There are three genera of pit vipers in the United States: copperheads (*Agkistrodon contortrix*), water moccasins (*Agkistrodon piscivorus*), and rattlesnakes (*Crotalus sp. and Sistrurus sp.*). American pit vipers have triangular heads containing retractable fangs and venom glands and the pits for which they are named. Located between the eyes and nostrils on each side of the face, these pits are the external openings of infrared-sensing organs, which allow pit vipers to detect and strike at prey whose body temperature is as little as .2 degrees Celsius higher than the ambient temperature. The most noticeable distinction between rattlesnakes and the other two American pit vipers are the rattles than give the rattlesnake its name. The genus *Crotalus* contributes the only two pit viper species native to Wyoming: *Crotalus viridus viridus* (prairie rattlesnake) and *Crotalus concolor* (midget faded rattlesnake).

*C. viridus viridus* is the Wyoming species most people are familiar with. The most widely distributed rattlesnake species in the United States, its range extends from the Canadian border to northern Mexico, and from the Great Divide deep into the Great Plains states. The eastern two-thirds of Wyoming is *C. viridus viridus* territory with individuals being found from the lowest elevations in the state to an altitude of 9000 feet above sea level. Though individuals in some locations may exceed 4 feet, an average adult is about 3 feet long and weighs roughly a pound. Coloration ranges from yellow-green to a darker brown-green depending upon where the

Continued on page 2
Rattlesnakes ...

snake is found. Rectangular to rounded motifs edged in white decorate the prairie rattler’s back and narrow into body-wrapping bands near the tail.

Recent DNA studies suggest that *C. concolor* is entitled to its own species designation after decades of being lumped in with the subspecies of *C. viridus* or *C. oreganus*. (Herpetologists will argue this designation ad nauseum so please don’t get a herp guy started unless you enjoy that sort of thing.) *C. concolor* limits its range to the rocky outcrops and thick sage country of the Green River Formation located in eastern Utah, western Colorado, and extreme southwestern Wyoming. A few *C. concolor* have been found in northern Arizona though blood work is necessary to make sure an individual is indeed *C. concolor* and not one of several other look-alike species. *C. concolor* is a small rattler, rarely reaching 24 inches in length, pale yellow-brown or tan in color with slightly darker oval dorsal blotches that may fade with age. The three states that contain most of the specie’s habitat forbid collection of the species so it is uncommon to see these snakes even in captivity. Unlike most rattlers whose venom is solely or mostly hemotoxic or cytotoxic (affecting blood and tissues), *C. concolor* venom contains a significant component of neurotoxin which affects the nervous system and adds an unwelcome component of neurotoxin which affects the nervous system and adds an unwelcome.

The record holder for distance in Wyoming is a female prairie rattler who traveled eight miles from her home den. Except for the occasional individual that wanders further afield and overwinters in a new den, snakes return to the same dens each fall from which they emerged in late spring. If the wandering individual is a female that gives birth in her new den, her young will return to the new den. Faded midget rattlers generally reproduce no oftener than every two or three years and stay even closer to their home dens than do prairie rattlers.

During the months that they live away from the den, rattlesnakes eat an average of two to three times their body weight in rodents, lizards, insects, birds, and other snakes. To conserve energy, rattlers are ambush hunters, lying in wait for prey alongside established rodent trails or in prairie dog towns.

Rattlesnakes possess several primary senses. Thermosensitivity is provided by the pits as mentioned earlier. Chemoreception is a function of the rattlesnake’s remarkable forked and constantly flicking tongue and the associated organ known as Jacobson’s Organ, a chemoreceptor located in the roof of the snake’s mouth. A very simplified explanation for a complex process is that the moist tongue takes in microscopic particles from the air and transfers them to the chemoreceptors to provide the snake with information about its environment. There is also evidence that the tongue receives electrostatic information from the environment that is processed by electroreceptors. While a rattlesnake’s nostrils are used mostly for breathing, they are lined with olfactory cells that allow it to smell its environment.

Despite lacking external ear openings and possessing a single inner ear bone known as a columella, rattlesnakes aren’t deaf. The snake’s body picks up surface vibrations and passes them to the columella and adjoining bones in the jaw and skull, resulting in sound perception. Lower pitched sounds transfer more clearly than high pitched sounds making it unlikely that one rattlesnake can hear the sound of another’s rattle.

Vision differs from species to species but rattlesnakes generally cannot see with any clarity though they are capable of detecting movement up to 40 yards away. Depth perception is also poor thanks to having eyes set on each side of the head. Rattlesnake sight is best adapted for the low light conditions of twilight and night, the times favored for hunting. There is good evidence that those amazing pits compensate for reduced vision by detecting infrared light (heat) and acting like night vision goggles to send images of prey and threats to the snake’s brain.

Rattlesnakes are extraordinarily sensitive to the slightest touch, pressure, or other contact on their bodies. Touch sensors called mechanoreceptors are literally distributed across the body and in the
hinges between scales. In combination with the snake’s circulatory system, these touch sensors allow the snake to control its body temperature by moving between environmental temperature gradients. Rattlesnakes are ectothermic creatures incapable of producing their own body heat. This makes them dependent on and vulnerable to environmental temperature. Optimum temperature for activity falls between 80 and 90 degrees Fahrenheit. Extremely high or low temperatures are equally undesirable though rattlers tolerate cold better than heat. Even snakes native to the world’s hottest environments will die quickly once their internal temperature passes 110 degrees Fahrenheit. On the other hand, adult rattlers survive temperatures just above freezing though they move pretty slowly under those conditions.

Though well equipped to protect themselves, rattlesnakes are not invulnerable to predation. Species in the genus *Lampropeltis* (commonly known as kingsnakes) are the best-known predator but according to Brian Hubbs’ book, “Harmless Snakes of the West,” Wyoming is not home to any species of kingsnake. (Contrary to popular belief, Wyoming bullsnakes are not natural enemies of rattlesnakes but instead harmoniously coexist and even den up for the winter with them.) Coyotes, badger, feral hogs, feral cats, turkeys, and various raptor species are also known to prey on rattlesnakes. More surprising perhaps is the threat posed by deer, antelope, and domestic equine species such as donkeys and horses, all of which will stomp a rattler if sufficiently threatened. The biggest predator of rattlesnakes, however, is humankind.

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**Windswept**

*Entry forms and guidelines available August 1, 2017*

**DEADLINE FOR ENTRIES:**
Tuesday, October 31, 2017 at 4:30 p.m.

Show opens on Thursday, November 9, 2017 and closes on Thursday, February 8, 2018.

Entry in the exhibition is open to all residents of Wyoming. In keeping with the theme of wilderness, images are limited to those that can be found in the wild: no humans, domestic animals, feral animals, or trappings of civilization.

**FOR MORE INFORMATION:**
307-235-2108 or indiahayford@caspercollege.edu
Open Monday-Friday, 9 a.m.-5 p.m.
According to experts in the Department of Wildlife Ecology and Conservation at the University of Florida, the chances of being bitten by any venomous snake in the United States including rattlesnakes, copperheads, water moccasins, and coral snakes is about one in 37,500. Only one person in 50 million will actually die from envenomation thanks to readily available medical care and antivenin. Eastern and western diamondback rattlesnakes account for almost 95 percent of snakebite fatalities in the United States; neither species is native to Wyoming. Nine times more people die annually from lightning strikes, and a person is 6,266 times more likely to die in a car or motorcycle accident than from snake bite.

Not only do rattlesnakes bite humans far less often than many people believe but up to 25 percent of those episodes involve dry bites or those in which no venom is injected into the victim. Though venom injection was once thought to be an involuntary reaction, scientists have determined that rattlesnakes exert muscular control over their venom glands and the erection of their fangs. It takes as long as several weeks for a snake’s body to manufacture venom so a snake may choose to not waste venom on a threat that can as easily be dissuaded by a dry bite. Alternatively, dry bites may occur when a snake has recently expended venom on a kill or when venom is prematurely expelled before the fangs penetrate a victim’s skin. Snakes replace fangs regularly and dry bites may result when the shed fangs haven’t been replaced by new ones.

That being said, people do incur envenomed bites. If you or a companion get nailed, throw out everything you learned from old westerns about slashing the fang punctures with a razor blade and sucking out the venom. Resist the urge to put a tight tourniquet between the bite and the heart unless you plan on leaving a limb behind when you finally reach medical aid. Packing the afflicted area in ice is also a bad idea. A particularly brilliant bit of idiocy that still gets touted about in some circles is the belief that shocking the bite area via car battery, stun gun, or other electric source will somehow neutralize the venom. True, some of those thus shocked do not experience the painful, debilitating results of an envenomed bite. For an explanation, please see the paragraph on dry bites above.

If bitten by a venomous snake, keep your wits about you and move away from the snake, making sure that it has no buddies hanging around to complicate your retreat. Do not bother to kill the snake either to appease your ire at being bitten or to take it along for identification. There are only two venomous snake species in Wyoming, so identification will be easy. Note its appearance, call 911, and begin first aid. Driving oneself to the hospital following a snake bite is not recommended. Emergency vehicles can usually get you to the hospital faster than you can get there.

Gotcha! Rattlesnake Bites

BY: INDIA HAYFORD, MUSEUM ASSISTANT

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THE WOODS LEARNING SCHOOL
ANIMAL PROJECT

On May 25, 2017, the Werner Wildlife Museum hosted the best-attended occasion of the year when over 300 students, parents, and friends gathered to enjoy animal lectures by Deyonne Jackson’s kindergartners and first graders. Each team of students chose an animal to study, did research at the museum and at school, then delivered a concise and interesting lecture to admiring friends, family, and other museum visitors. Following the overwhelming enthusiasm generated by the 2015 lectures, this year’s attendees had a choice of either an afternoon or evening session. Judging by the crowd this year, the 2019 lectures may need to go to three sessions. Way to go, Woods Learning Center!

“Where the Wyoming Wild Things Are”

Deyonne Jackson and students.

Grizzly bear presenters.

Bison presenters.

Owl presenters.

Taxidermy presenters.

Participants and audience in backyard.
Rattlesnake Bites ... Continued

on your own. A bite that initially appears to be minimal can abruptly evolve into an emergency so never wait to seek out medical assistance. Antivenin treatment is generally most effective if started within four hours of the bite.

According to Mayo Clinic and the West Virginia University School of Medicine, proper first aid begins with immobilization of the bitten area along with the removal of any constrictive clothing or jewelry. Clean the wound by wiping away from, not across, the fang marks then cover it with a loose, clean dressing. Do not flush with water. Keep the wound at heart level and maintain this gravity-neutral position as consistently as possible. Do not use alcohol or caffeine since either could speed up your body’s absorption of the venom. Do not take NSAIDS (nonsteroidal anti-inflammatory drugs) or ASA (drugs containing aspirin) and avoid opiates especially if bitten by a species like Crotalus concolor that has a neurotoxin component in the venom. The WVU study notes that a venom extractor may be useful if it is applied within five minutes of the bite then left in place for half an hour. If medical aid is more than half an hour away and the bite is on an extremity, a wide flat constriction band may be applied about 2 inches above the bite. Two fingers should easily slide under the band so that only superficial venous and lymphatic flow are restricted. Do not confuse a constricting band with a tourniquet which is a narrow band that cuts off blood flow to the extremity.

Rattlesnake venom contains enzymes that rapidly damage tissue, destroy blood, and alter the permeability of blood vessels. Symptoms of hemotoxic envenomation include one or more of the following: intense pain at the bite site, edema, swelling, rapid pulse and/or breathing, numbness and tingling along the bitten limb or around the mouth, weakness, or an unusual metallic taste. When venom contains neurotoxin components, neuromuscular transmission is compromised resulting in symptoms like difficulty swallowing and/or breathing, double vision, excess sweating, excessive salivation, and paralysis of the upper eyelids.

Bite severity depends upon the size and species of snake and the amount of venom injected. Age, size, and physical condition of the victim are also important along with location and depth of the bite and the time elapsed between the bite and the onset of medical treatment.

The main therapy for venomous snakebite is administration of an antivenin called CroFab or Crotalidae Polyvalent Immune Fab (Ovine). Derived from sheep serum, CroFab replaces an older type of antivenin derived from horse serum which was more likely to induce anaphylactic responses in patients. Therapy is not cheap. As of June 2017, the cost of antivenin at Wyoming Medical Center in Casper, Wyoming, was $2,600 per vial. On average, each case requires 10 to 15 vials of antivenin; in one bad bite case, the victim required administration of 40 vials before treatment concluded.

To prepare CroFab, sheep are immunized with venom from the water moccasin (Agkistrodon piscivorus) or one of several species of rattlesnakes: Crotalus atrox (western diamondback), C. adamanteus (eastern diamondback), and C. scutalatus (Mojave). The Mojave rattlesnake is known for having a significant amount of neurotoxin in its venom, unlike most rattlesnake venom, which is hemotoxic. The final product combines these four monospecific antivenins and has been shown to effectively neutralize the venom of the 10 most significant North American pit vipers. The continent’s other significantly venomous snake, the coral snake, is an elapid possessing neurotoxin and requires a different antivenin. Elapids account for less than one percent of venomous snake bites in the U.S. and are not found in Wyoming.

The best plan, of course, is to avoid getting bitten in the first place. Much of Wyoming is prime rattlesnake country and it behooves a person to pay close attention to his or her environment. Proper field dress is important: rattlesnake country is not a place for hiking in Bermuda shorts and sandals. Long, closely woven pants with loose legs and leather boots that come to mid-ankle or higher are better choices. Be aware of where you put your feet and especially where you put your hands. Studies show that two-thirds of all bites take place on an upper extremity with half the bites being inflicted upon fingers. A hospital worker in the heart of Utah’s C. concolor territory reported seeing two or three C. concolor bites a year, usually oil field workers or rock climbers who weren’t watching where they put their hands. One gentleman was bitten on the lower arm when he failed to properly scope out the area he had chosen for an outdoor nature call.

The surest way to get bitten is to pick up a snake. Rattlesnakes do not make good pets. When a would-be pet owner who has been drinking combines alcohol with a cavalier attitude toward rattlers, the result is often a run to the hospital for many vials of very expensive antivenin, a miserable few weeks, and possible disfigurement. Upon sobering up following a bad bite from a potential pet, one young man told his doctor, “It was only a little snake. I didn’t think it could hurt me.” Oh, yeah.
The metal bison sign has been installed in its new location in front of the Werner Wildlife Museum. Originally designed and built by a Casper College welding class, the bison was stored in the Casper College School of Science office for many years. Many thanks to the Casper College building and grounds crews for bringing the bison home. Special thanks to David Vasquez who was present every step of the way from demolishing the old sign base (no mean feat – the thing was boulder-solid) to landscaping the new exhibit.
Did you miss Summer Field Science Camp this year? Then you REALLY missed out on a fine experience. Campers spent five wonderful days in the great outdoors studying plants, birds, animals, rocks, and fossils in locations like Bates Hole, Speas Fish Hatchery, Casper Mountain, Edness Kimball Wilkins State Park, and Alcova Lake. If you have a child, or are a child, entering fourth grade this fall, be sure and put field camp on your calendar for summer 2018. To the right are some photos from this year’s adventures in Bates Hole.

There are worse things than being stuck in the mud.

Netting for biological treasures.

Making the acquaintance of a Wyoming bull snake.