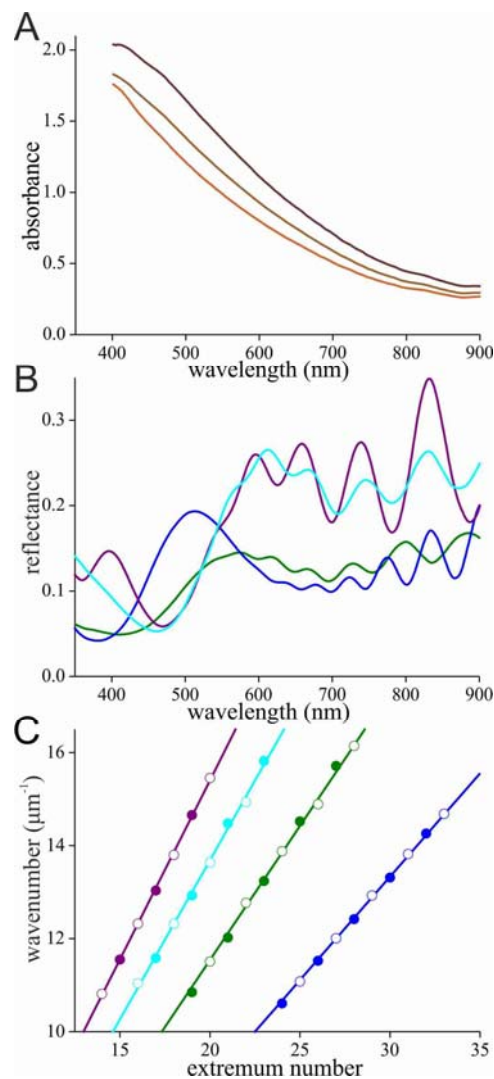# Supplementary Material



Fig. S1. Optical characteristics of single barbule cells. (A) Absorbance spectra of three different barbules immersed in immersion oil measured with a microspectrophotometer (MSP; area cross section ~10 µm). (B) MSP reflectance spectra of four different barbules in air, showing oscillations. (C) Wave numbers calculated with the wavelength values of the oscillation minima (open circles) and maxima (closed circles) > 600 nm of the four spectra of panel A. The fitted linear functions yielded the local barbule thickness: 2.0 µm (purple data), 2.3 µm (cyan), 2.7 µm (green), and 3.5 µm (blue).
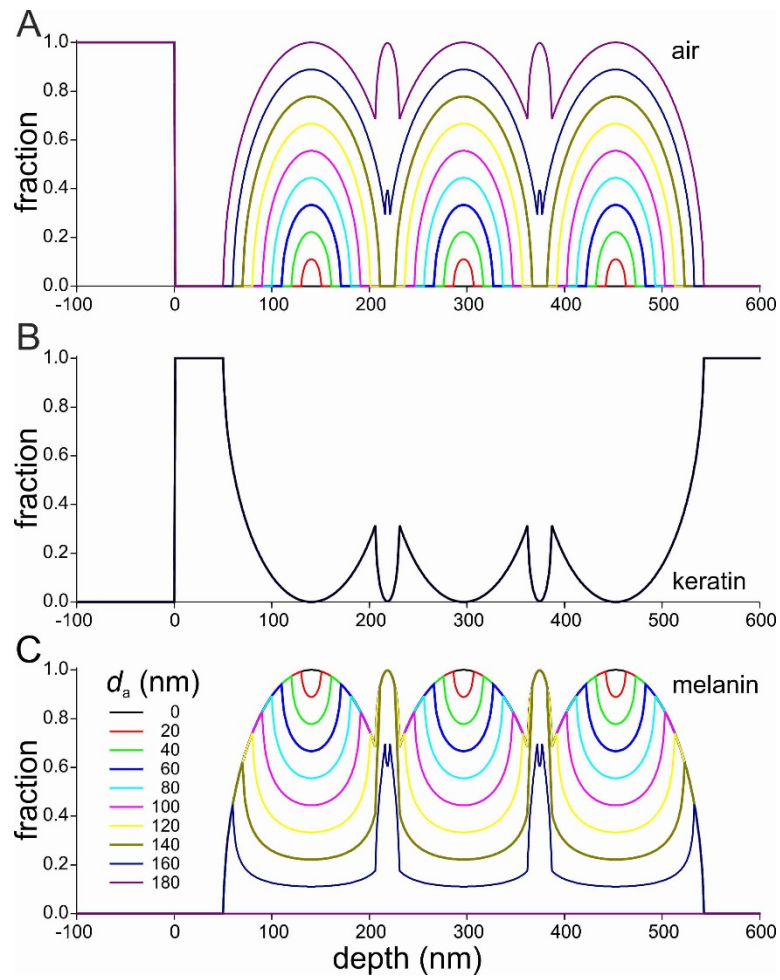
Fig. S2. The fractions of air (A), keratin (B), and melanin (C) as a function of depth for three layers of close-packed melanosomes with diameter $d_m = 180$ nm and variously sized air holes with diameter $d_a$.
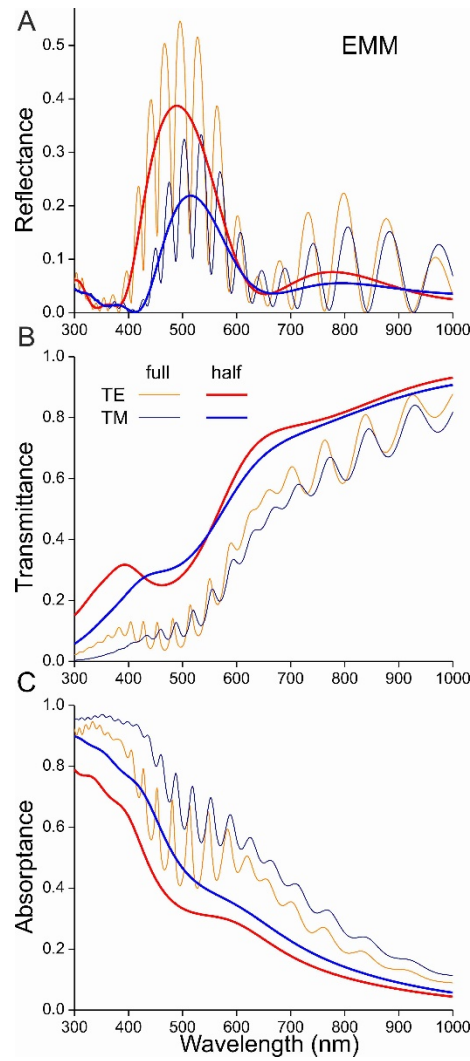
Fig. S3. Reflectance (A), transmittance (B), and absorptance (C) spectra of the full barbule of Fig. 4 as well only half the barbule, for normally incident TE- and TM-polarised light, calculated with the transfer-matrix formalism for effective medium multilayers (EMM), using the refractive index profiles of Fig. 4 for $w$ = -2 and 2, respectively.
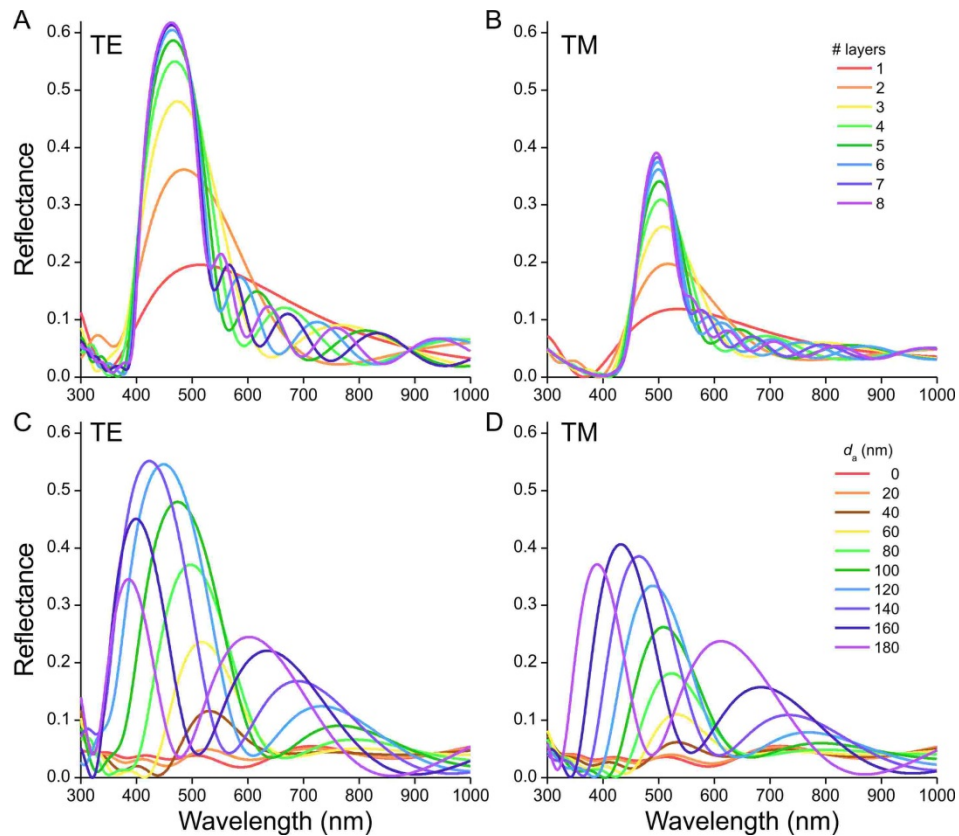
Fig. S4. Dependence of the reflectance of a half barbule on the number of melanosome layers and air core diameter calculated with the transfer-matrix formalism for multilayers. (A, B) Reflectance spectra for 1 to 8 layers of melanosomes with diameter $d_m = 180$ nm and air hole diameter $d_a = 100$ nm, using the refractive index profiles of Fig. 4 for $w = -2$ and 2 for TE- and TM-polarised light, respectively. (C, D) Reflectance spectra for TE- and TM-polarised light for three layers of melanosomes with diameter $d_m = 180$ nm and air hole diameters of 0 to 180 nm.
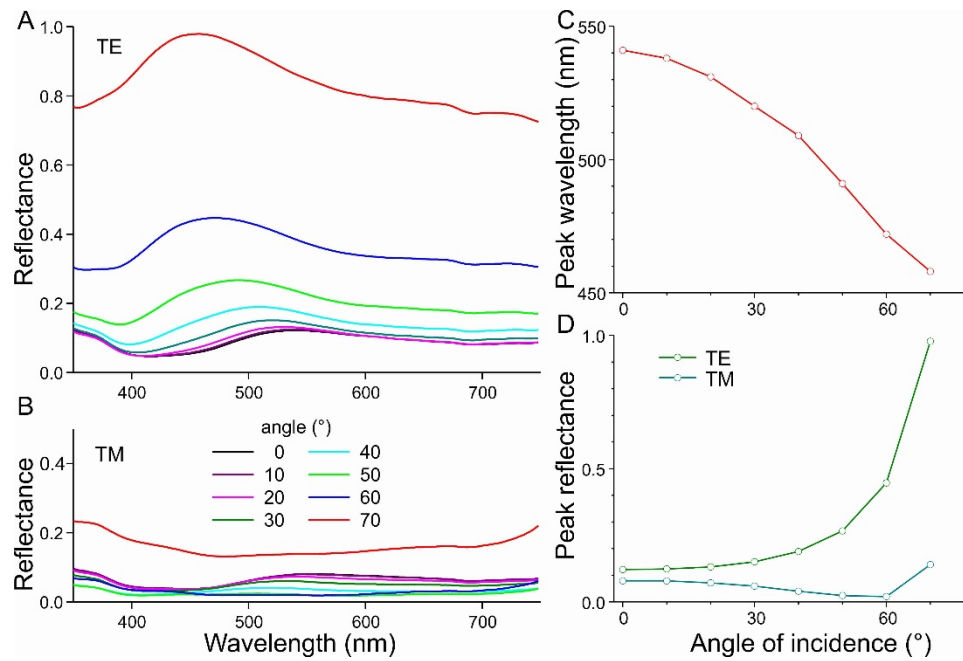
Fig. S5. Angle dependence of the reflectance of TE- and TM-polarised light for the green area of the magpie feather in Fig. 1C. (A) Reflectance spectra of TE-polarised light for angles of light incidence 0º to 70º. (B) Reflectance spectra of TE-polarised light. (C) Peak wavelength of the reflectance spectra of (A) as a function of the angle of light incidence. (D) Reflectance values at the peak wavelengths in (C) for TE- and TM-polarised light.