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# The right way to color dinosaurs in paleoart

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**For many years, paleoartists have given many dinosaurs the colors of elephants and Komodo Dragons. A recent trend, however, is to give them spectacular colors based mostly on birds. However, this should not be done randomly, there are three main criteria to choose the models to be used in paleoart colors: the habitat, the diet, and the variation among species. Additionally, there are other criteriato choose colors according to the sex, and the age.**

Many reconstructions give large herbivorous dinosaurs the color of elephants. Photos: Wikimedia.

For many years, most paleoartists have used gray as the basic color for large herbivorous dinosaurs, and you can see this in attraction parks, the television series Walking with Dinosaurs and the Jurassic Park film series. A probable reason is that they looked for a modern equivalent, a large terrestrial herbivore, and chose elephants as the model.

Healthy adult elephants have few, if any, predators: theoretically, they do not need to hide, and as a result, they can have a dull coloration that is different from the background. Another possibility is that most dinosaurs were given a similar dull coloration because paleoartists base their reconstructions on large land reptiles, like the Komodo dragons.

The grayish colors in reconstructions of predatory dinosaurs match the color of large predatory reptiles that occur today, like the Komodo dragon. Photos: Wikimedia.

Nevertheless, reptile scales can also be colorful, there are no physiological barriers to this, as shown, for example, by chameleons.

The physiological capacity to produce brilliant coloration existed in basal reptiles, so there is no reason to think that scaly dinosaurs well dull. Extant chameleons are an example of spectacular coloration. Photo: Wikimedia.

We now have scientific evidence that dinosaurs did have complex colorations, of which we are only starting to learn from a few fossils [1].

Examples of paleoartists who are giving brilliant colors to their dinosaur reconstructions include Luis Rey (see gallery) and Emily Willoughby (see gallery).

Even though it is true that we can improve paleoart by using the colors of current reptiles and birds for the reconstruction of extinct dinosaurs, it cannot be done randomly, as done by some film makers: the *T. rex* from the film *Dinosaur Island*, from 2014 comes to mind.

Models should be chosen according to biological principles. I think that the three main criteria to check for modern equivalents are:

1. The model species must live in a similar environment as the animal to be reconstructed.

2. Their diets must also be similar.

3. The decision must be taken after studying several model species, to assess the range of variation.

Dinosaur colors probably varied with climatic season, like fur changes in some artic mammals during the winter, and during the reproductive season. Here, the evolutionary principle is that the most colorful individuals are the ones that invest less in offspring; usually, these are the males, which can become more colorful in the mating season, like we see today in pelicans. The colors also probably varied with age, with more cryptic coloration in the young. We can see an example for avian dinosaurs is the Mandarin Duck: compare female and chicks, with the male.

The coloration of extinct dinosaur s most probably followed the same evolutionary principles followed by extant avian dinosaurs, for example, females, and the young, had more cryptic colors, while the males had brilliant colors during the mating season, like the Mandarin Duck. Photos: Wikimedia

The principle applies to other animals, including mammals.

Animal coloration principles apply to all species, not only to dinosaurs. Photo: Wikimedia.

Poisonous animals advertise their poison with strong colors, from the black and yellow bees to the black and red coral snakes; we do not know if any dinosaurs had venom, but there is a small chance that chemical defenses might have evolved in such a large and longevous group, just like they evolved more than once in snakes.

An additional advantage of using modern bird and reptile models, is that good paleoart can lead to new insights, for example, consider that white egrets fish at the water edge and are white. Why?

A possible reason is that, by being white, they are more difficult to distinguish from the bright sky behind them (consider this from the point of view of fish). Spinosaurus, which also fished from the shore, could have been white for the same reason.

White animals that capture fish while standing in the water, are harder for the fish to see. The same principle could apply to dinosaurs that fished in the same way. Photo: Wikimedia.

I decided to do a practical test of the three principles that I propose here, and painted some plastic models with the colors of extant reptiles or birds that have equivalent diets and habitats.

The results appear in the following figure and include herbivores in lush vegetation, herbivores in dry habitats, predators from dark habitats, and fish eaters that captured their prey while standing on shallow water.

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