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# The Reaction Diffusion System and Fibre Formation

Produced for the CRC for Premium Quality Wool undergraduate program by;  
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# Fibre Formation

Fibre

IRS

Medulla

Huxley

Cortex

Henle

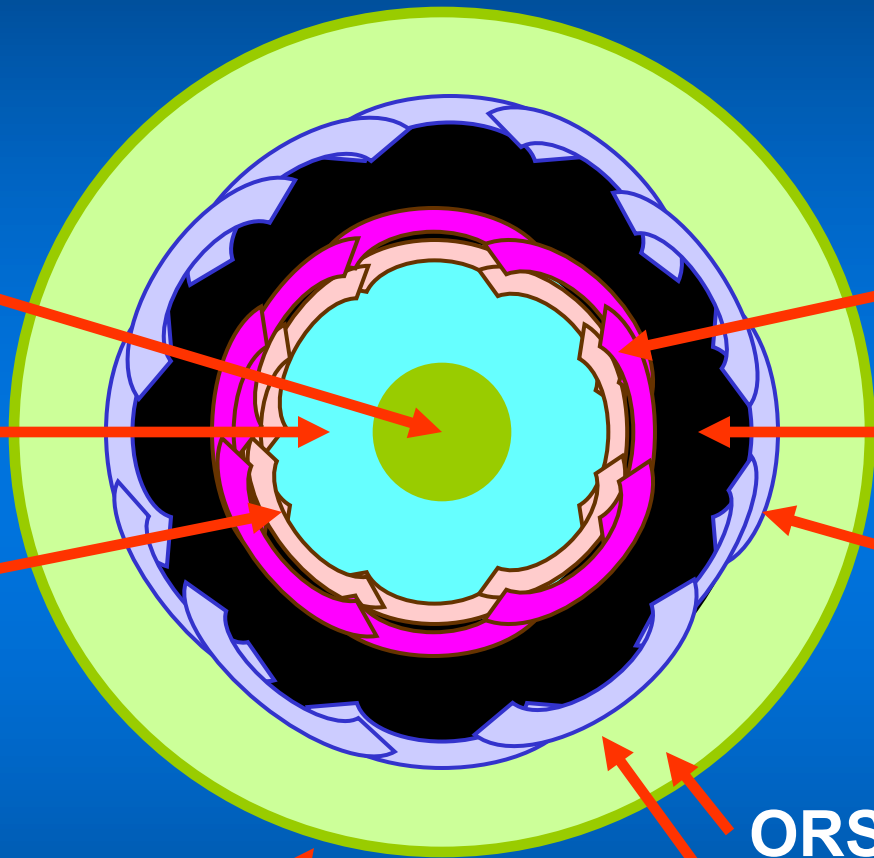
Cuticle

Cuticle

Basal membrane

ORS

Companion layer

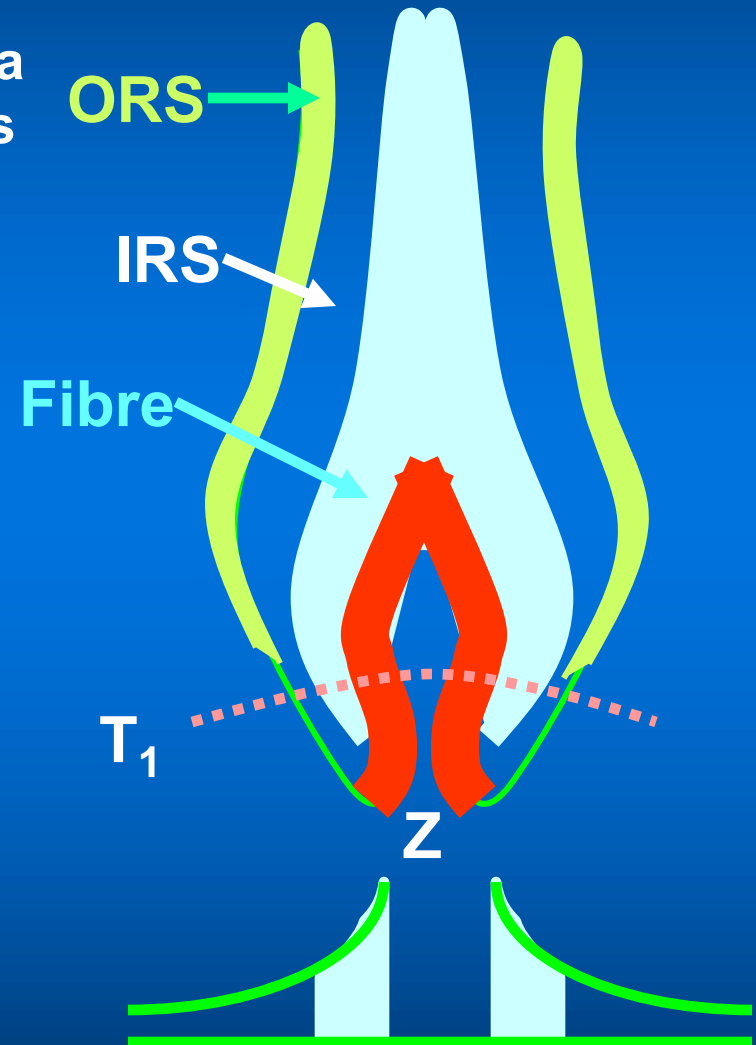


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# Mechanisms that control Differentiation (Stage 1)

- Differentiation is controlled by a dermal factor (Z) which diffuses radially outward through the bulb
  - if cells have high [z] they become fibre
  - if cells have low [z] they become IRS
  - if cells are in contact with BM and have high [z] they become fibre
  - if cells are in contact with BM and have low [z] they become ORS



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# Mechanisms that control Differentiation (Stage 2)

- Differentiation is controlled by cell-cell contact between cells of different types.
  - Contact between IRS and fibre cells
    - IRS cells differentiate to IRS cuticle
    - fibre cells differentiate to fibre cuticle
  - Contact between IRS and ORS cells
    - IRS cells differentiate to Henles layer
    - ORS differentiate to Companion cells

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# Summary of Stages 1 and 2 of Differentiation

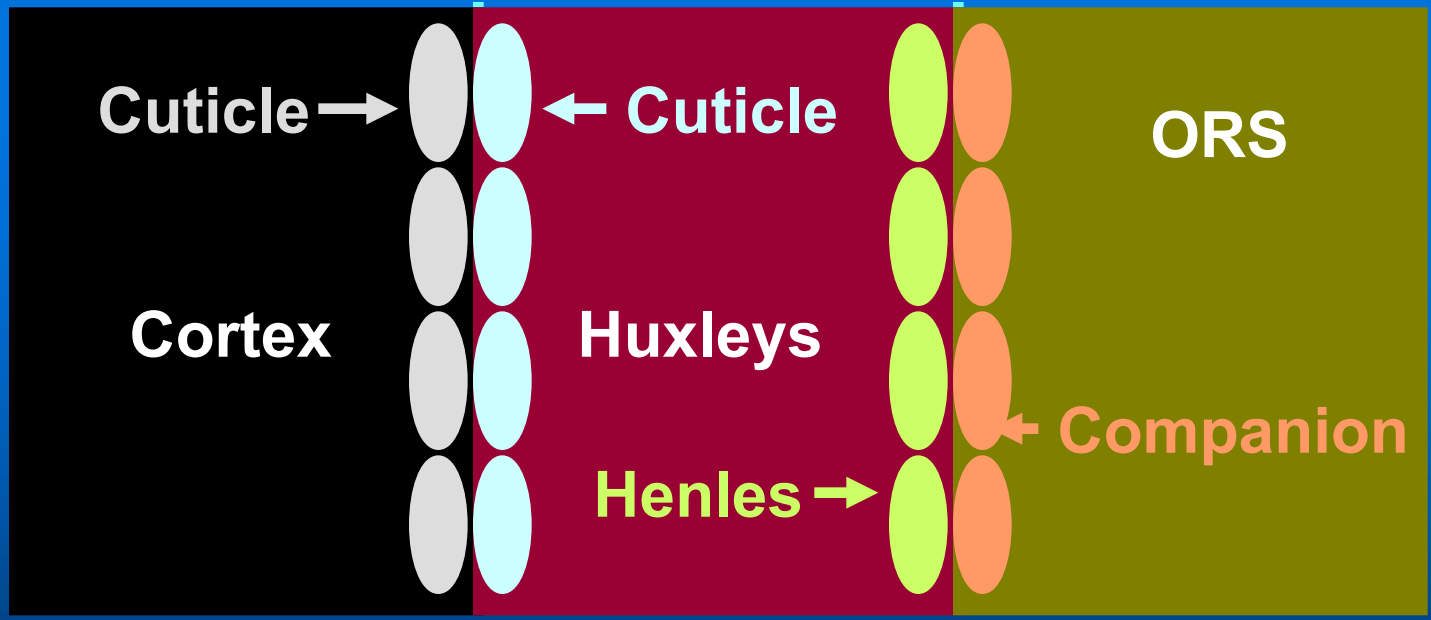
Stage 1

Fibre

IRS

ORS

Stage 2

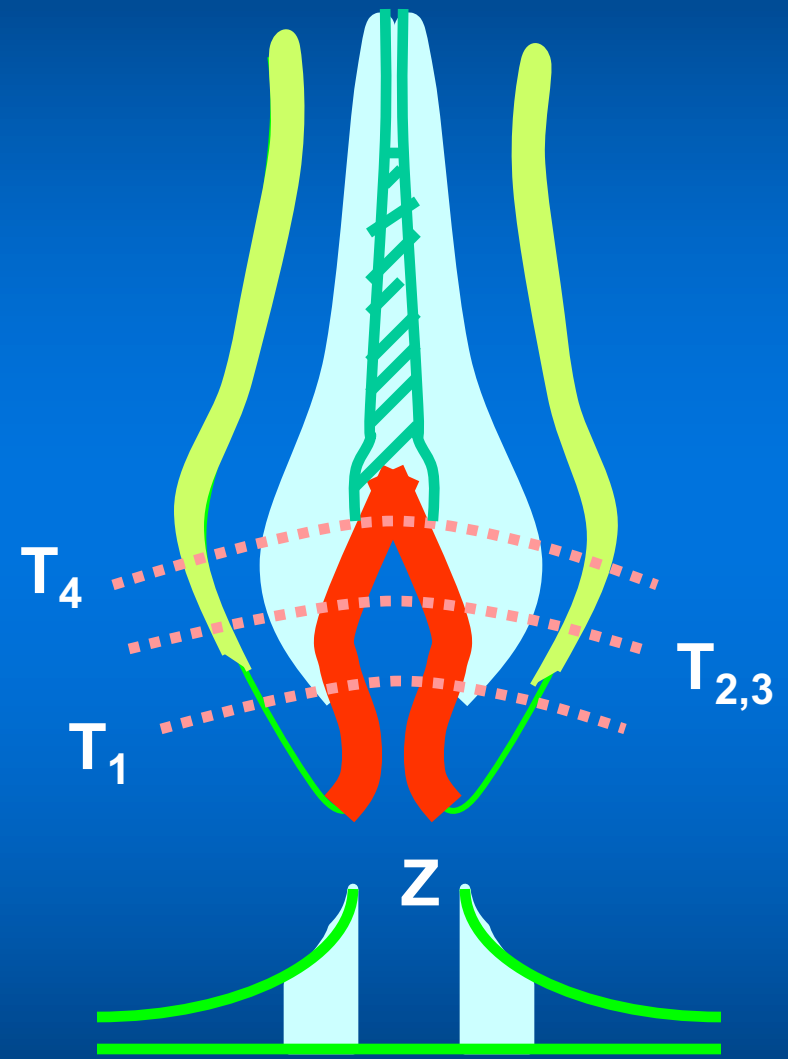


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# Formation of the Medulla

- Cells which are in contact with the basal membrane for time greater than  $T_4$  will differentiate into medulla cells.
  - this implies bulbs that have large papilla will have cells in contact with the BM for a long period of time and will therefore have a medulla.

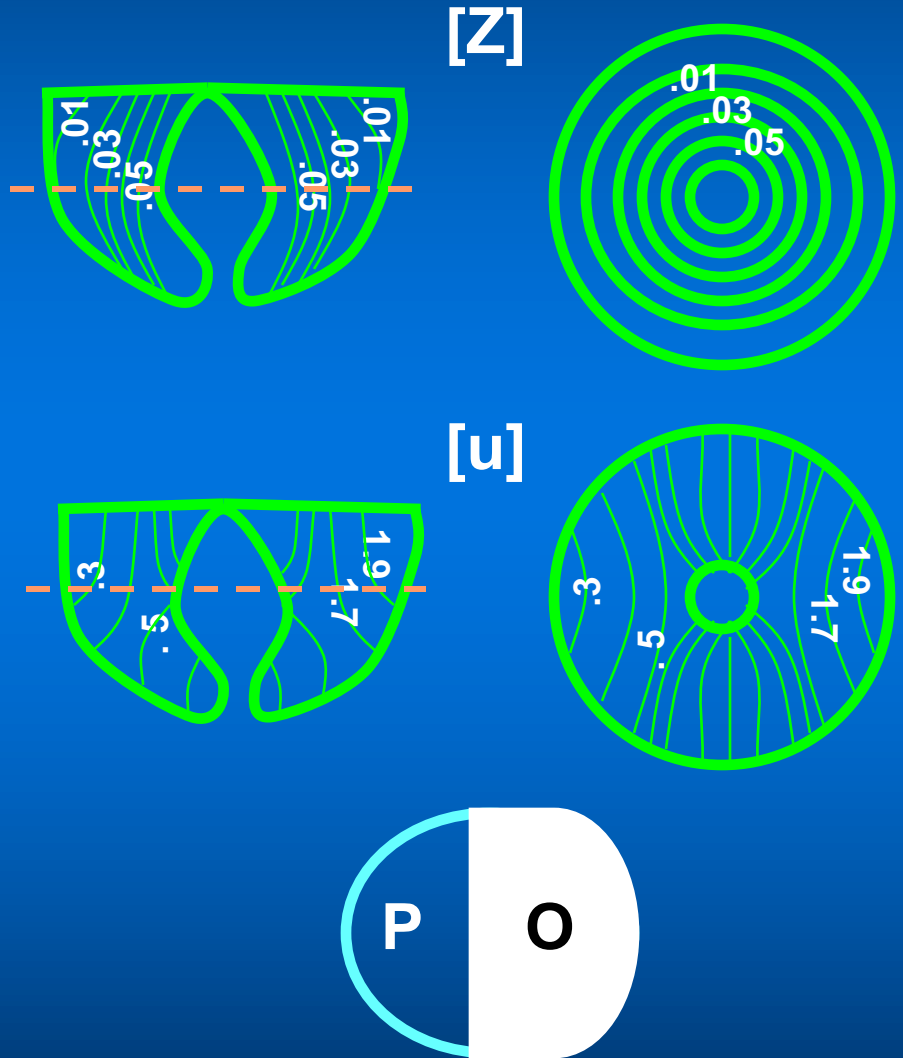


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# Differentiation of Cortical Cell Types (Stage 3)

- fibre cells undergo a further stage of differentiation in the bulb depending on the [z] and [u]
- fibre cells in  $T_2$  to  $T_3$ 
  - if [z] + [u] is above a certain threshold, the cells become orthocortical cells
  - if [z] + [u] is below a certain threshold, the cells become paracortical cells



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# Conclusion

- **Wavelike patterns predicted by RD system are required to explain cell differentiation in the bulb**
  - O/P
  - non-circular cross-sectional areas
  - relationship between these two

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