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Wave to Your Friends

Brightly colored lizards, such as this male rainbow lizard, seem to be a come on to predators, but they survive quite well. Photo by Bill Magnusson.

By the end of the twentieth century, there was a large literature on the benefits of bright colors for animals. Sexual selection was widely recognized as responsible for brightly colored males in species with drab-colored females. Some species, such as coral snakes, had obviously evolved bright colors because these advised that they are venomous. However, bright colors in juveniles and species in which both sexes were brightly colored, but not distasteful, did not fit the predictions. Two suggestions seemed rather unlikely to me. One was that species that were very active developed bright colors to advertise to predators that they were very fast and therefore it was not worthwhile for the predators to bother chasing them. The other was that the bright tails evolved because they attracted the predators to bite the tail rather than the head. This might make sense if the predator has already seen you, but it doesn't make much sense to attract a predator to bite your bright tail if it wouldn't have seen you otherwise; it could only be part of the story.

I had been collecting a lot of information on lizards, their predators, strange habits that seemed to have no function, and bright colors. The same things appeared to happen in other parts of the World. I visited South Africa and was impressed by the male blue-headed agamas[180] that ran around trying to attract females. In the south of the USA, I saw juvenile five-lined skinks[181] with blue tails that looked much like the black-spotted skinks near Manaus. Adult-male five-lined skinks have bright red throats. I remembered the Galapagos lava lizards in which only the females had red throats.

I did not want to invent an ad-hoc explanation for every species. I reasoned that a few simple rules should apply to all these cases. I started with my experience with hunting. I knew that movement was the biggest give away. While you were still, your target, whether it be a bird, mammal or lizard probably wouldn't recognize you, even if you were wearing bright colors or other distinctive clothing. Not all movements are equally obvious, and if you

get close, eye movements are likely to give you away. Chameleons and some fish keep one eye still while the other swivels to follow prey[182].

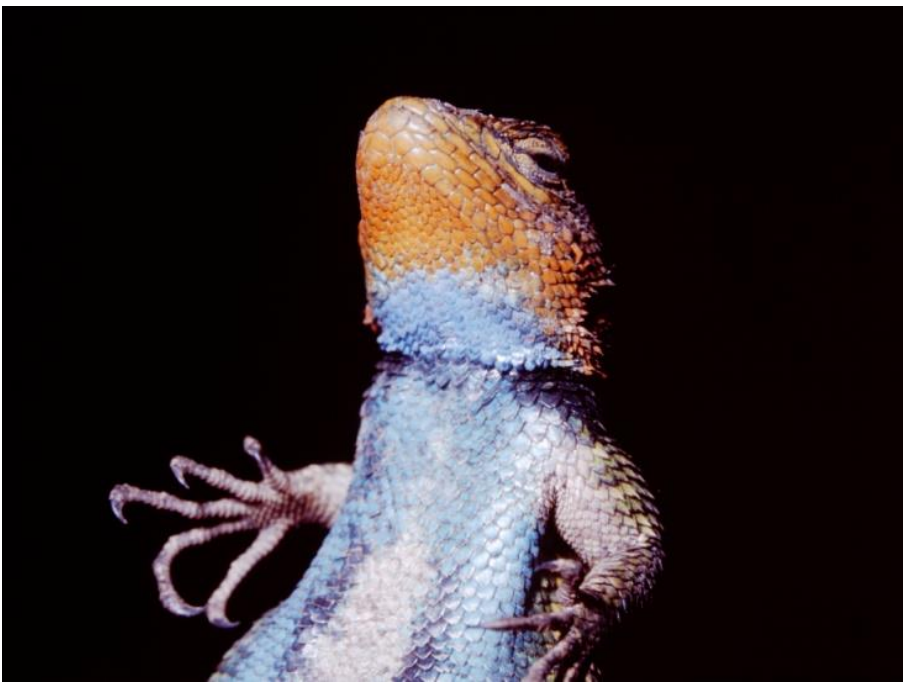

Photo 16.1 *Brightly colored lizards, such as this species of* Sceloporus *from Mexico, usually hide their bright colors underneath themselves or in expandable flaps except when displaying to another lizard. Photo by Bill Magnusson.*

If you can keep still, it pays to be dull colored, which applies to most sit-and-wait predators and slow-moving prey, such as sloths. If, however, you move around a lot it doesn't matter whether you are dull colored or not; someone will see you. In this case, sexual selection can act on both sexes equally, but as explained above, this doesn't happen often because females are usually laden with eggs or spend a lot of time sitting still while incubating eggs in exposed nests. Brightly colored female birds are usually only found in species that nest in holes.

The first step seems fairly obvious. Movement destroys camouflage, so other factors that would select for bright colors can only act on animals that move around a lot and have evolved other means of avoiding being eaten by predators. All the animals I know of that are brightly colored forage actively, even those that are also distasteful or toxic to predators. Some, such as the male blue-headed agamas, only develop bright colors in the season that they are most active, seeking receptive mates. The females, which do not change behavior seasonally, remain drably colored.

However, what about the animals with flash colors that are only shown for a short time, or animals that normally spend most of their time sitting still, but after they come to rest keep moving some part of the body, such as the tail or arm? Some of the animals that habitually waved arms or tails after coming to a stop were cryptically colored, so the movement seemed to be an unnecessary invitation to predators.

I watched a male green anole moving around in a small tree. Male anoles tend to move more often than females, perhaps looking for a mate or patrolling their territories to expel intruding males. Every time the lizard changed position, it would run a short distance, stop, lift its head high and expand the bright orange dewlap under its throat several times. I could see no females or rival males, but I assumed that it was displaying just in case another member of its own species was watching. Our observations on other species led me to think that there might be an additional reason it was showing off its bright colors; it may have been inviting predators to attack it!

Photo 16.2 *Even female and juvenile rainbow lizards,* Cnemidophorus lemniscatus, *which are not brightly colored, wave their arms every time they move from one spot to another. Photo by Bill Magnusson.*

All the rainbow lizards we watched waved their arms every time they stopped after running a short distance, independent of whether they were male, female, adult or juvenile, and also independent of whether there was another rainbow lizard nearby. They also do it at any time of day, so they are not lifting their toes off the hot ground as some desert lizards do. The same applied to tail waving by Trinidad geckos; it just did not seem to be primarily a social signal.

I thought about the behavior of my aboriginal friends when they hunted feral buffalo. When the buffalo was walking or grazing, the hunter would creep forward. As soon as the buffalo lifted its head and kept its eyes still, the hunter would freeze. When the buffalo started to move, so did the hunter, slowly closing the gap. In the end, the hunter would be only a few meters from the buffalo, but it didn't seem to notice as long as he didn't move.

I did the same when hunting lizards. I moved when the lizard moved, and I froze whenever the lizard stopped. When close enough, I waited for the lizard to move before making a grab for it. My captive snakes showed the same behavior. When a lizard was moving, the snake moved too, slowly closing the gap. Even when close enough, the snake did not strike if the lizard was motionless; it waited for the lizard to move before taking the final lunge.

You can distinguish moving objects against the background when you are walking, but it is much harder than when your eyes are still, and it takes extra time for your brain to process the information. That is why we, snakes and other predators wait until the prey is in motion before making our move. This does not make sense in terms of simple physics. A stationary object has to overcome much more inertia, so a moving lizard can get to high speed faster than a stationary one. However, that slight advantage is outweighed by the extra time it takes to decide that you need to run.

Moving from one place to another is dangerous for a lizard. Movement negates most of the advantages of camouflage and the lizard is essentially blind to predators when moving. It would be much better if the lizard could maintain its eyes stationary while it moves its body. Some birds do that when walking. If you watch a chicken or pigeon, you will see that it appears to be bobbing its head as it walks. In reality, it is using its flexible neck to maintain its eyes stationary as the body moves forward. It then quickly moves the head to catch up before repeating the process as the body moves forward again. Lizard necks are not that flexible, so they have to use another device to keep their eyes still while maintaining movement that will induce a predator to take action so that they can see it.

Photo 16.3 *Trinidad geckos,* Gonatodes humeralis*, move intermittently, and when they stop they wriggle their tails for a few seconds. Photo by Bill Magnusson.*

Lizards with flexible tails can waggle the tail as soon as they stop, while keeping the head up and the eyes vigilant. Waving the tail may just be a device to distract the predator from the head to the expendable tail, but that is unlikely to be the whole story, because getting your tail bitten off is a very expensive defense strategy. If tail movement tricks the predator into moving because it thinks you are inattentive, and your stationary eyes can detect it, you may get away with no losses.

Lizards adapted to fast running, the so-called race runners, generally do not have flexible tails, presumably because floppy appendages would slow them down. Therefore, they cannot use their tails to maintain movement when the head is held still. At least one group of lizards, the rainbow lizards, seems to have overcome this difficulty. Instead of wagging their tails after making a

move, they wave their forearms as though saying to a predator "Come and try to eat me." And that might be just what the behavior evolved to communicate[183]! Other species of lizards, such as Australian bearded dragons also wave their legs after moving from one place to another, but I have not watched enough to know whether predator defense of social signaling is the most likely explanation.

All the disparate observations on lizards and snakes I had made since I was a child watching fence lizards at my grandmother's house seemed to come together in a coherent story. As it involved hot males, psychedelic colors, sex and death, perhaps it would make a nice soap opera!