



Prairie Rattlesnakes (*Crotalus viridis*) were locally abundant across the Great Plains at the time these articles were written. Many of the rattlesnake encounters reported by pioneers traversing the Oregon and Mormon trails were with this species. This snake is in a classic “defensive” position.

itself by the destruction of the snake. But the *certainty* of the effect of the poison serves as a warning and is advantageous, not in defense after the attack is made, but in *preventing* an attack from being made. If, then, the color of the rattlesnake were different from all harmless snakes, so much so as to render it conspicuous, this would be beneficial to it, by the readiness with which all animals would recognize it, and thus protect the snake by this notice of the deadly character of its weapons. If then a conspicuous color would be of advantage, it seems to me that any other means which it may be able to use in making known its character to any animal that may come near it, would be advantageous, and would be increased and preserved by natural selection, and that the whirring noise which it produces, in this view of the matter, admirably serves its purpose. In effect it amounts to this, and by experience its enemies learn to understand its language, “I am a *rattlesnake*, armed with what will be death to you if you come too near; give me a wide berth!”

Prof. Shaler remarks that it is a fact well known doubtless to those who have observed serpents, that many when in a state

of excitement vibrate the end of their tail just as the rattlesnake does. This statement reminded me of a South American species described by Darwin in his “Voyage of a Naturalist” (vol. i, p. 123, Harper’s ed.), where he says:—

“Of reptiles there are many kinds: one snake (a *Trigonocephalus*, or *Cophias*), from the size of the poison channel in its fangs, must be very deadly. Cuvier, in opposition to some other naturalists, makes this a sub-genus of the rattlesnake, and intermediate between it and the viper. In conformation of this opinion I observed a fact, which appears to me very curious and instructive, as showing how every character, even though it may be in some degree independent of structure, has a tendency to vary by slow degrees. The extremity of the tail of this snake is terminated by a point, which is very slightly enlarged; and as the animal glides along, it constantly vibrates the last inch; and this part striking against the dry grass and brushwood, produces a rattling noise, which can be distinctly heard at the distance of six feet. As often as the animal was irritated or surprised, its tail was shaken; and the vibrations were extremely rapid. Even as long as the body retained its irritability, a tendency to this habitual movement was evident. The *Trigonocephalus* has, therefore, in some respects, the structure of a viper, with the habits of a rattlesnake; the noise, however, being produced by a simpler device.”

It was these remarks of Darwin that first suggested the problem of the rattlesnake’s tail to my mind, and, as I had thought considerably about the matter, of course I was deeply interested in the paper by Prof. Shaler; but I must acknowledge that, while many of his suggestions are correct and highly valuable, I was disappointed to find that the only advantageous use, in his estimation, of this tail appendage of the rattlesnake, is an imitative call-note to allure birds within its reach, and that, otherwise, it is rather a disadvantage than an advantage to be preserved and perfected by natural selection. If it is useful for both purposes, then there is a double reason for the action of natural selection. If it is not used as an imitative call-note, but is useful in the manner I have pointed out, then I have shown that it is explained by natural selection.

The Rattle of the Rattlesnake⁶

Professor Samuel Aughey

I wish to contribute my observations on the rattlesnake, having been specially favored in opportunities for the study of this reptile.

Of all the articles that have appeared on the subject in the *NATURALIST* that by Mr. Putnam appears to me to present the most satisfactory theory concerning the use of the rattles. I am satisfied that *one* of their uses is to bring the sexes together.

In July, 1869, I was engaged in surveying along the Logan river in Wayne County, Nebraska. After completing my contract I devoted a day to investigating the natural history of the neighborhood. While washing a collection of unios at the water’s edge, I heard the familiar rattle of the *Massasauga* (*Crotalophorus*

⁶ Reprinted from *The American Naturalist* 7:85–86 (February 1873).

Editor's Remarks

Rattlesnakes are iconic symbols of the American West. During the 18th Century, rattlesnakes became symbols of the American colonies and their fight for independence from the British. For example, Paul Revere showed the snake fighting a British dragon on the masthead of *The Massachusetts Spy* in 1774. In 1775, a letter attributed to Benjamin Franklin appeared in the *Pennsylvania Journal*, calling for the adoption of the rattlesnake as the symbol of the United States and saying, among other things, that the rattlesnake “never begins an attack, nor, when once engaged, ever surrenders: She is therefore an emblem of magnanimity and true courage. ... she never wounds 'till she has generously given notice, even to her enemy, and cautioned him against the danger of treading on her,” leading to the motto “Don't tread on me,” emblazoned on an early revolutionary flag.

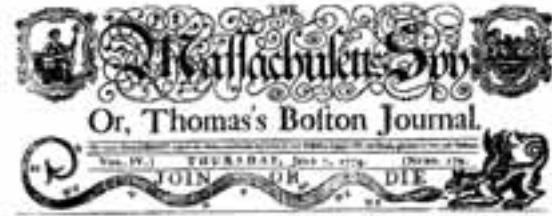
Yet today, rattlesnakes invariably appear as “bad guys” in movies and books. Rattlesnake roundups still occur in many places, and focus on killing as many of these useful animals as possible. A proposed position paper from the American Society of Ichthyologists and Herpetologists “strongly opposes traditional rattlesnake roundups. Such roundups promote overexploitation of natural populations of wildlife, unnecessary killing and inhumane treatment of individual animals, degradation of habitat, and promotion of outdated attitudes toward important elements of America's natural heritage.” We strongly agree with this statement.

Here we reprint several classic scientific papers focusing on rattlesnakes. In 1872, N. Shaler published a piece in the *American Naturalist* attempting to explain the function of the rattle. “For some years I have been teaching that the tail appendage of the rattlesnake was not to be explained on the doctrine of natural selection, inasmuch as it could contribute in no way to the advantage of the ani-



SUZANNE L. COLLINS, OIAH

mal.” However, having provided a “useful” purpose for the “appendage,” he concluded that “it must be confessed that the case of the rattlesnake seems to me no longer the bar to the acceptance of the theory it once did.” Later that year, and in the same journal, J. Henderson speculated on the evolution of the rattle and its possible function. The following year, Samuel Aughey proposed yet another possible explanation.



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Benjamin Franklin at one time called for the adoption of the rattlesnake as the symbol of the United States. That suggestion led to the motto and image emblazoned on this Revolutionary War era flag.

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Today, these discussions, which occurred less than two decades after publication of Charles Darwin's *On the Origin of Species** in 1859, seem naïve. Even the language and the methods are archaic. For example, the almost indiscriminant use of “theory” speaks eloquently to the evolution of language (today we would substitute “hypothesis” for all applications other than to Darwin's theory of natural selection). Also, the heavy reliance on anecdotal observations and a readiness to draw definitive conclusions from them contradict modern scientific methods. Our knowledge has greatly increased in the intervening years, and our ability to test hypotheses about form and function is much more sophisticated. Nevertheless, 134 years after the last of these papers first appeared, many U.S. citizens still adamantly cling to their opposition of evolution.

Gad Perry

* Complete title: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life.*



SEZANNE L. COLLINS, CMH

In 1873, Professor Samuel Aughey indicated that the rattle might also be used to attract mates or allies in a struggle against predators. Like Henderson, many of his observations were of Western Massasaugas, although he also described an encounter with a Prairie Rattlesnake (*Crotalus viridis*), illustrated here.

tergeminus [= *Sistrurus catenatus*]). I quietly crept up the bank and cautiously looking over the level bottom I saw, at the distance of about thirty feet, a rattlesnake coiled up with head erect and gazing in an opposite direction from my position. Every three or five minutes the snake would cease rattling for a minute or more and then commence again. In about half an hour from the time that I first saw the snake I observed another rattlesnake approach the first one. Closer and closer the second one approached, until at length they met and indulged in a sexual embrace. I watched them for at least an hour and left them at last without disturbing them.

The next year at the Bow river in the same state I saw the same thing repeated under similar circumstances. In neither case could I ascertain whether it was the male or female that give the call.

I am satisfied that the theory that the rattle resembles the noise made by the Cicada, and that it is employed because of this resemblance to entrap birds, etc., is a mistake. I have been accustomed to the sound of the Cicada and the rattle of the rattlesnake from my youth, and soon learned to distinguish them, although there is betimes a striking resemblance between them. My familiarity with them was gained in my native state amid the Alleghanies of Pennsylvania. In the last week of June, 1869, I was on the Missouri flood plain in a dense timber in Cedar County, Nebraska. At the time there were many Cicadae and multitudes of birds in the timber. One day I was sitting on a log, classifying a collection of flowers and plants. Suddenly I heard the well-known rattlesnake rattle. The snake was not more than forty feet from me. I could not have been the cause of its alarm as a large log lay between us and I had been quiet for nearly an hour. Even the Cicadae were alarmed and disappeared, and soon not a bird was to be seen, but the rattling continued. Unfortunately, on the impulse of the moment, I killed the snake

without waiting to see or learn the purpose of its rattling. Again I have noticed that the Massasauga, at least in Nebraska, is by far the most abundant far away from the timber, where the Cicadae are rarely if ever seen.

These observations seem to me to point to the theory that the rattle calls the sexes together. In July, 1871, I was in the timber on the Missouri in Dakota County, Nebraska. I got sight of a Baltimore oriole (rare in Nebraska) which I was following as it flitted from twig to twig. As it swept near the ground a rattlesnake struck his highest notes and seemed to paralyze the oriole with fear. This snake was a *Crotalus*. The poor bird hovered near the snake and fearing that it might fall into its jaws I shot the reptile. This experience suggested the theory that perhaps an additional purpose of the rattle was to frighten its victims into submission and to protect itself by the terror it inspires from its natural enemies. However that may be, is it not a mistake to limit such a peculiar organ to any one single purpose? What is needed to determine definitely the natural history of the rattlesnake is closer and more accurate observation over a wide area, and by persons who are fitted by nature and education for such work. Unfortunately for science, the almost universal custom has been to kill the rattlesnake as soon as found, without waiting to learn its disposition and habits of life.

Once in the Dakota Nebraska timber I saw an attack of hogs on a rattlesnake. In a few minutes after the snake commenced rattling, three others made their appearance. They apparently came to the assistance of the first one, but all were killed by the hogs in a few minutes. Seven hogs were more than a match for four rattlesnakes. Here evidently the rattle was used to call for help. These belonged to the genus *Crotalophorus*.

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