The Colours of Arctic and Alpine Animals

I much regret that I have been too busy to reply to my friend, Mr. A. R. Wallace (NATURE, April 16, p. 552), till the present moment, but this delay, unavoidable on my part, is the less to be regretted, since it has given an opportunity for the interesting facts recently adduced by Sig. Lorenzo Camerano (NATURE, May 28, p. 77) to be taken into consideration. As Mr. Wallace, with that keen penetration so familiar to all who know him and his writings, goes to the root of the matter under discussion and raises a distinct issue, I will now beg permission to offer a few words in reply to both these gentlemen.

First, with respect to the physical side of the question, Mr. Wallace is perfectly correct in supposing that colour per se has no influence upon the radiating or absorbing powers of bodies as far as regards obscure radiation. But I would point out that in the present case we are not concerned with colour alone; we have not merely to consider whether black or white is the best radiator, but we have for comparison two surfaces, hair or feathers, as the case may be, having, as far as we know at present, the same structure, and differing only in colour. The question before discussed has appeared to me to be very safe, inasmuch as the natural structure and arrangement of the fur would be lost in the process of weaving into cloth. Mr. Wallace's strictures as to the use of artificial dyes are, however, quite sound, and in these I fully concur. I may further state that when this question was raised some years ago, I examined the literature (although by no means exhaustively) to see whether any experiments of the kind had been made. I have since been able to find any experiment bearing directly upon the question under consideration.

The point to be decided is, not only whether dark hair or feathers are better radiators than white hair or feathers, but whether the radiative power of these white coverings is less for that particular kind of radiation which is most greedily absorbed by the substance (snow) among which the animals have to pass their winter existence. Till this problem is solved physically we have, as it seems to me, only the purely biological considerations to fall back upon.

Before passing to the more strictly zoological side of the subject I should like to disclaim the notion to which Sig. Camerano's letter may give rise, that the radiative (as distinguished from the protective) theory of Arctic colouring is original as far as concerns myself. With respect to the white covering of the warm-blooded animals, this theory was, as far as I knew at the time, original when first broached in 1880; but Lord Walsingham, in his writings, goes to the root of the matter under discussion and raises a distinct issue, I will now beg permission to offer a few words in reply to both these gentlemen.

The point to be decided is, not only whether dark hair or feathers are better radiators than white hair or feathers, but whether the radiative power of these white coverings is less for that particular kind of radiation which is most greedily absorbed by the substance (snow) among which the animals have to pass their winter existence. Till this problem is solved physically we have, as it seems to me, only the purely biological considerations to fall back upon.

Before passing to the more strictly zoological side of the subject I should like to disclaim the notion to which Sig. Camerano's letter may give rise, that the radiative (as distinguished from the protective) theory of Arctic colouring is original as far as concerns myself. With respect to the white covering of the warm-blooded animals, this theory was, as far as I knew at the time, original when first broached in 1880; but Lord Walsingham, in his writings, goes to the root of the matter under discussion and raises a distinct issue, I will now beg permission to offer a few words in reply to both these gentlemen.

The point to be decided is, not only whether dark hair or feathers are better radiators than white hair or feathers, but whether the radiative power of these white coverings is less for that particular kind of radiation which is most greedily absorbed by the substance (snow) among which the animals have to pass their winter existence. Till this problem is solved physically we have, as it seems to me, only the purely biological considerations to fall back upon.

Before passing to the more strictly zoological side of the subject I should like to disclaim the notion to which Sig. Camerano's letter may give rise, that the radiative (as distinguished from the protective) theory of Arctic colouring is original as far as concerns myself. With respect to the white covering of the warm-blooded animals, this theory was, as far as I knew at the time, original when first broached in 1880; but Lord Walsingham, in his writings, goes to the root of the matter under discussion and raises a distinct issue, I will now beg permission to offer a few words in reply to both these gentlemen.

The point to be decided is, not only whether dark hair or feathers are better radiators than white hair or feathers, but whether the radiative power of these white coverings is less for that particular kind of radiation which is most greedily absorbed by the substance (snow) among which the animals have to pass their winter existence. Till this problem is solved physically we have, as it seems to me, only the purely biological considerations to fall back upon.

Before passing to the more strictly zoological side of the subject I should like to disclaim the notion to which Sig. Camerano's letter may give rise, that the radiative (as distinguished from the protective) theory of Arctic colouring is original as far as concerns myself. With respect to the white covering of the warm-blooded animals, this theory was, as far as I knew at the time, original when first broached in 1880; but Lord Walsingham, in his writings, goes to the root of the matter under discussion and raises a distinct issue, I will now beg permission to offer a few words in reply to both these gentlemen.

The point to be decided is, not only whether dark hair or feathers are better radiators than white hair or feathers, but whether the radiative power of these white coverings is less for that particular kind of radiation which is most greedily absorbed by the substance (snow) among which the animals have to pass their winter existence. Till this problem is solved physically we have, as it seems to me, only the purely biological considerations to fall back upon.
colours of some Alpine Coleoptera are brighter than those of the warmer plains, and that the species of small islands often show a tendency to melanism, are at present simply inexplicable, but, as far as I can see, do not tell for or against either theory. It would certainly be a strong case against the present view if any animal could be named which became white in winter and was not an inhabitant of a country subject to cold winters. As far as my knowledge extends no such species exists. The light colour of desert mammals is most probably due to predatory advantage—the melanism of desert insects mentioned by Sig. Camerano is, I must confess, a new fact to me, and not at all in accordance with my own limited experience. The strongest objection raised by Sig. Camerano is, perhaps, contained in the statement that in the birds of the Antarctic region black is much more prevalent than in those of the Arctic regions. It is unfortunate, however, that the writer adduces in illustration such countries as Australia and New Zealand, which certainly cannot be considered within the Antarctic region.

In conclusion I should like to emphasize that the theory of climatic protection is not, as Mr. Wallace appears to believe, opposed to the theory of adaptation. If my first letter gave rise to this impression, I will take the present opportunity of pointing out that the animal kingdom abounds with cases of what our German colleagues happily call "functional change" (Functionswechsel)—that is, the conversion of a character (or function) originally acquired for one purpose to a totally new use. It is thus not at all improbable that a mode of coloration originally acquired as a climatic protection, may afterwards be found to be of adaptive value, so that climatic and natural selection would in such cases work together. I fully concede that many of the Arctic and Alpine species now derive such advantages from their white covering; the question is whether this colouring was originally acquired solely for this purpose, or whether climatic adaptation may not have had an equal or even a greater influence in its production.

R. MELDOLA