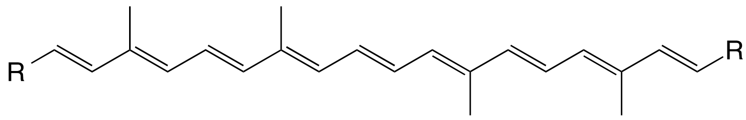
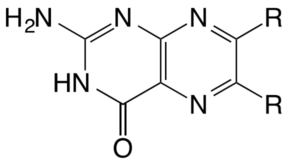
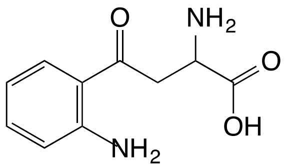


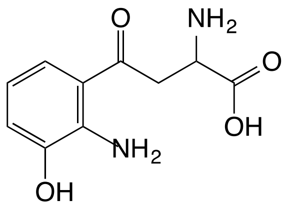
carotenoids



pterins

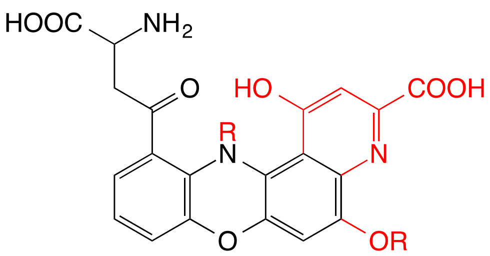


kynurenine

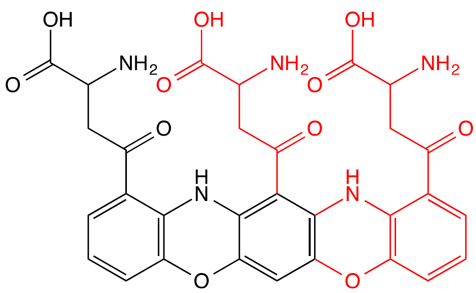


3-OH kynurenine

ommochromes



ommatins



ommin A

Common molecular structure between ommins and ommatins is shown in black, the rest in red.

Fig. S1. Molecular structures of common pigments.

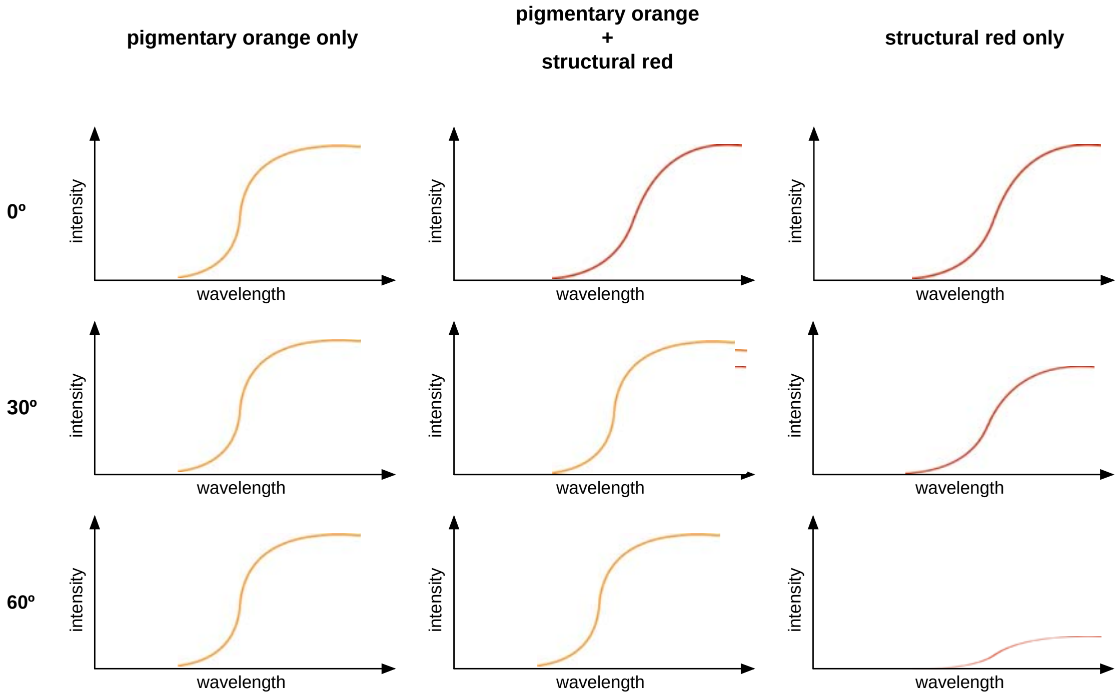


Fig. S2. Hypothetical pigmentary orange/structural red interaction and their reflectance spectra. These setae are too small that their reflectance spectra can only be acquired through a microspectrophotometer at the normal direction, hence no experimental spectra were measured. The pigmentary colour is non-iridescent, therefore the reflectance spectra remain the same no matter the viewing directions. The structural coloured setae remain the same hue due to their complex morphology. However, the intensity is significantly affected by the viewing directions, and almost invisible at larger oblique angles (> 60º) (Stavenga et al., 2016). The setae that have both the structural red and pigmentary orange elements appear to be red at normal viewing direction because structural colours are much brighter than pigmentary colours. Hence, structural red overshadows pigmentary orange and determines the final visual appearance. At mid-range viewing directions (e.g. 30º), the reflectance spectrum is a mixture in between structural red and pigmentary orange. However, this slight swift in hue is almost inconspicuous. At larger oblique angles (> 60º), the intensity of the structural red is too weak to be seen, consequently the pigmentary orange becomes the dominant visual factor. Hence, setae with pigments appear less iridescent than that without.

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Table S1. Raw Raman dataset for unpigmented spider silks.

Click here to Download Table S1

Table S2. Raw Raman dataset for yellow.

Click here to Download Table S2

Table S3. Raw Raman dataset for chemical and feather standards.

Click here to Download Table S3

Table S4. Raw Raman dataset for orange/red.

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Table S5. Raw Raman dataset for black.

Click here to Download Table S5