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Title	Reconstructing carotenoid-based and structural coloration in fossil skin
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Publication date	2016-03-31
Original Citation	McNamara, M.E., Orr, P.J., Kearns, S.L., Alcalá, L., Anadón, P. and Peñalver, E. (2016) 'Reconstructing carotenoid-based and structural coloration in fossil skin', Current Biology, 26(8), pp. 1075–1082. Available at: https://doi.org/10.1016/j.cub.2016.02.038.
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.1016/j.cub.2016.02.038.
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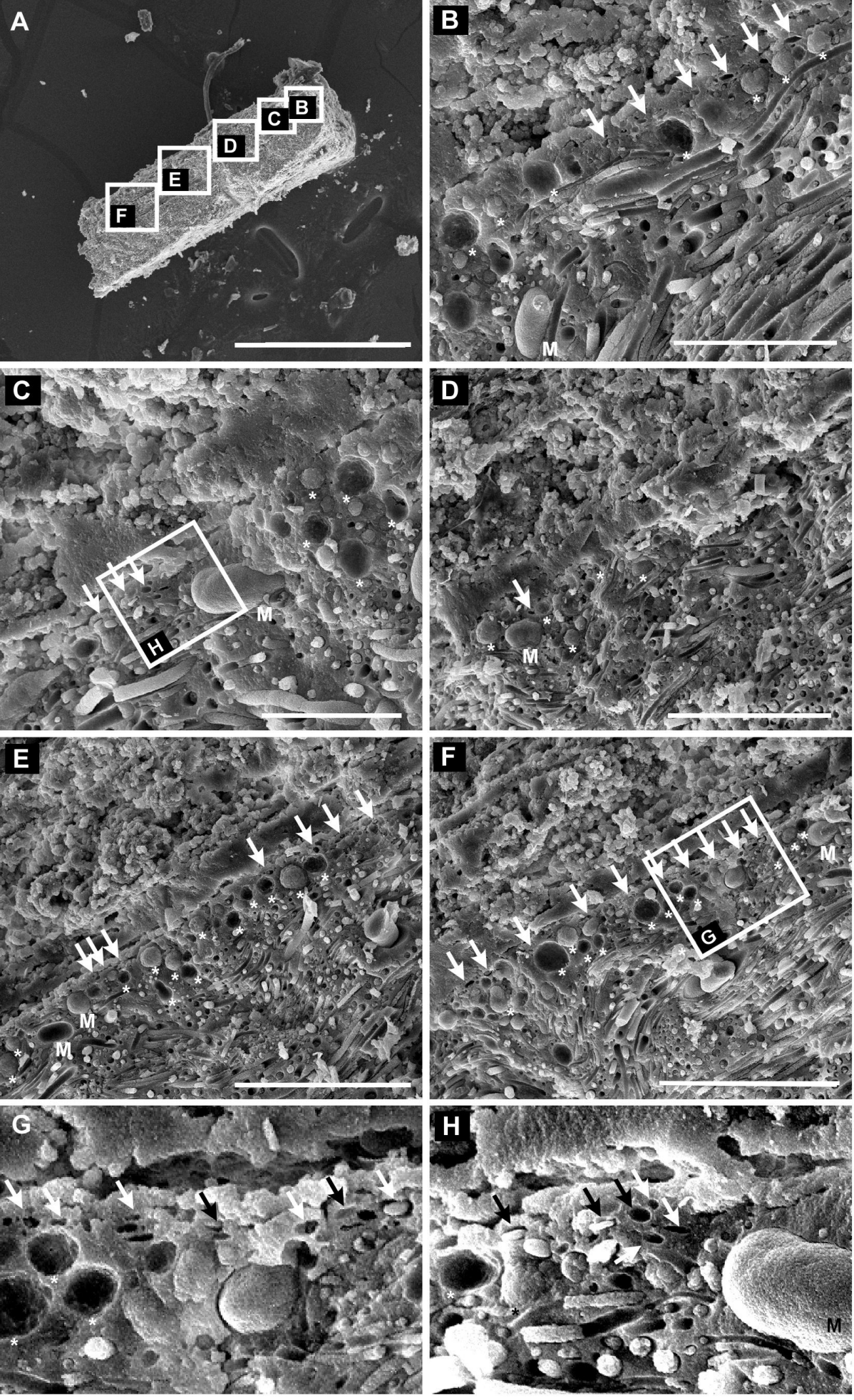


Figure S1, Related to Figure 2. Scanning electron micrographs of sample #6. Only chromatophores which could be identified confidently upon detailed examination of higher-resolution images are labelled. Except where otherwise indicated, labels are positioned immediately underneath melanophores and xanthophores. M, melanophore; *, xanthophore; arrow, iridophore. Scale bars: (A), 400 μm; (B-D, F, G), 20 μm; (E, F), 50 μm.

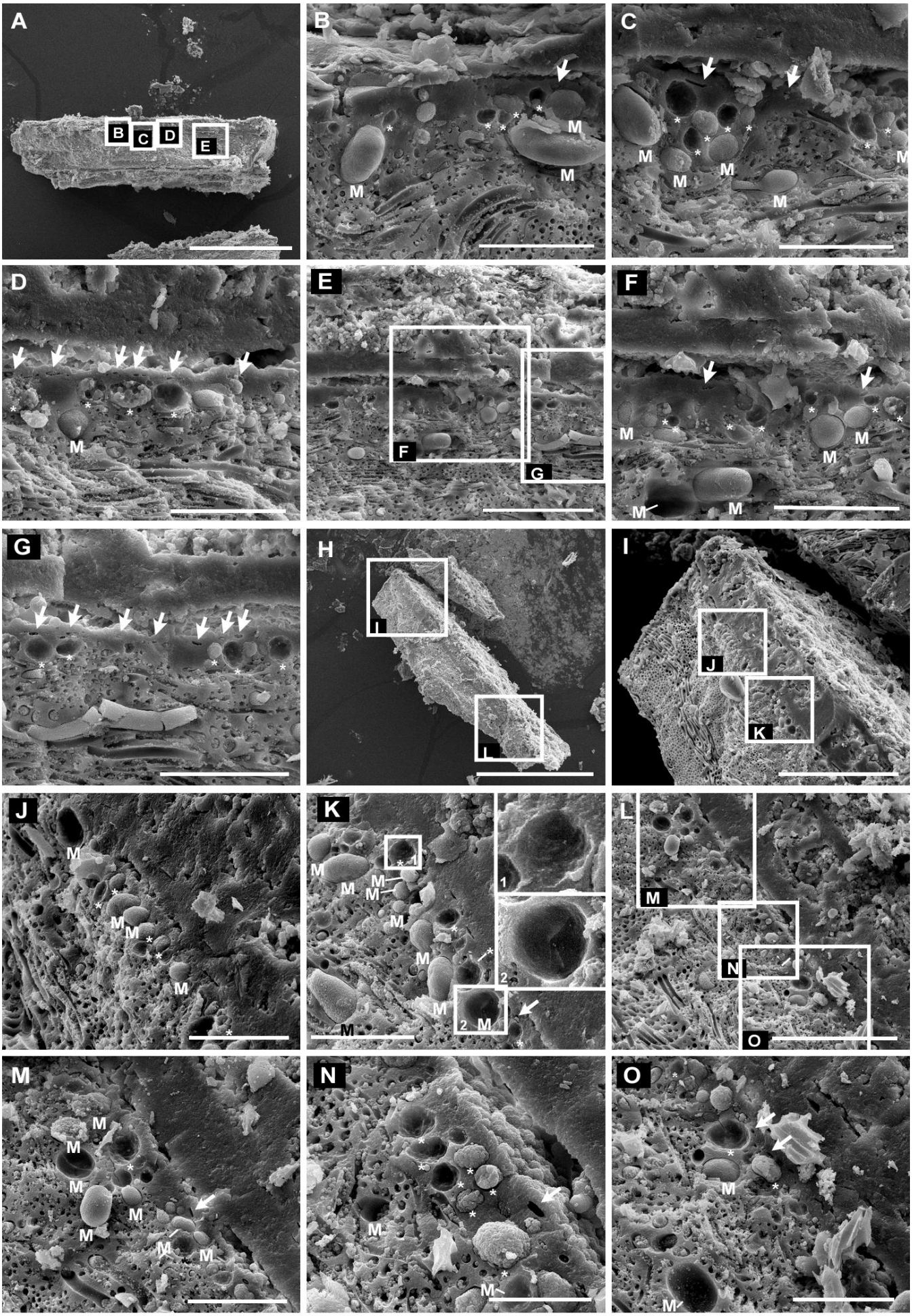


Figure S2, Related to Figure 2. Caption overleaf.

Figure S2, Related to Figure 2 (continued). Scanning electron micrographs of sample #7 (A-G) and sample #2 (H-O). Only chromatophores which could be identified confidently upon detailed examination of higher-resolution images are labelled. Except where otherwise indicated, labels are positioned immediately underneath melanophores and xanthophores. M, melanophore; *, xanthophore; arrow, iridophore. Scale bars: (A, H), 400 μm; (B-D, F, G, J, K, M-O), 20 μm; (I), 100 μm; (E, L), 50 μm.

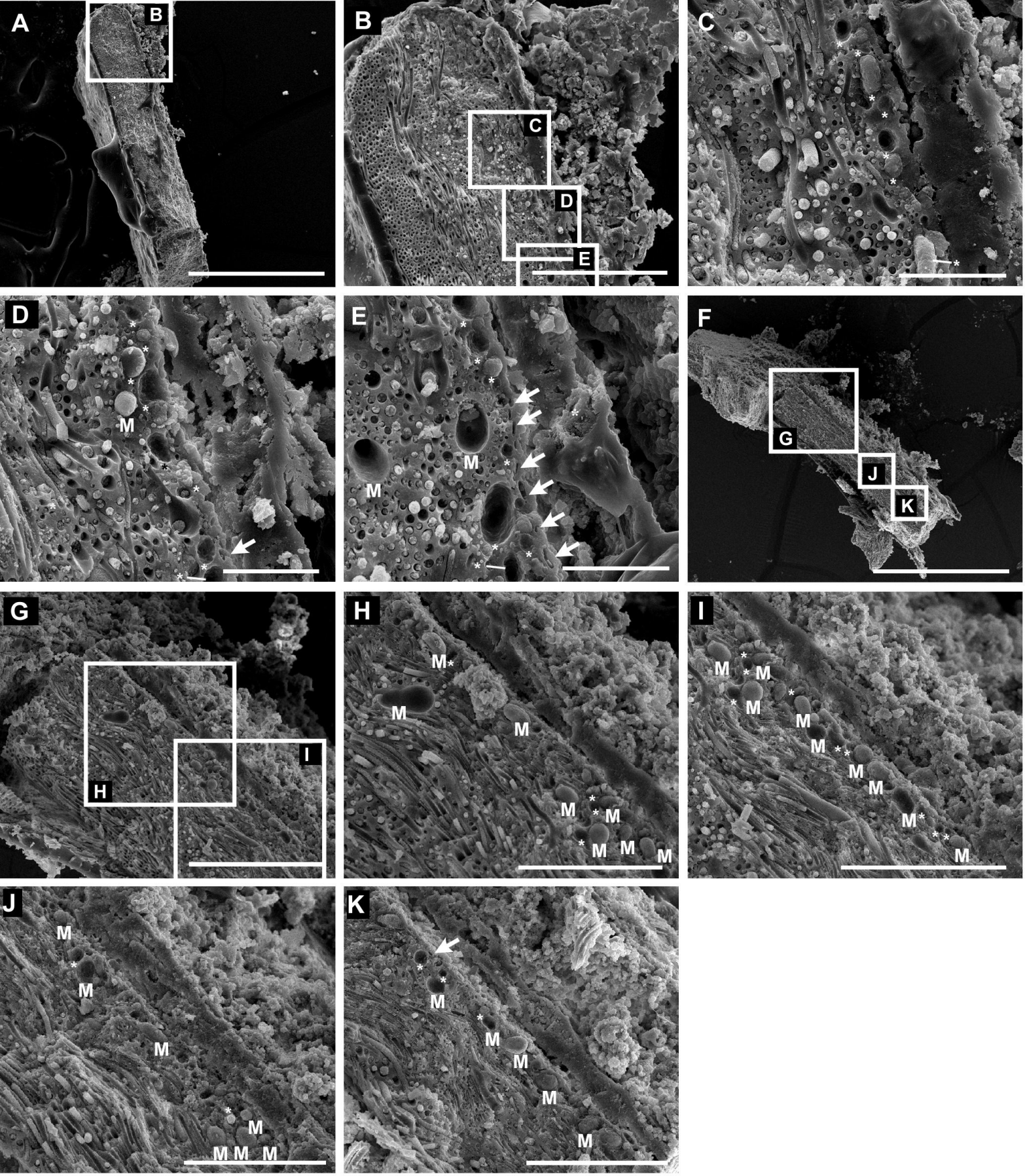


Figure S3, Related to Figure 2. Scanning electron micrographs of sample #4 (A-E) and sample #3 (F-K). Only chromatophores which could be identified confidently upon detailed examination of higher-resolution images are labelled. Except where otherwise indicated, labels are positioned immediately below melanophores and xanthophores. M, melanophore; *, xanthophore; arrow, iridophore. Scale bars: (A, F), 400 μm; (B, G), 100 μm; (C-E, H-K), 20 μm.

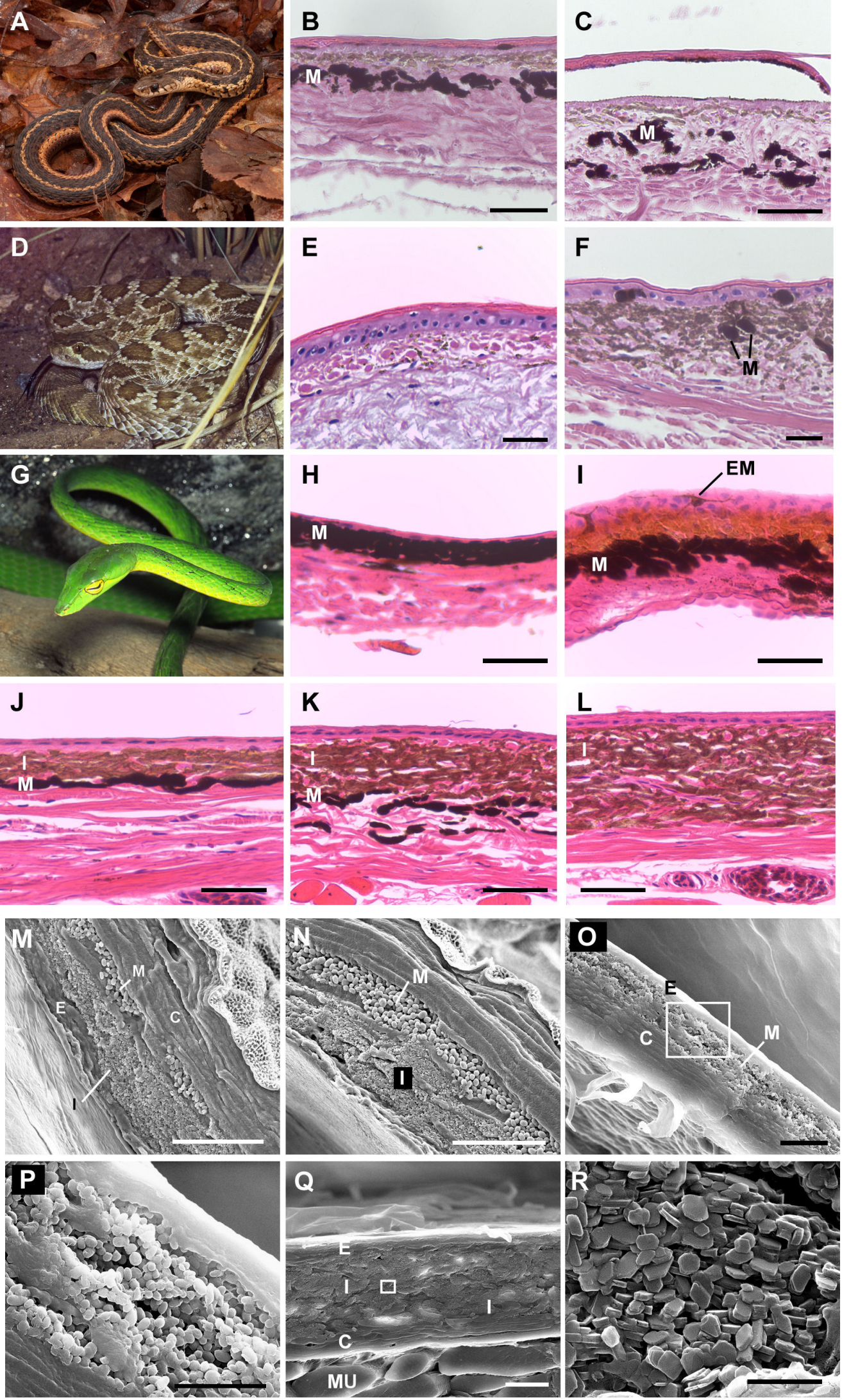


Figure S4. Caption overleaf.

Figure S4, Related to Figure 2 (continued). Skin from the extant snakes *Thamnophis sirtalis* (A-C), *Crotalus scutulatus* (D-F) and *Ahaetulla prasina* (G-R). Photographs in (A, D, G) were provided by Twan Leenders. (B, C, E, F, H-L) are light micrographs of histological sections of skin of various hues stained using Aniline Blue. (B) dark brown; (C) light brown; (E) cream-white; (F) yellowish; (H) black; (I) dark brown; (J) green; (K) light brown; (L) cream-white. Iridophores in (H-L) were identified using scanning electron micrographs (M-R). EM, epidermal melanosomes; I, iridophores; M, dermal melanophores. (M-R) Scanning electron micrographs of skin from the extant snake *Ahaetulla prasina*. (M) light green; (N) dark green; (O, P) dark brown, with (P) detail of melanosomes in melanophores; (Q, R) cream-white, with (R) detail of purine platelets of iridophores. C, collagen; E, epidermis, I, iridophore; M, melanophore; MU, muscle. Scale bars: (B, C, E, F, H-L), 20 μm; (M-O), 10 μm; (P), 5 μm; (Q), 20 μm; (R), 2 μm.

	contingency table of mean values				
Sample number	**2**	**3**	**4**	**6**	**7**
iridophore	6.18	0.81	7.26	28.07	10.89
xanthophore	11.56	7.26	11.69	28.07	11.56
melanophore	7.26	14.92	2.42	3.55	5.38

Table S1, Related to Figure 2. Contingency table showing mean values for the abundance of chromatophores in figured images of the fossil snake skin. Images of the fossil skin are at different scales so the abundance data for each image were normalised to 5000 μm^2. Result of chi-squared test: $X^2 = 42.6$; df = 3, 5; $X^2_8 = 20.09$, $p < 0.01$.

taxon	*classification*	*visible hue*	*iridophores*	*xanthophores*	*melanophores*	*iridophore position*	*reference*
Agkristrodon contortrix	Reptilia, Ophidia	light brown	**	**	X	below xanthophores	S7
		dark brown	*	**	**	below xanthophores	
Anolis carolinensis	Reptilia, Iguanidae	red	*	**	**	above xanthophores	S1
		green-brown	*	**	**	below xanthophores	
		cream-white	**	*	X	-	
Anolis graham grahami	Reptilia, Lacertidae	blue-green	**	X	***	-	S8
Bothriechis rowleyi	Reptilia, Ophidia	green	**	**	**	below xanthophores	S1
Bothriechis schlegii	Reptilia, Ophidia	yellow	**	**		below xanthophores	S1
Elaphe obsoleta obsoleta	Reptilia, Ophidia	black	X	X	****	-	S9
Lacerta vivipara	Reptilia, Lacertidae				***	below xanthophores	S10
Micrurus fulvius	Reptilia, Ophidia	red	-	***	*	below xanthophores	S9
		yellow	**	***	X	below xanthophores	
		black	X	X	****	below xanthophores	
Pantherophis guttatis	Reptilia, Ophidia	black	X	X	****	-	S8
Phrynosoma modestum	Reptilia, Lacertidae		***	*	**	below xanthophores	S11
Pituophis melanoleucis	Reptilia, Ophidia	dark brown	*	*	***	below xanthophores	S12
		pale	**	**	*	below xanthophores	
Plestiodon latiscutatus	Reptilia, Lacertidae	yellow-white	***	*	*	below xanthophores	S2
		brown	**	*	***	below xanthophores	
		green	*	*	*	above xanthophores	
		blue	**	X	**	below xanthophores	
		black	X	X	****	below xanthophores	
Sceloporus undulatus	Reptilia, Ophidia	blue	***	*	**	below xanthophores	S13
		yellow-orange	**	*	*	below xanthophores	
		grey	*	X	***	below xanthophores	
		cream	**	X	X	below xanthophores	

Table S2, Related to Figure 4. Relative abundance and position of chromatophores in skin regions of different hues in extant reptiles. Number of asterisks denotes relative abundance of chromatophores. *, rare; **, occasional; ***, frequent; ****, abundant. X denotes absence of specific chromatophores. Caption continued overleaf.

Table S2 continued. Interpretation of integumentary hue based on the relative abundance and stratigraphy of chromatophores is not always straightfoward. White is characterised by a near-absence of chromatophores; iridophores and / or xanthophores are rare [S1]. Cream-white / pale yellow is characterised by rare iridophores and xanthophores, sometimes with very rare isolated melanophores [S2]. Yellow is characterised by abundant xanthophores, common iridophores and rare melanophores [S3]. Black is characterised by very abundant melanophores; other chromatophores are rare to absent. Red can be produced in various ways, all involving xanthophores comprising predominantly pterinosomes: very abundant xanthophores and common melanophores [S3], or common xanthophores, iridophores and melanophores; in the latter case, the xanthophores can occur above [S1], or below [S4], the iridophores. Blue hues are characterised by skin regions with very abundant, regularly aligned iridophores and common melanophores [S2]. Some green hues are also exclusively structural in nature, i.e. generated solely by stacks of aligned iridophores (whereby the platelets are thicker than those which generate blue hues; Figure S4). Other green hues are generated by mixing of a structural blue (generated by the iridophores) combined with a pigmentary yellow hue (from xanthophores). In this case, the xanthophores can occur above [S1, S5] or below [S2] the iridophores. Such green hues are challenging to differentiate from some brown hues on the basis of morphological evidence alone. Brown colours can be produced by a combination of abundant iridophores and melanophores (Figure S4K), abundant xanthophores and melanophores (Figures S4B, I), or (as with some green hues), a combination of common iridophores, xanthophores and melanophores [S2, S6]. However, the vertical superposition of iridophores above xanthophores, known for some green hues [S2], has not been reported for brown hues. Figure modified from [S2].

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