Electronic Supplementary Materials 1: Thin-film equations

Because we used a perpendicular initial angle of incidence in our colour measurements, only the formulae for the p-component of polarization are presented. Following Jellison (1993), we treated each interface as a matrix of the form

$$I_j = \begin{bmatrix} 1 & r_j \\ r_j & 1 \end{bmatrix} \qquad [1]$$

where $r_j = (\tilde{n}_j\cos\phi_{j\text{-}1} - \tilde{n}_{j\text{-}1}\cos\phi_j) / (\tilde{n}_j\cos\phi_{j\text{-}1} + \tilde{n}_{j\text{-}1}\cos\phi_j)$.

$\tilde{n}_j$ and $\tilde{n}_{j\text{-}1}$ are the complex refractive indices (($\tilde{n} = n\text{-}k$i), where n= real refractive index and k = extinction coefficient) of the layer under consideration and the layer above it, respectively. ϕ_j and $\phi_{j\text{-}1}$ are the complex angles of incidence, calculated using Snell's law: $\tilde{n}_0\sin\phi_0 = \tilde{n}_j\sin\phi_j$.

The transfer matrix incorporated the thickness of the jth layer:

$$L_j = \begin{bmatrix} \exp(ib_j) & 0 \\ 0 & \exp(-ib_j) \end{bmatrix} \qquad [2]$$

$b_j = (2\pi d_j\tilde{n}_j\cos\phi_j)/\lambda$, where d_j is the thickness of the layer, and λ is the wavelength of light.

The total scattering matrix is then given by

$$S = \left(\prod_{1}^{N} I_j L_j\right) I_{N+1}, \qquad [3]$$

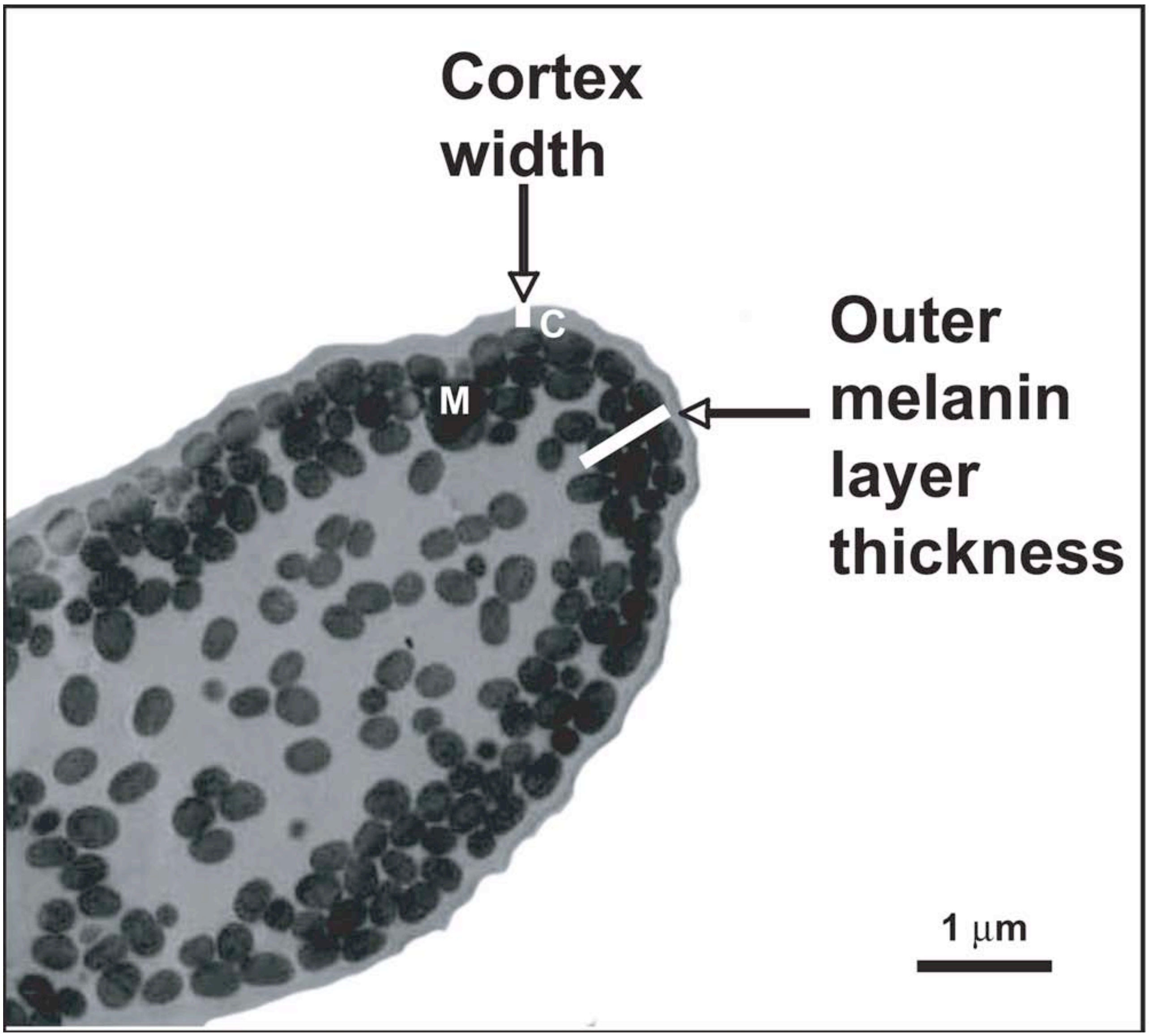
where N is the layer number. [4]

The amplitude reflectivity (r) is $r = S_{21} / S_{11}$.

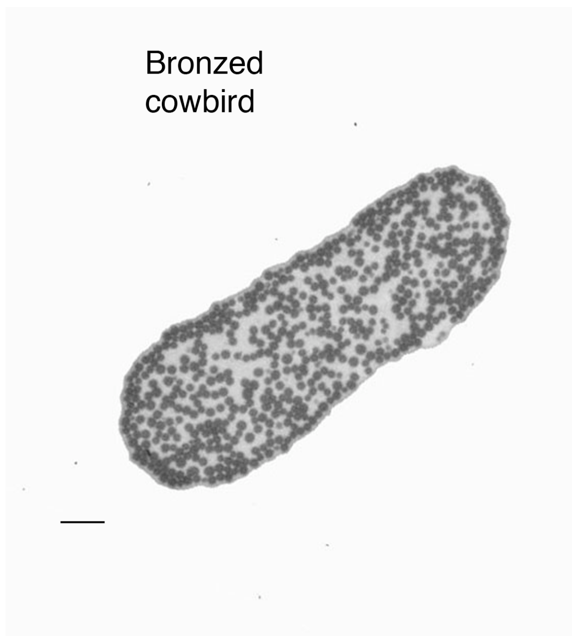
The final reflectance (R) is calculated as $R = rr^*$. [5]

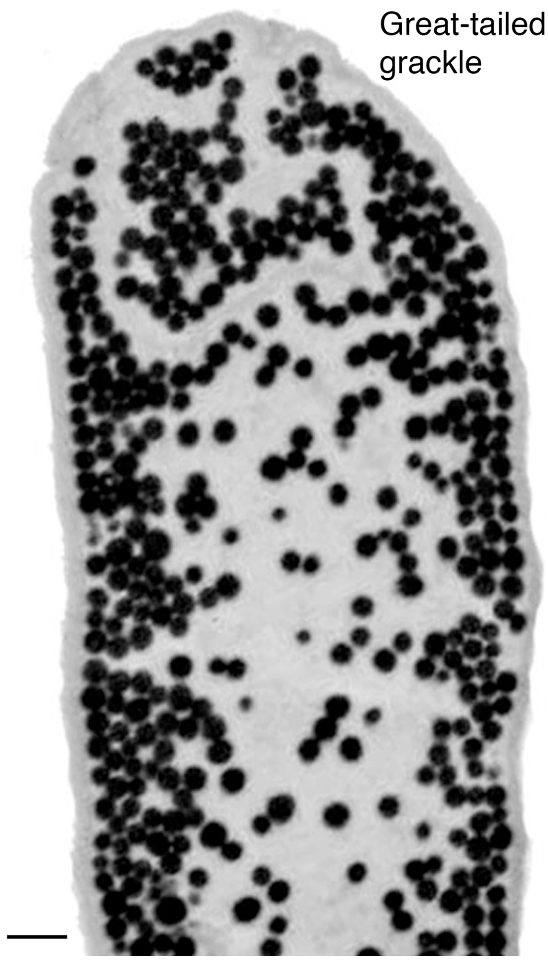
Electronic Supplementary Materials 2: Example of nanostructural measurements

Transmission electron micrograph of an iridescent feather barbule illustrating measured nanostructural variables. C = Cortex, M = Melanin granules.

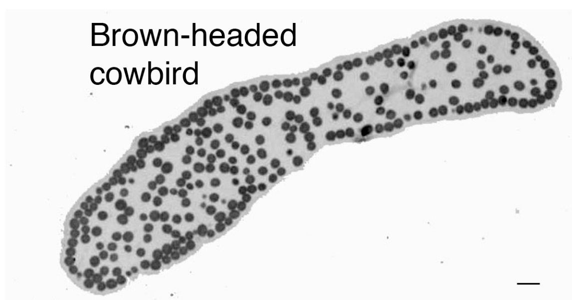

Cortex
width
C
M
Outer
melanin
layer
thickness
1 μm

Electronic Supplementary Materials 3: Examples of the microanatomy of feather barbules of the species used in this study. All images are transmission electron micrographs, and scale bars in each case are 500 nm.

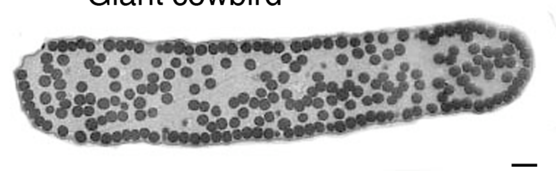

Bronzed
cowbird

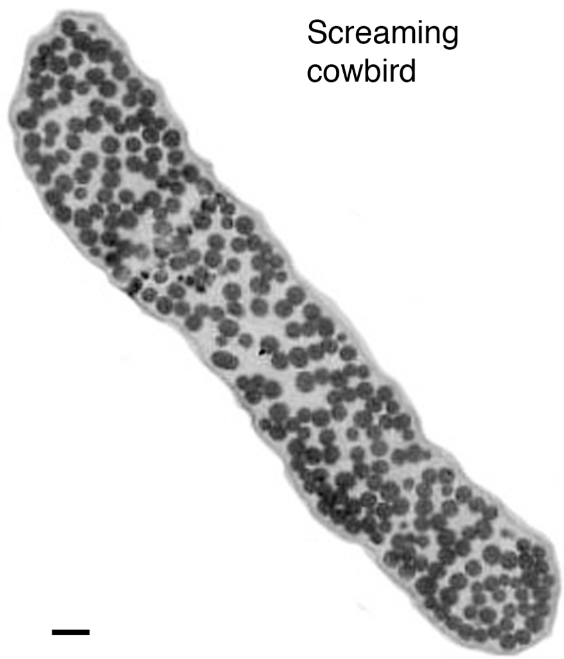

Great-tailed
grackle

Red-winged blackbird


Brown-headed
cowbird

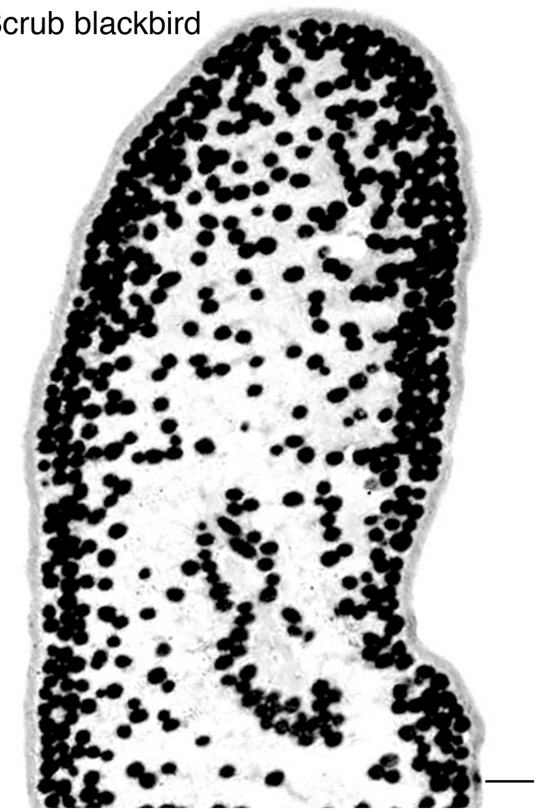
Giant cowbird



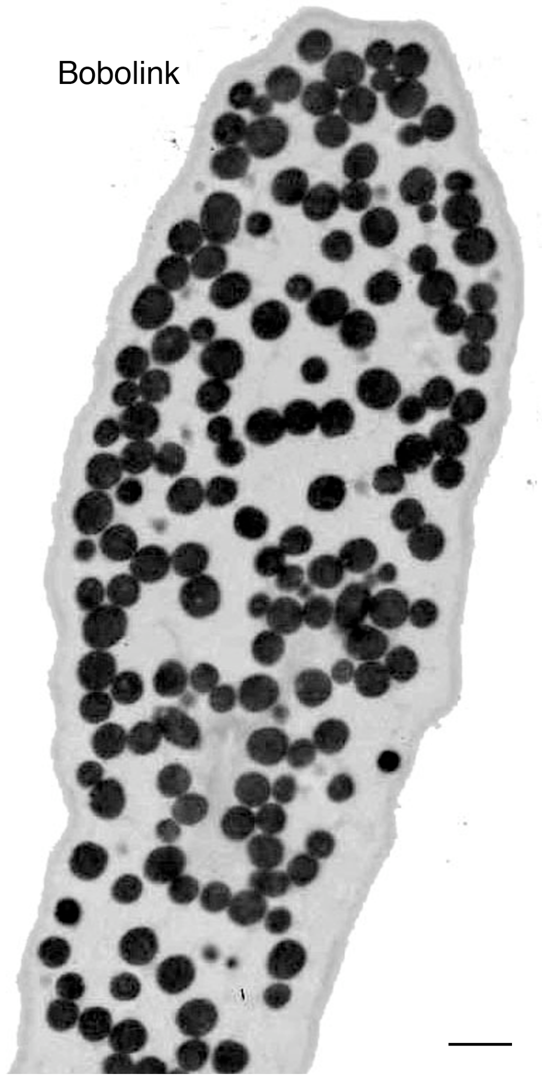


Screaming
cowbird

Scrub blackbird



Shiny cowbird


Bobolink


Western
meadowlark

Boat-tailed
grackle