

SESSION TWO
***Breaking Rest without
Losing Sleep***

SPONSORED BY Villa Crop Protection

Chair: Dian Craven | Fruitways



*Basics of dormancy and
rest breaking*

Dr Esmé Louw | Stellenbosch University



The basics of **Dormancy and Rest-breaking**

Esmé Louw
Horticultural Science Department
Stellenbosch University

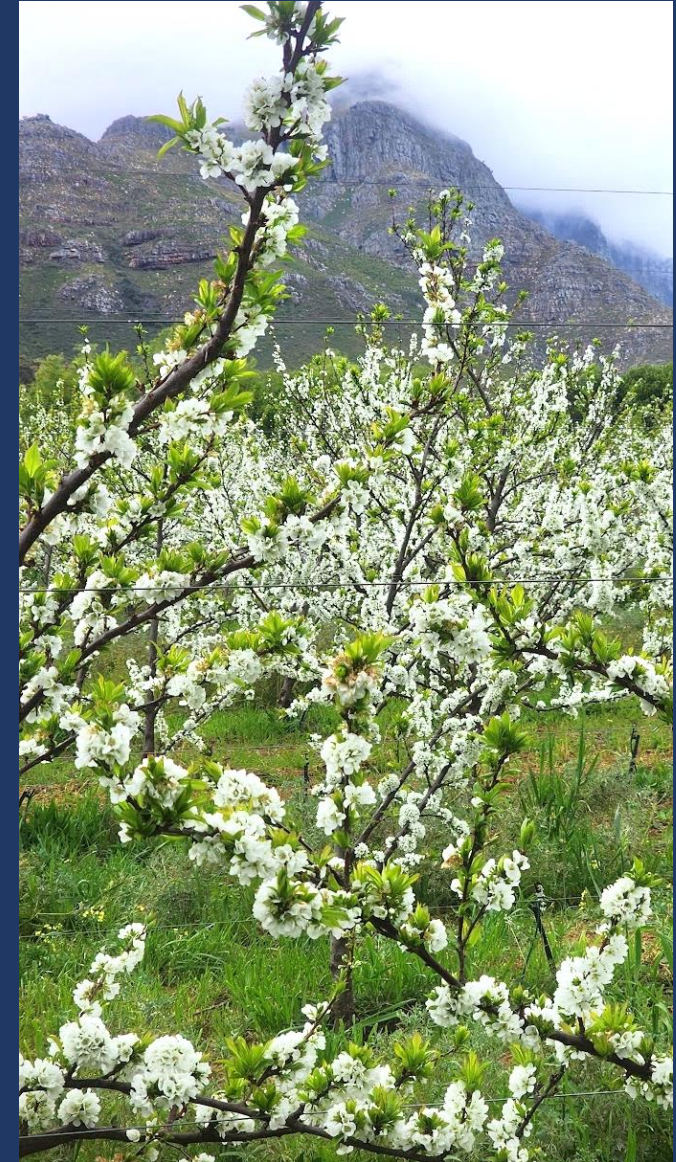


BUD- DORMANCY and natural rest-breaking



FUNCTIONS OF BUD DORMANCY:

- Survival
- Synchronise bud break



DORMANCY PROGRESSION



~~PARADORMANCY~~ ~~PARADORMANCY~~

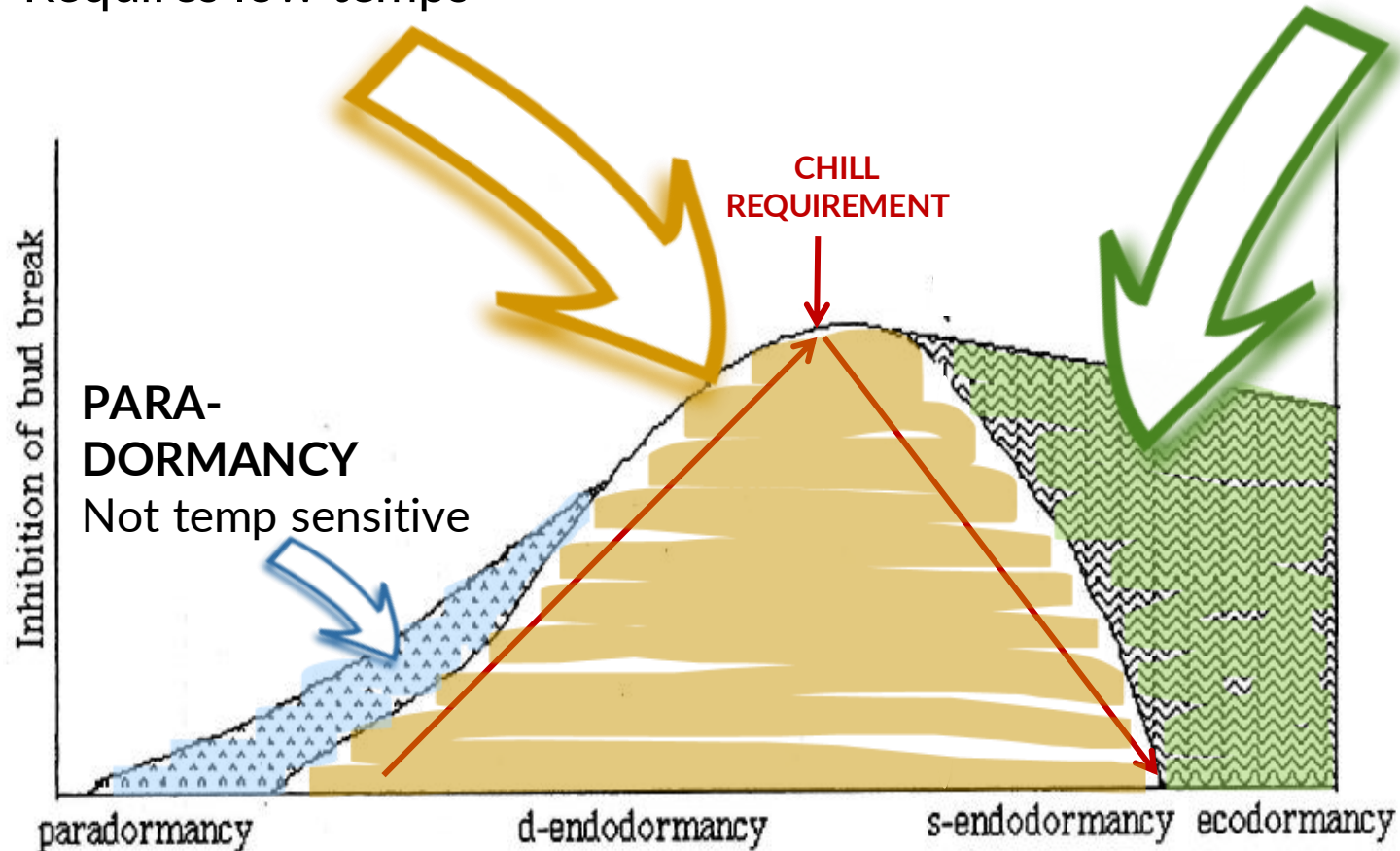
- Correlative inhibition
- Not regulated by temperature

ENDODORMANCY

DORMANCY PROGRESSION

ENDO-DORMANCY
Requires low temps

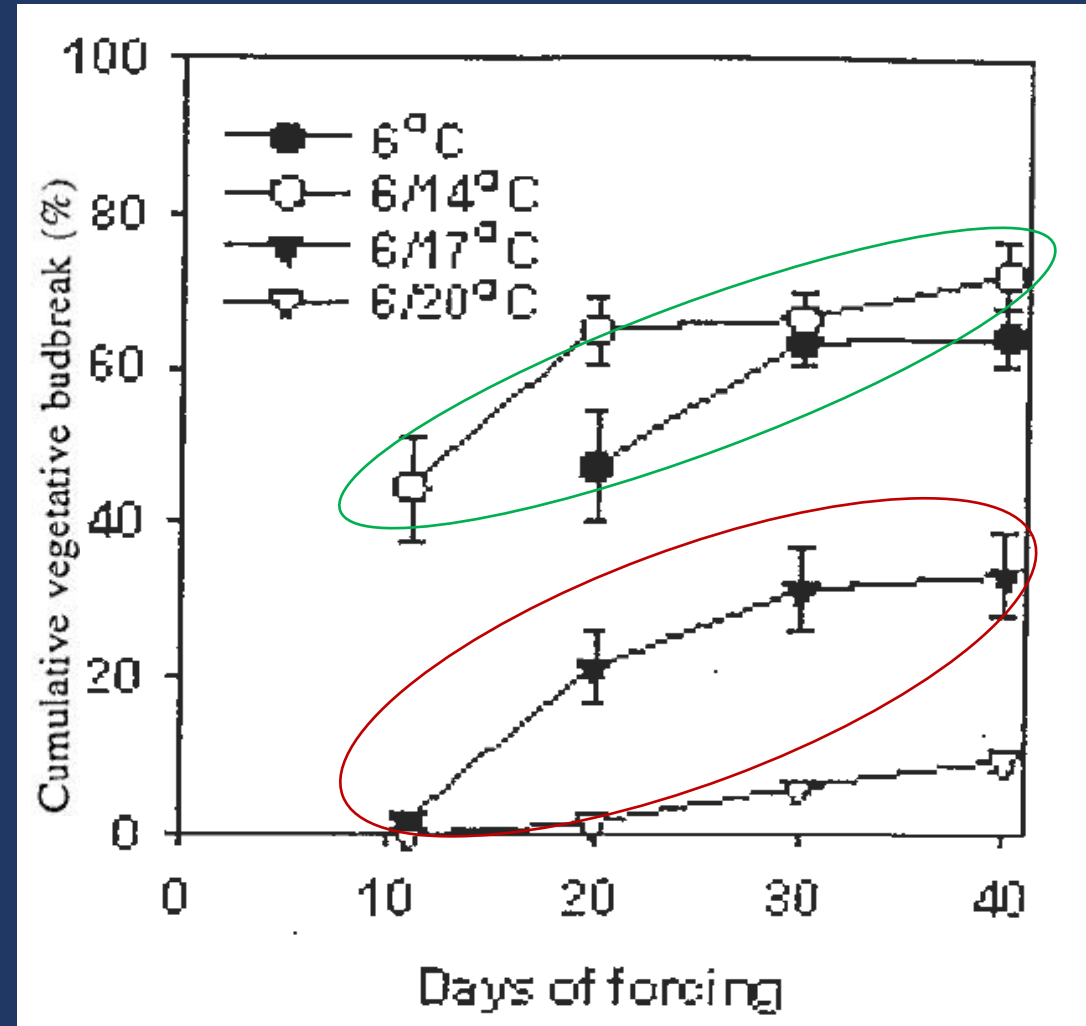
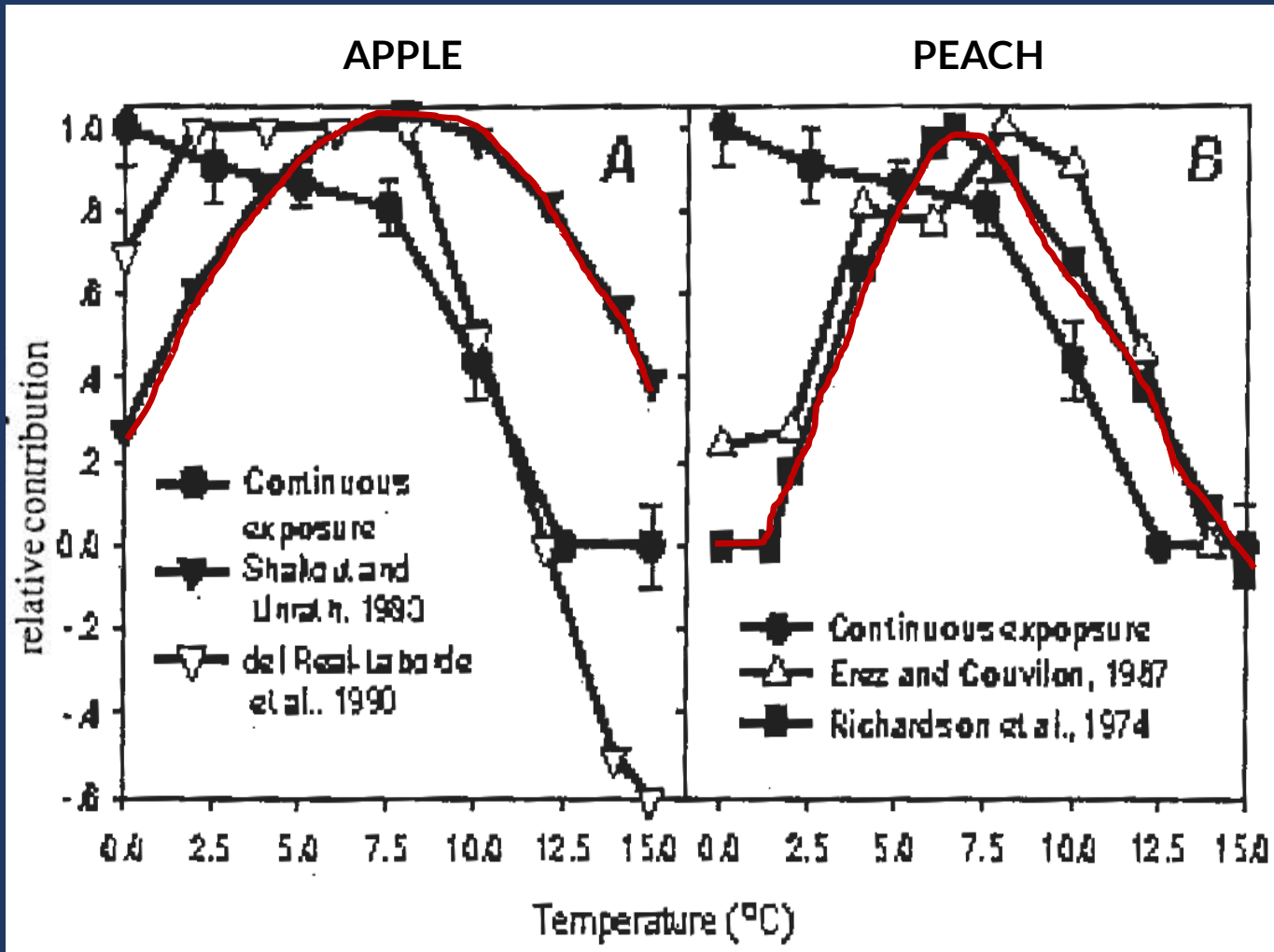
ECO-DORMANCY
Requires warm temps



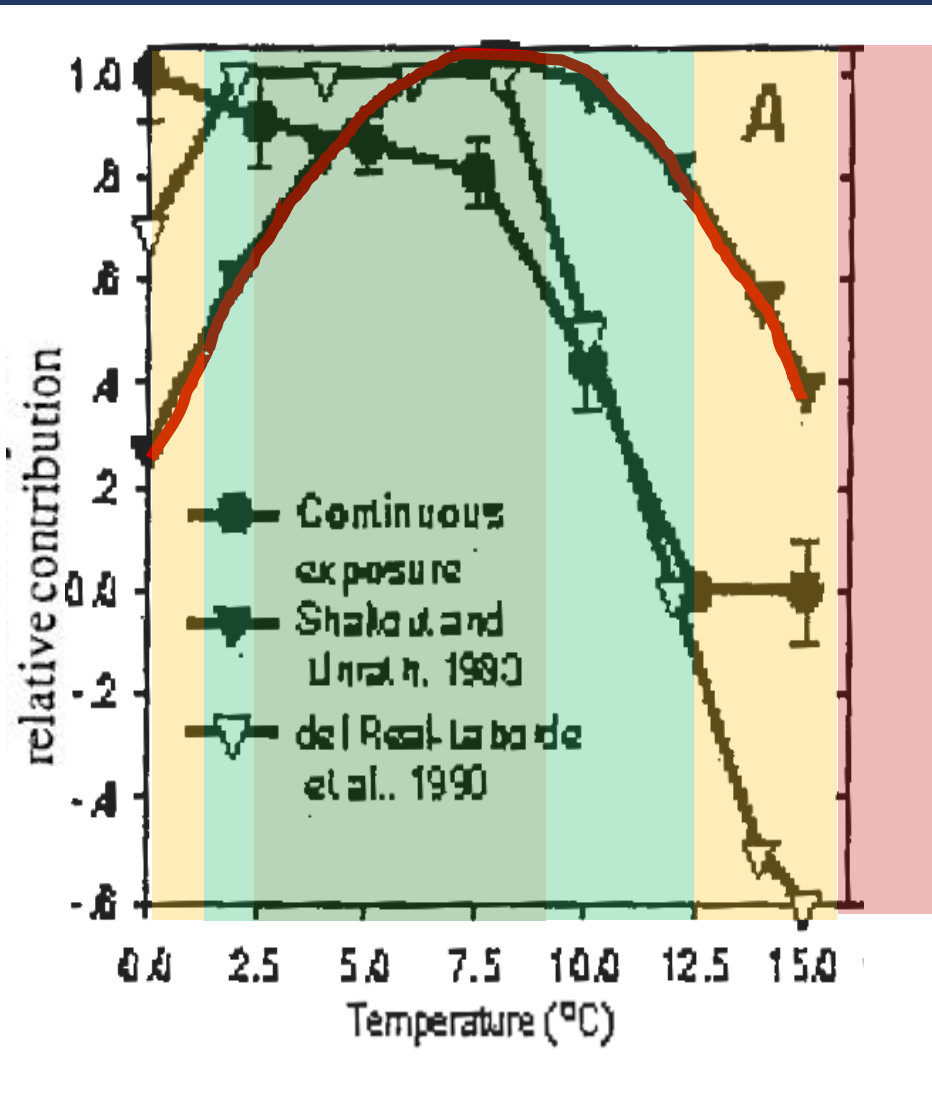
Faust et al (1997)



ENDO-DORMANCY: Effective low temperatures



CHILL MODELS

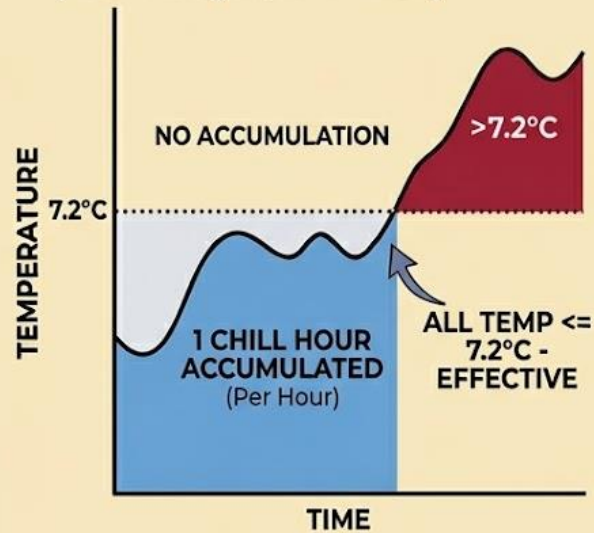


CU values	Temps °C
0	<1.4
0.5	1.5-2.4
1.0	2.5-9.1
0.5	9.2-12.4
0	12.5-15.9
-0.5	16.0-18.0
-1.0	>18

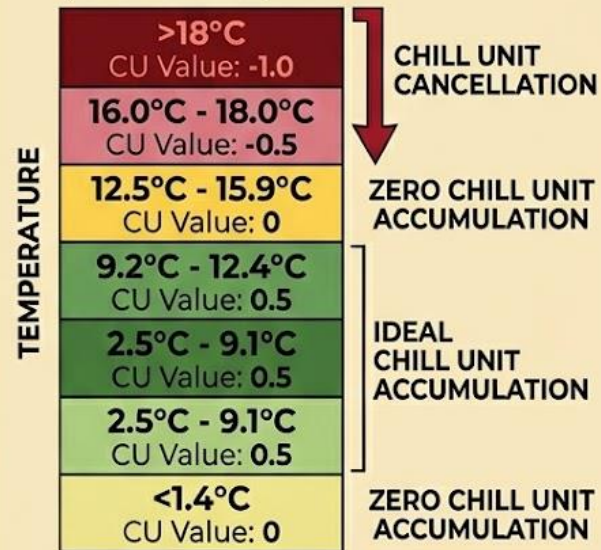
- Weighted values to effective temperatures
- Sub-zero has no contribution
- Warmer temps are negative
- Chill negation

CHILL MODELS

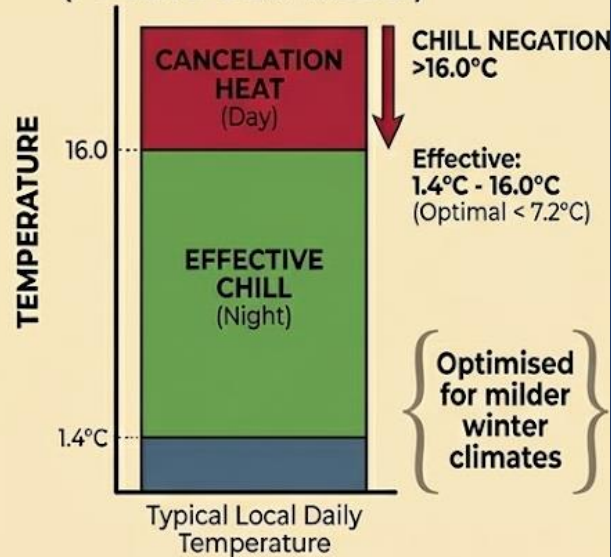
1. CHILLING HOURS MODEL (Weinberger/Standard)



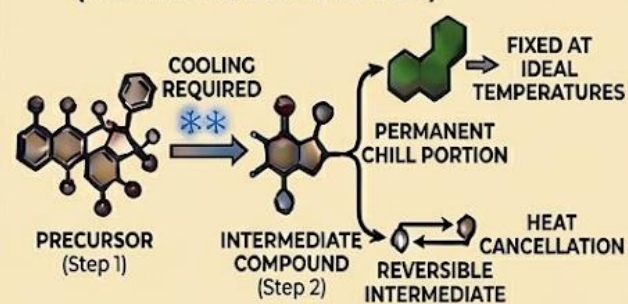
2. UTAH CHILL MODEL (Richardson)



3. INFROUTECH CHILL MODEL (Positive Utah model)



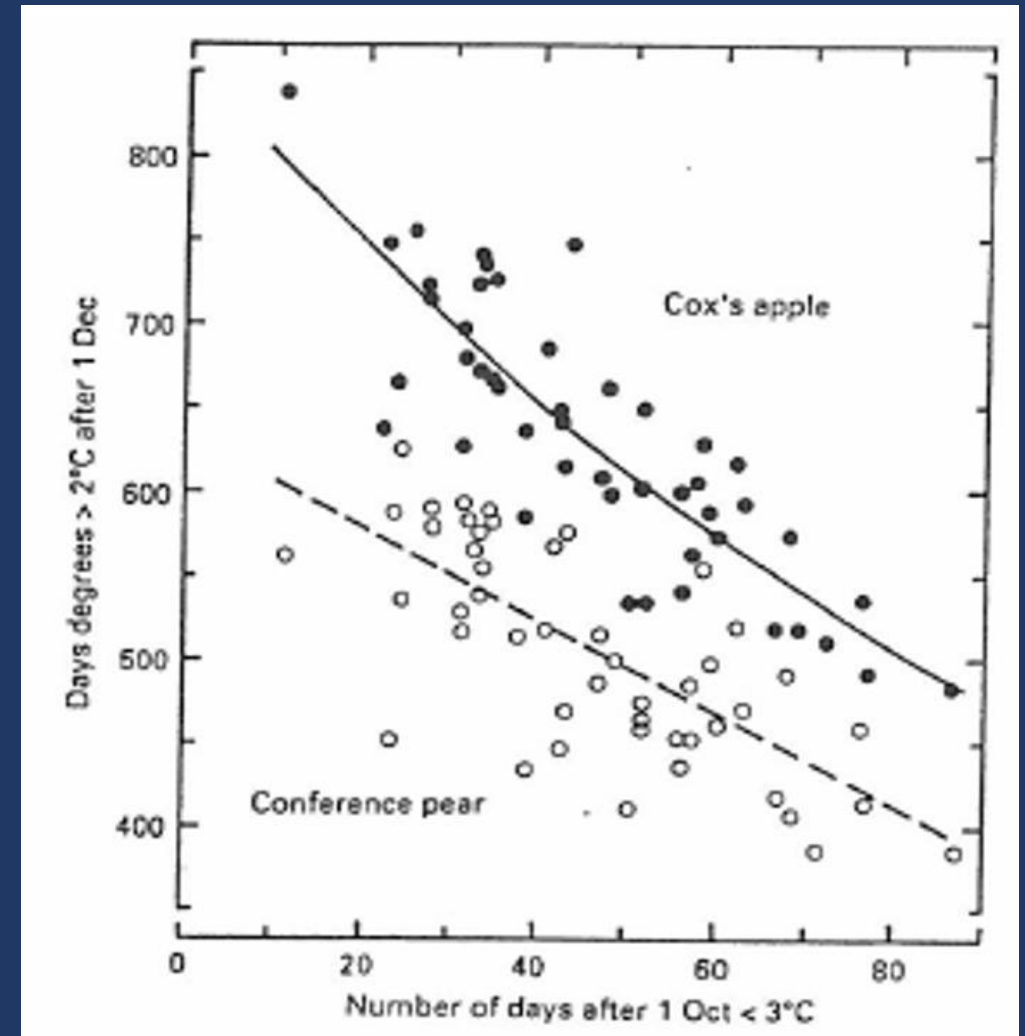
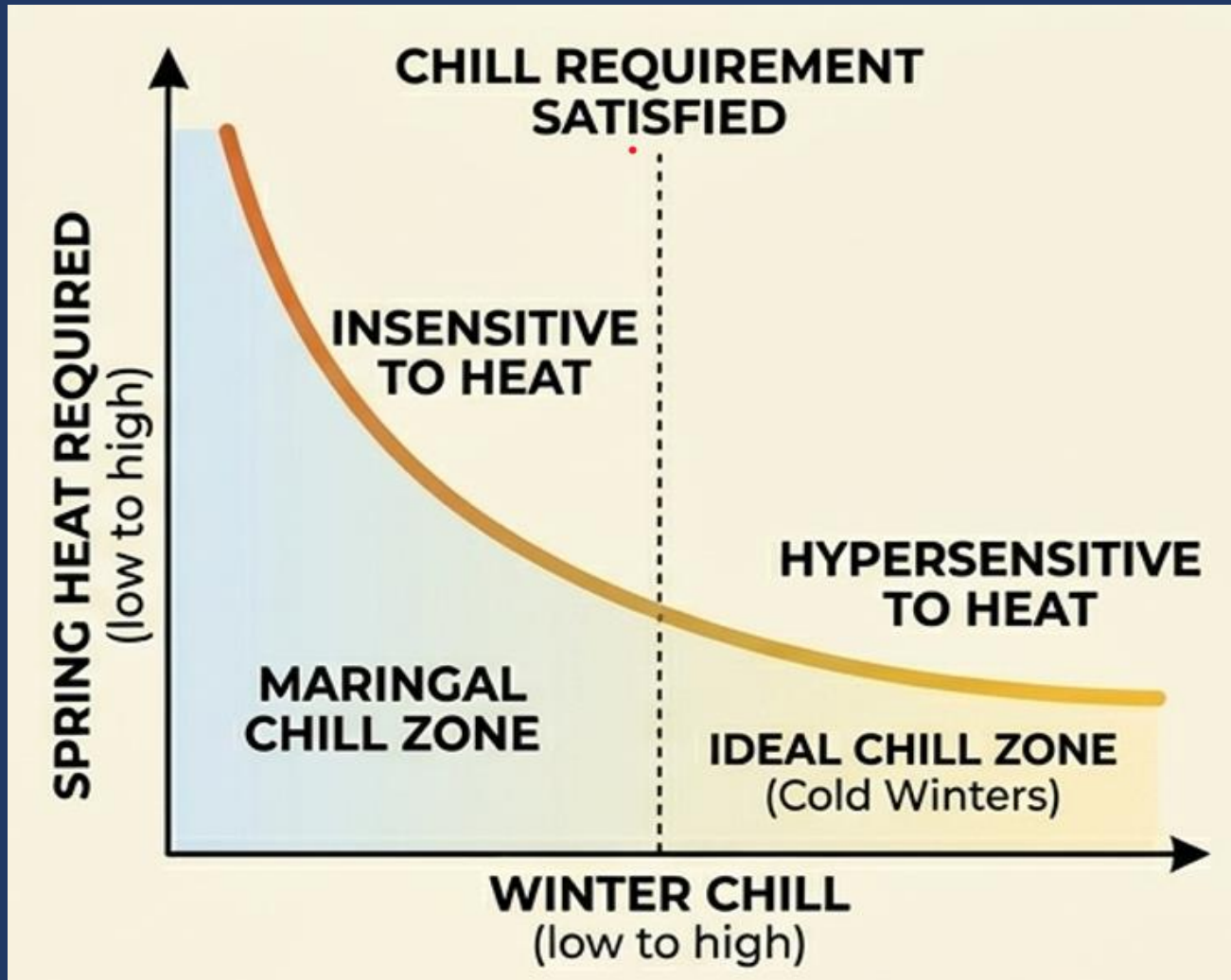
4. DYNAMIC MODEL (Fishman/Erez/Lavee)



Measured in Chill Portions

ECO-DORMANCY: Effective warm temperatures

Compensatory inverse relationship



CHILL versus HEAT



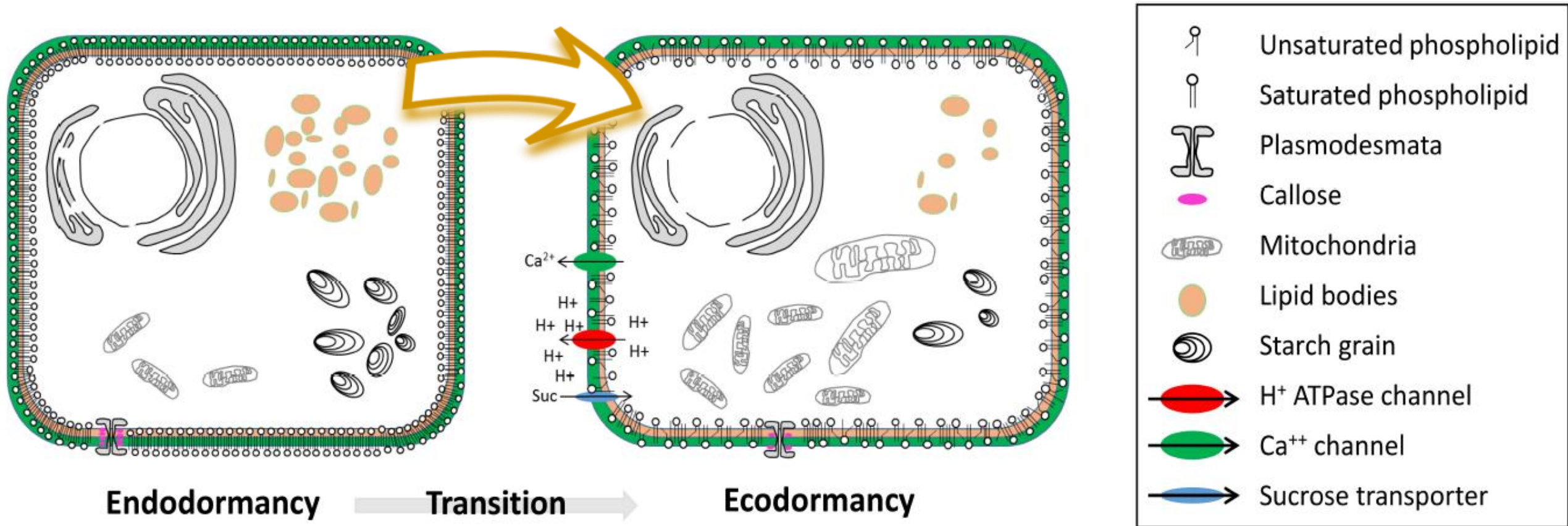
COLD autumn
COLD winter
WARM spring

COLD autumn
COLD winter
COLD spring

WARM autumn
WARM winter
WARM spring

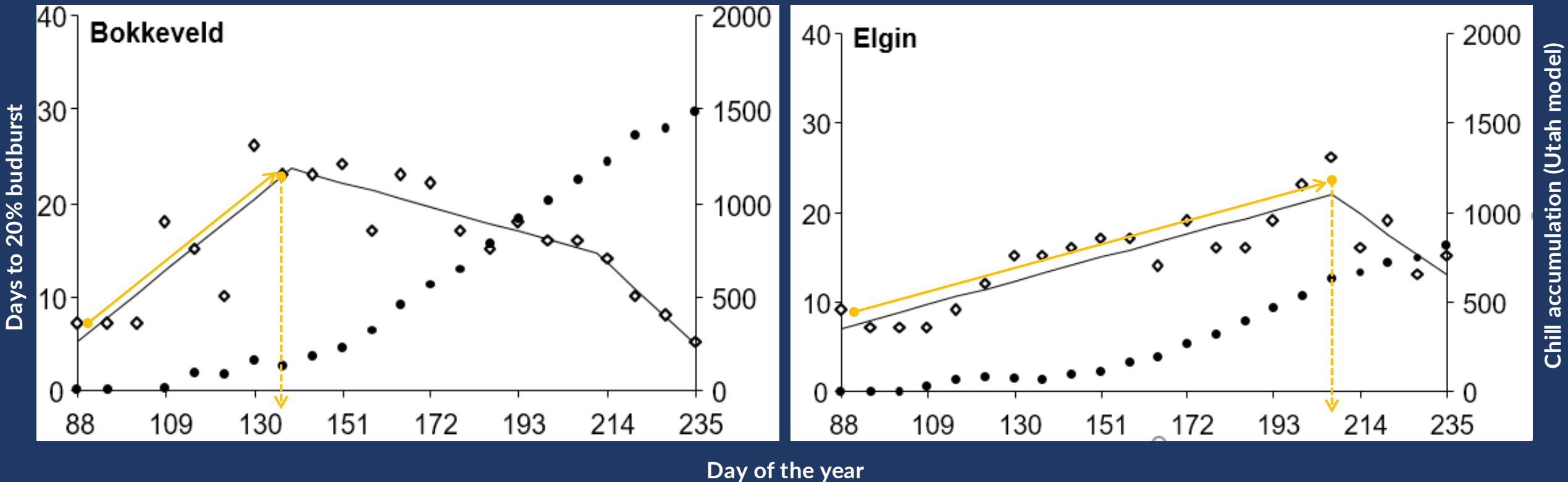
WARM autumn
WARM winter
COLD spring

PHYSIOLOGICAL BLOCK



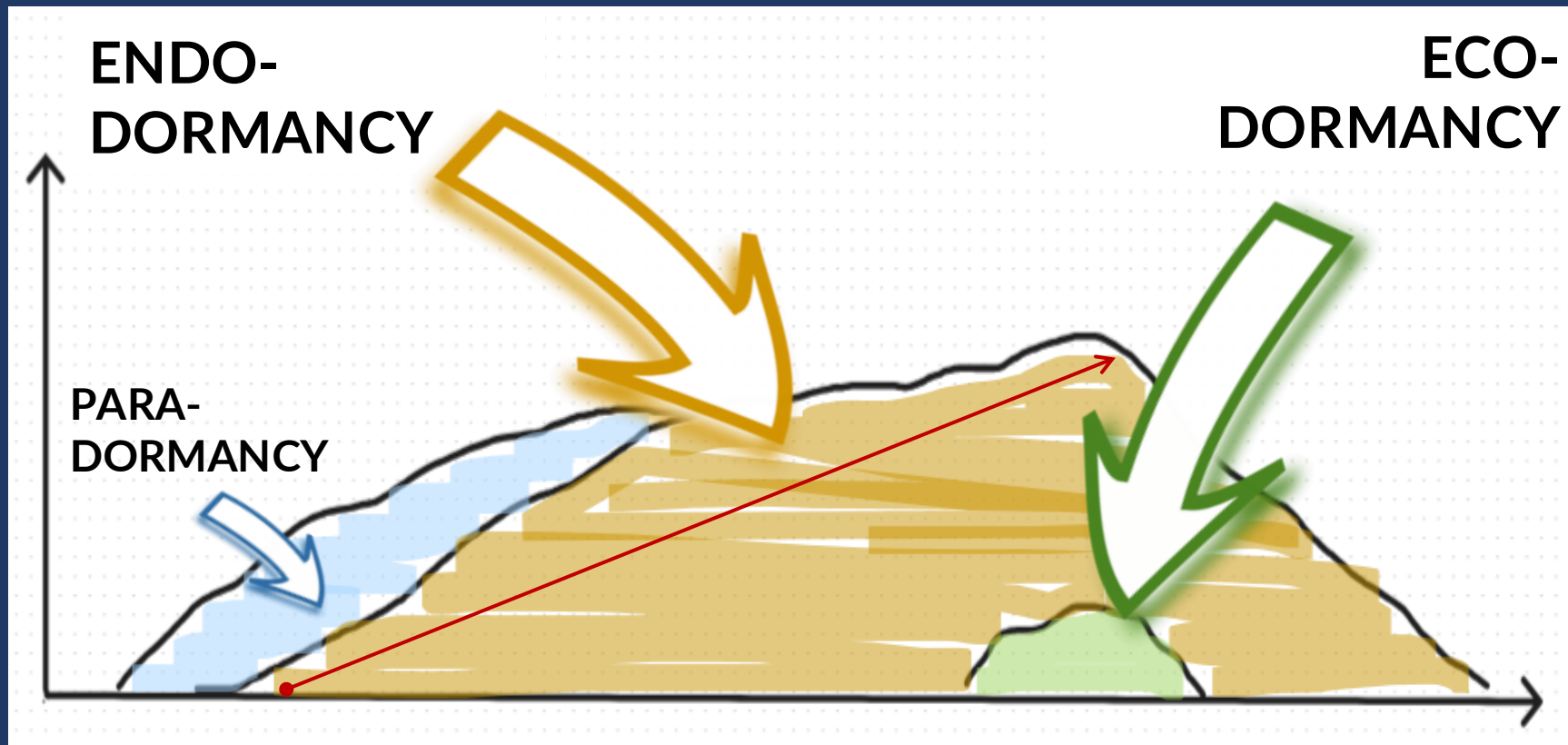
LACK OF WINTER CHILL – Dormancy progression

Cook & Jacobs, 2000



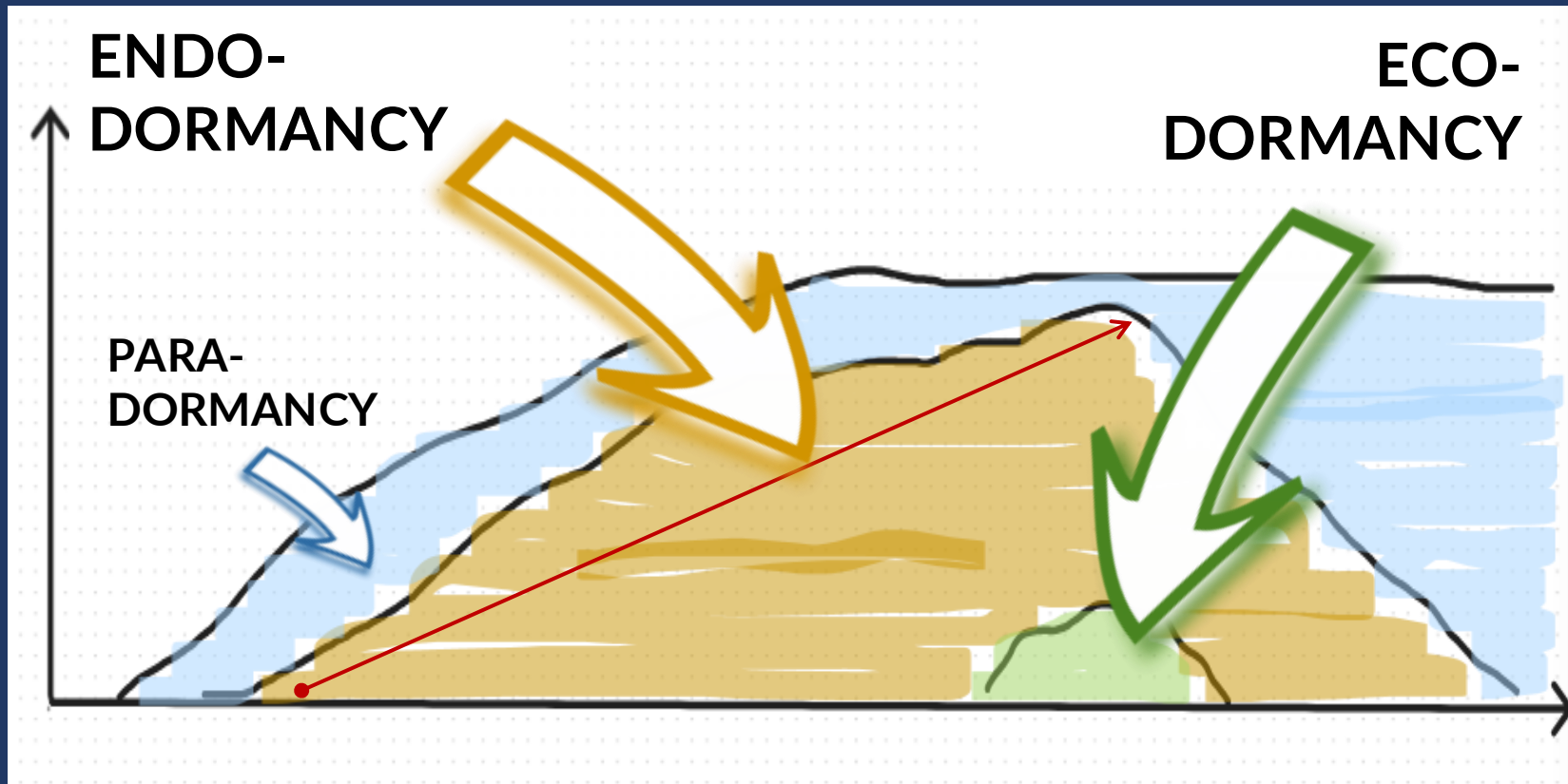
LACK OF WINTER CHILL – Dormancy progression

APICAL BUDS



LACK OF WINTER CHILL – Dormancy progression

LATERAL BUDS



LACK OF WINTER CHILL – Delayed foliation



LACK OF WINTER CHILL – Mixed maturity



LACK OF WINTER CHILL – Basal dominance



Photo: Esmé Louw

Proximal autonomy



Photo: Anton Müller

Struggle to full vertical space



Photo: Anton Müller

Basal branches show strong competition with leader/trunk

LACK OF WINTER CHILL - symptoms



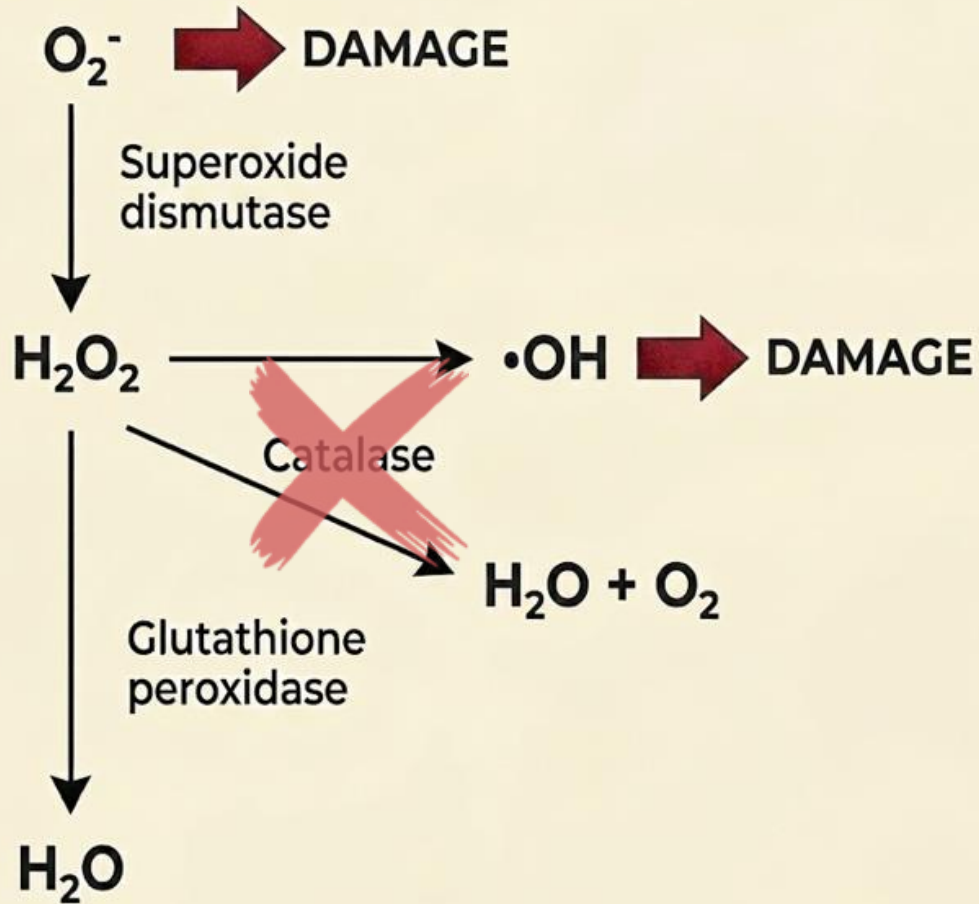
ARTIFICIAL REST-BREAKING: Application



- 0.5% hydrogen cyanamide and 3% mineral oil
- Primer applications
- Timing and dosage
- Weather conditions
- Tree heath and soil conditions

WHY IS HYDROGEN CYANAMIDE SO EFFECTIVE?

REACTIVE OXYGEN SPECIES (ROS) PATHWAY



CREATES HIGH
OXIDATIVE STRESS

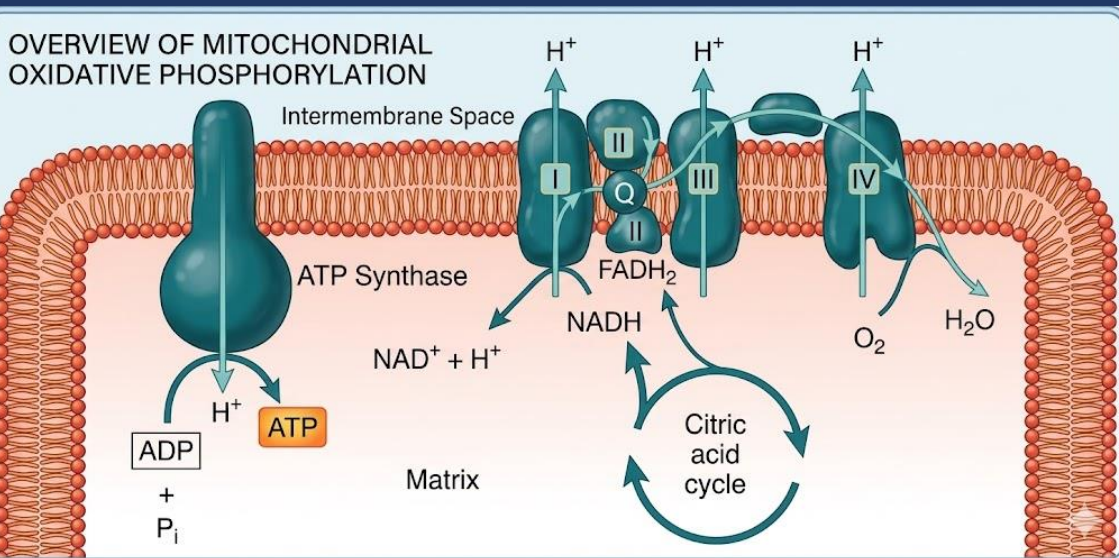
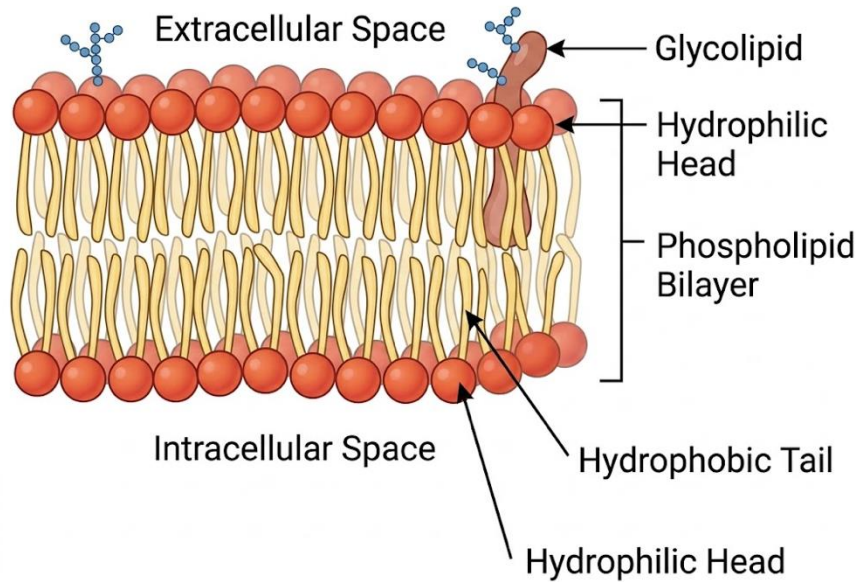
Inhibits **catalase** enzyme

high H_2O_2 concentrations

H_2O_2 = **ROS** = signalling molecule

Dormancy release/growth response

WHY IS HYDROGEN CYANAMIDE SO EFFECTIVE?



MIMICS
WINTER CHILL PHYSIOLOGY

More unsaturated fatty acids
in **membranes**

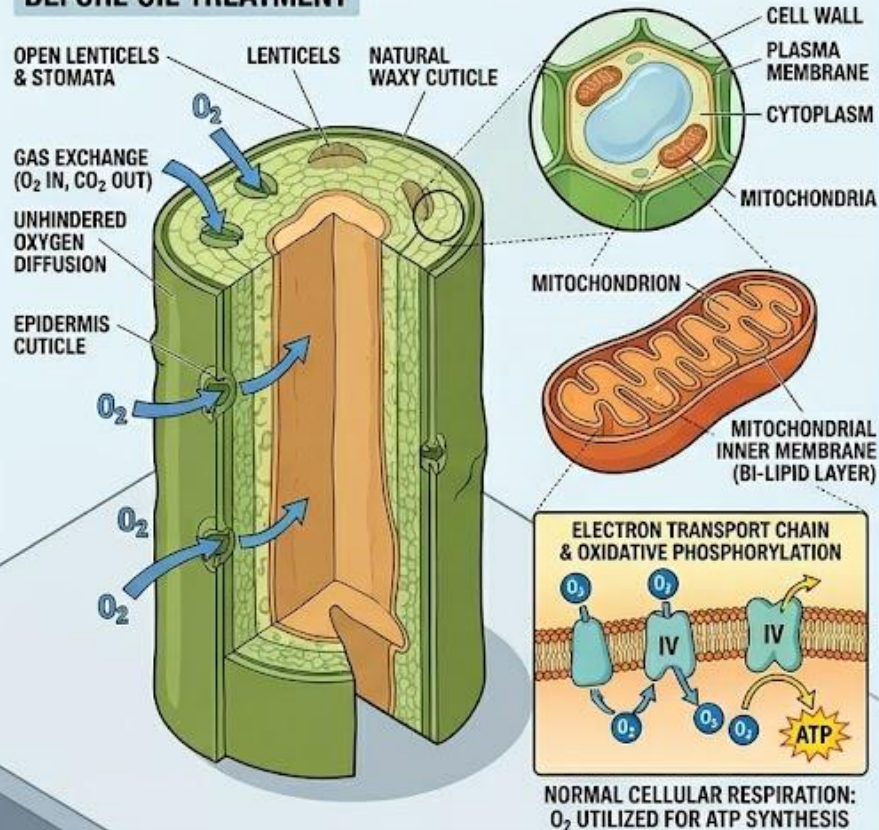
Fluid and **flexible** membrane

Activates respiration to provide
energy for bud break

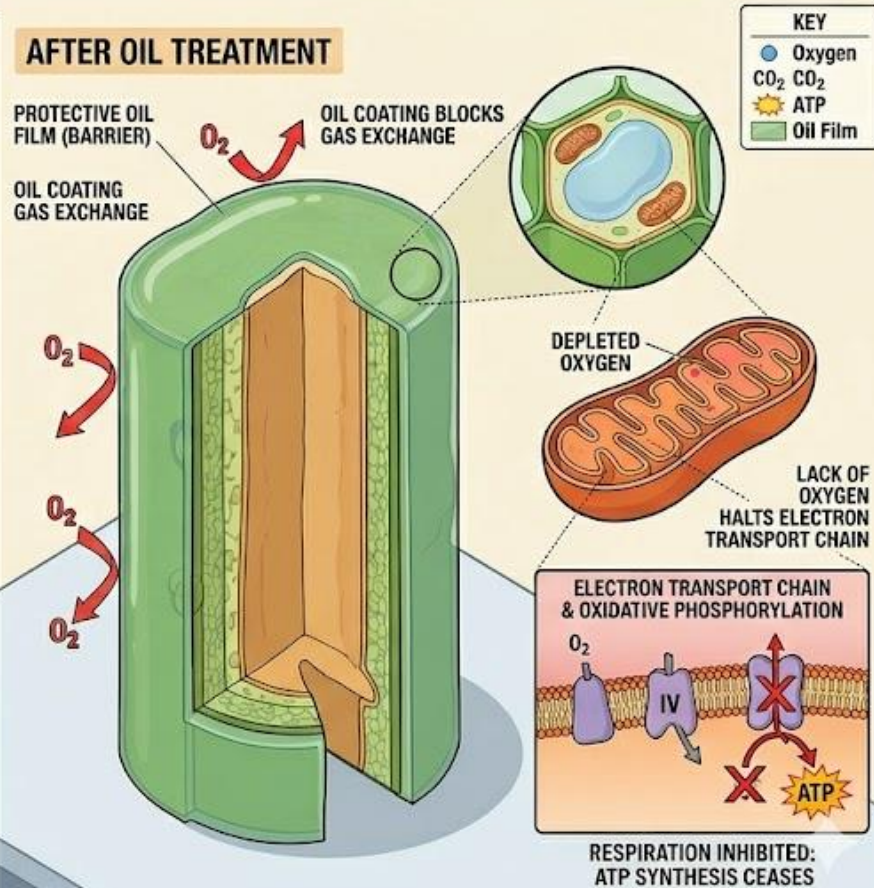
WHY IS MINERAL OIL SO EFFECTIVE?

MECHANISM OF OIL TREATMENT PREVENTING OXYGEN ENTRY AND CELLULAR RESPIRATION IN AN APPLE SHOOT

BEFORE OIL TREATMENT



AFTER OIL TREATMENT



CREATES HIGH
OXIDATIVE STRESS



Prevents O_2 from entering



Fermentation starts



Ethanol =
increases ROS
triggers **growth** response

ARTIFICIAL REST-BREAKING

PHILAGRO SA

DORMEX®

Reg No L5740 Wet / Act 36 van / of 1947

A soluble concentrate growth regulant for delayed foliation in apples, apricots, plums, cherries, wine and table grapes, kiwi fruit, as well as advancement of budding in sultana grapes and berries listed.

'n Oplosbare konsentraat groei-reguleerder vir vertraagde bot by appels, appelkose, pruime, kersies, wyn- en tafeldruiwe, kiwivrugte, asook vervroeging van bot in sultana druiwe en gelyste bessies.

ACTIVE INGREDIENT / AKTIEWE BESTANDDEEL

Cyanamide520 g/l Sianamied

REGISTRATION HOLDER / REGISTRASIEHOUER
Philagro South Africa (Pty) Ltd
Reg no 1998 / 010658 / 07
Posbus / PO Box 36213
Menlopark 0102
Tel: (012) 3488808

DORMEX® is a product of AlzChem , Trostberg, Germany
DORMEX® is 'n produk van AlzChem , Trostberg, Duitsland

Batch No.: Lotnommer:		
Date of manufacture: Vervaardigingsdatum:		

UN NUMBER: 2922

Emergency telephone number / Noodfoonnommer.: 0800-00-58-17

DORMEX® IS A REGISTERED TRADE MARK OF ALZCHEM, TROSTBERG, GERMANY
DORMEX® IS 'N GEREISTREEDE HANDELSMERK VAN ALZCHEM, TROSTBERG, DUITSLAND

HARMFUL
SKADELIK



REGULATION OF HYDROGEN CYANAMIDE

BANS:

37 countries (as of Dec 2024):

- EU (27 Member States since 2008)
- Bahrain
- Kuwait
- Oman
- Qatar
- Republic of Iraq
- Saudi Arabia
- Switzerland
- Turkey
- United Arab Emirates
- United Kingdom.

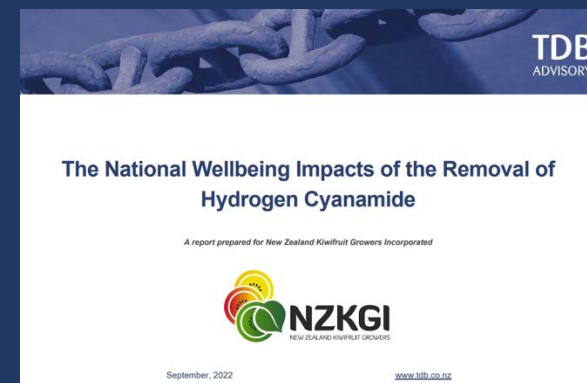
RESTRICTIONS:

- **New Zealand**

One application/year
with strict buffer
zones (Jul – Sep)

- **California**

Strict PPE, buffer zones and application times



International regulatory action:

None

Not regulated under Rotterdam or Stockholm Conventions

Thank you!



"Although we may not understand why, when plants differ from the expected reaction, we must remember the plants are right and we are wrong."



Esmé Louw

Dept. Horticultural Science
Stellenbosch University

esmelouw@sun.ac.za