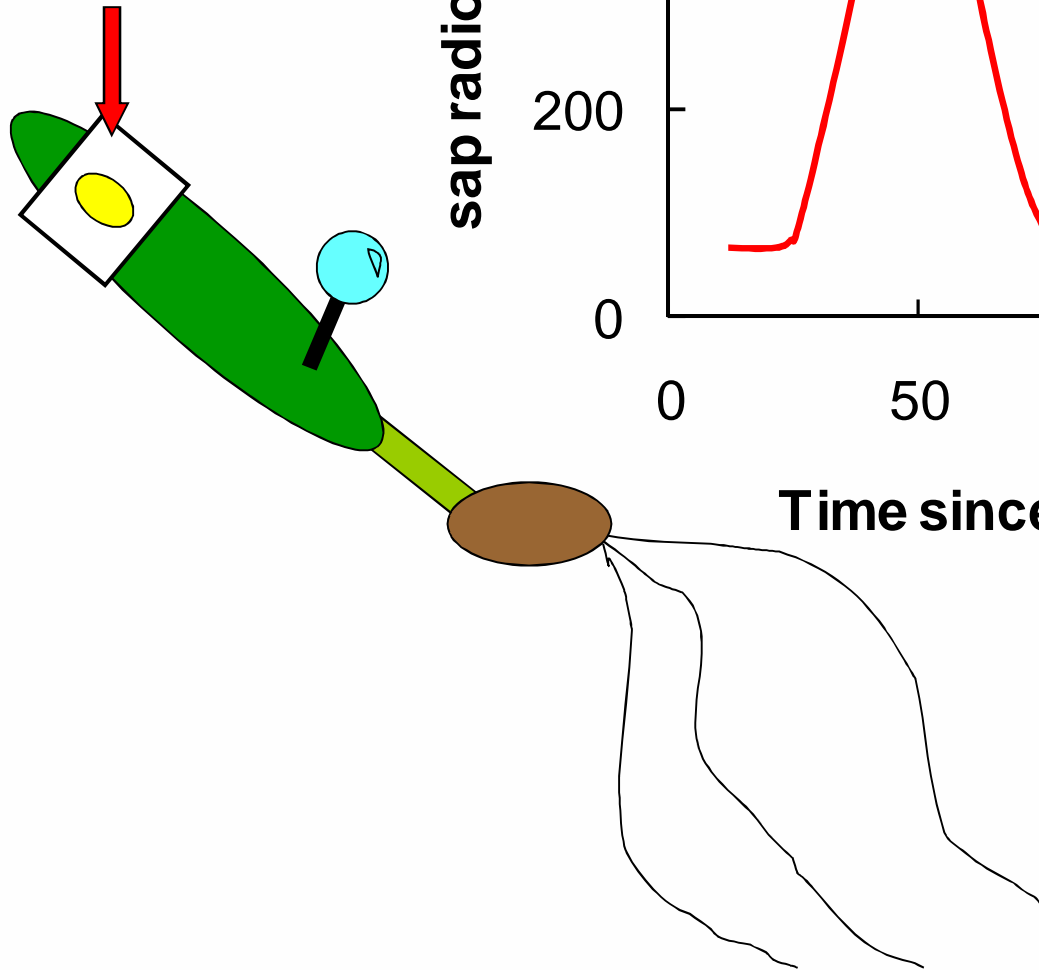


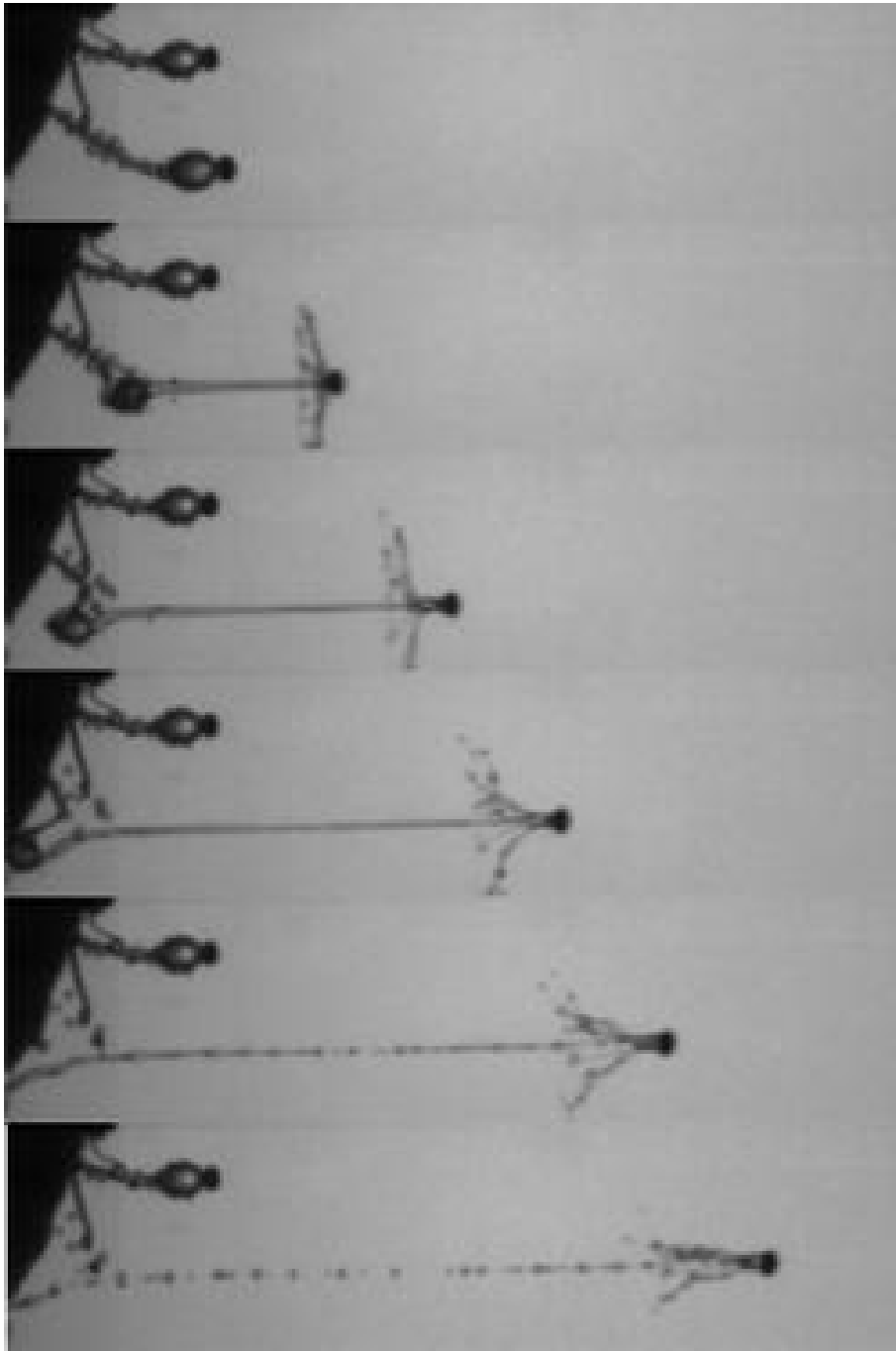
UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM

sucrose



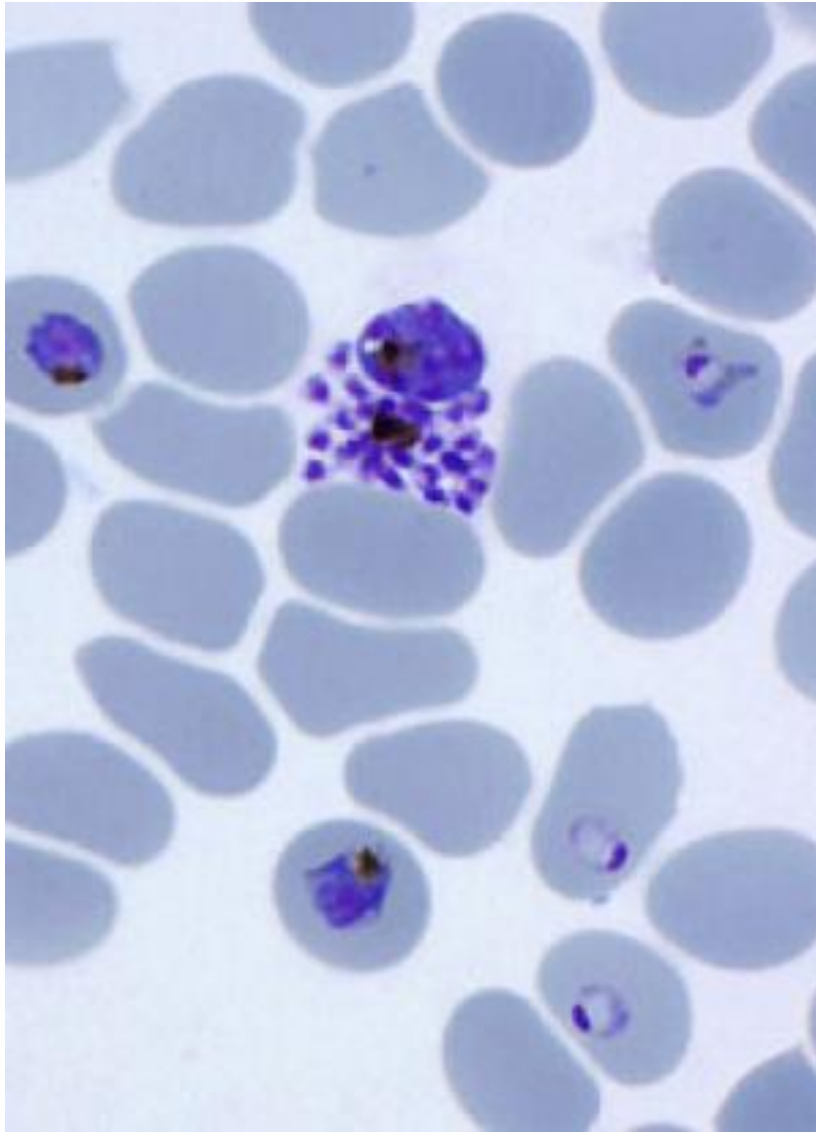


UNIVERSITY OF
BIRMINGHAM



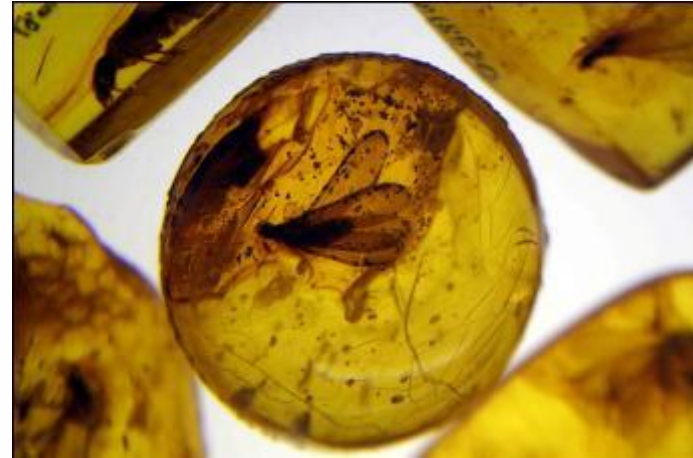


UNIVERSITY OF
BIRMINGHAM

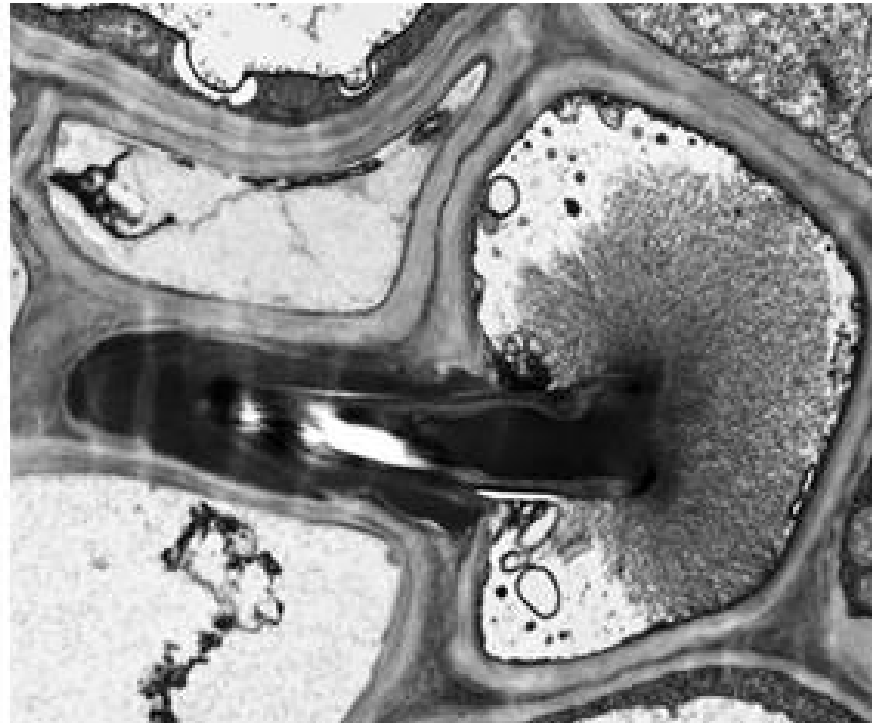


UNIVERSITY OF
BIRMINGHAM

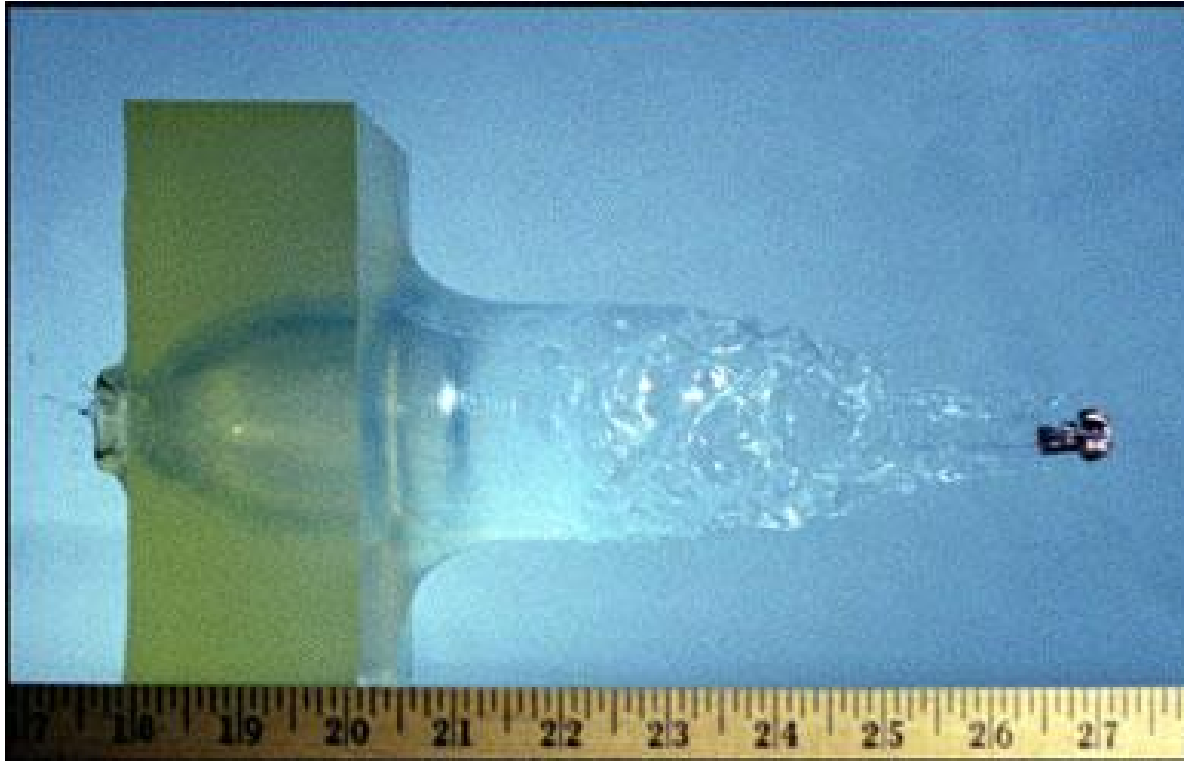




UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
BIRMINGHAM

<http://www.uni-giessen.de/~gf1114/rgvbel/longmov.html>