

# Supplementary Material

for

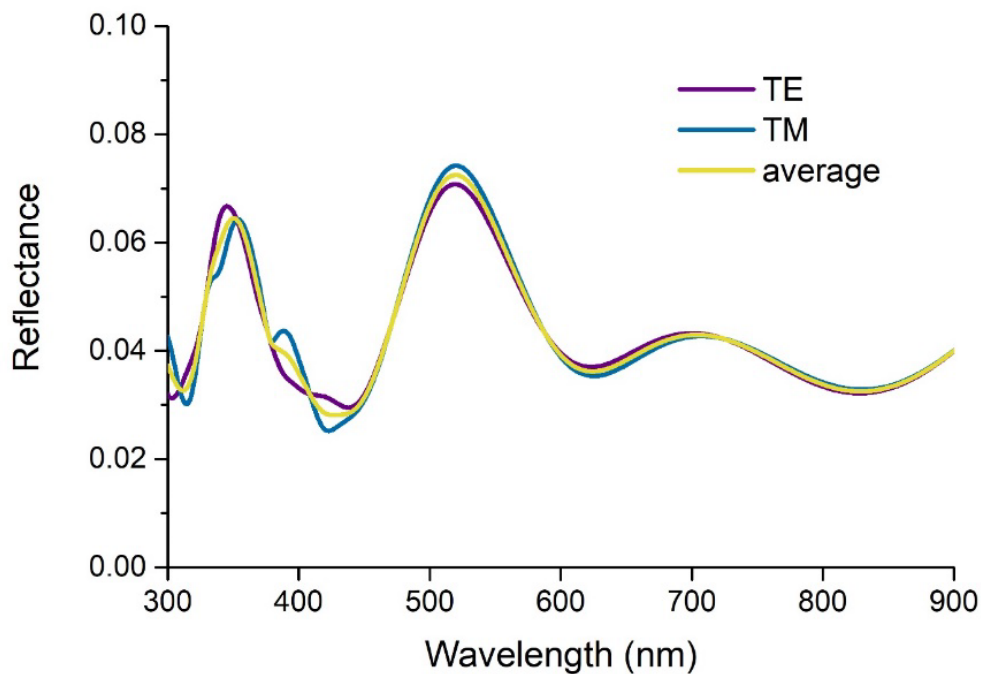
**Cortex thickness is key for the colours of iridescent starling feather barbules with  
a single, organised melanosome layer**

by

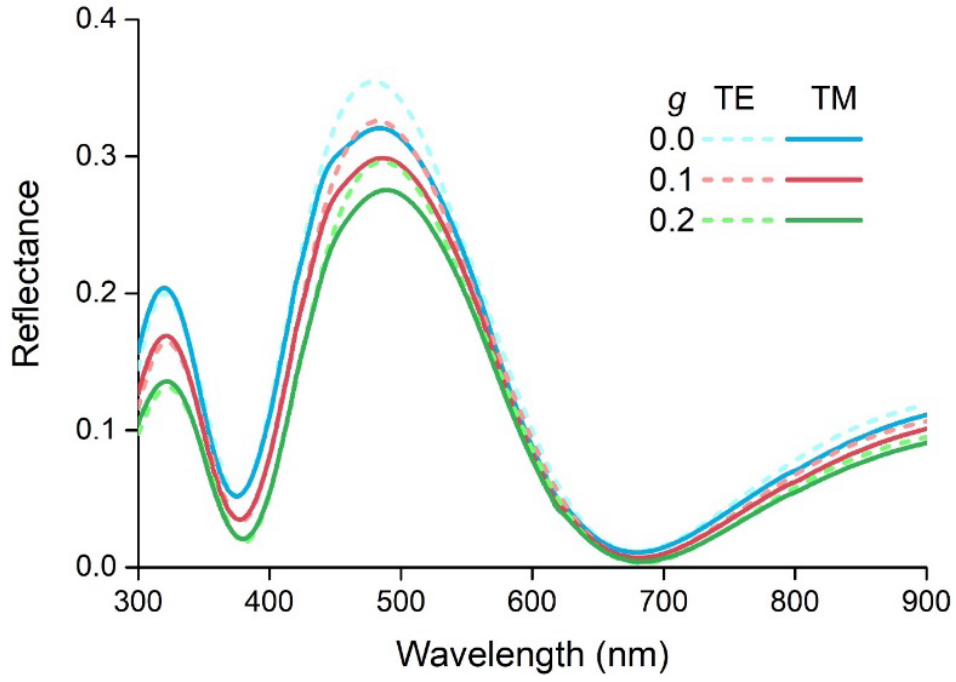
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**Fig. S1. Polarisation-dependent FDTD multilayer modelling of a *S. vulgaris* barbule.** In the simulation, a melanosome diameter of 250 nm and a cortex thickness of 310 nm were used. The results are very similar to the effective-medium-multilayer modelling results of Fig. 3B.



**Fig. S2. Polarisation-dependent FDTD multilayer modelling of a *L. nitens* barbule for different value of the melanin filling fraction  $g$ .** With anatomical parameters identical to those used for the effective-medium-multilayer modelling shown in Figure 7C, i.e., melanosomes with a composite thickness of 225 nm featuring an air-gap with different melanin filling fractions  $g$  of thickness of 85 nm below a keratin cortex of 160 nm, the reflectance spectra are very similar to those of Fig. 7C.

**Table T1. Overview of *S. vulgaris* structural parameters.** The parameters are either measured from FIB-SEM and oil immersion microscopy or obtained from literature and are used in optical modelling. Where possible, parameters are listed as a range or for green and purple barbule cells, respectively.

|   | <i>c</i> (nm)<br>(green / purple) | <i>D<sub>m</sub></i> (nm)<br>(green / purple) | <i>D<sub>i</sub></i> (nm) | Length (nm) |
|---|-----------------------------------|---|---------------------------|-------------|
| <b>This work:</b>                           |                                   |   |                           |             |
| FIB-SEM                                     | 275±30 / 336±27                   | 273±20 / 271±25                               | 0                         | -           |
| oil immersion                               | -                                 | 349±25 / 351±22                               | ~ 80 (hypothesis)         | ~1500       |
| EMM modelling                               | 300 / 390                         | 250 / 250                                     | 0                         | neglected   |
| <b>Durrer, 1970:</b>                        |                                   |   |                           |             |
| type C: all                                 | 260-623                           | 210-276                                       | -                         | 1200-1700   |
| type C <sub>2</sub> : all                   | 260-330                           | 214-258                                       | -                         | -           |
| type C <sub>2</sub> :<br><i>S. vulgaris</i> | 290 / 330                         | 254 / 250                                     | -                         | -           |

**Table T2. Overview of *L. nitens* structural parameters.** The parameters are either measured from FIB-SEM and oil immersion microscopy or obtained from literature and are used in the optical modelling. The external platelet size in the modelling has been chosen as reported in the literature: 1-0.8 µm. Where possible, parameters are listed as a range or for blue and green barbule cells, respectively. Note that literature parameters for *L. nitens* do not currently exist, but in this study have been compared with the structurally similar and closely related starling *L. chloropterus* (Durrer, 1970; Maia et al., 2013).

|                      | <i>c</i> (nm)<br>(blue / green) | <i>d<sub>m</sub></i> (nm) | <i>d<sub>a</sub></i> (nm) |
|----------------------|---------------------------------|---------------------------|---------------------------|
| <b>This work:</b>    |                                 |                           |                           |
| FIB-SEM              | 118±25 / 185±31                 | -                         | -                         |
| EMM modelling        | 135 / 188                       | 70                        | 85                        |
| <b>Durrer, 1970:</b> |                                 |                           |                           |
| type E: all          | -                               | 67-74                     | 73-101                    |