I DIDN'T KNOW THAT!
(Insects)

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I DIDN'T KNOW THAT!!!
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Robert Boles and Tom Eddy

Insects have existed on Earth 70 to 100 times as long as man. They are man's greatest competitors for survival, eating his crops, destroying his buildings, biting his livestock, carrying serious and often deadly diseases, and not hesitating to attack man himself. On the other hand, insects are almost indispensable for man's welfare. For example, without insects to pollinate many of our crops, about the only food we would have would be the seeds of wind-pollinated grains.

This issue of the Naturalist introduces the reader to some of the valuable, harmful, and almost unbelievable activities of this great group of animals.

The role of the housefly in the spreading of certain diseases (e.g., typhoid) wasn't believed until 1898, less than one hundred years ago.

Mosquitoes (Culex sp.) transmit equine encephalitis ("sleeping sickness") that sometimes breaks out in Kansas and other parts of the United States.

People once thought that a few flies "were nice things to have around, to make things more homelike".

(Cover picture) What if the Hercules beetle (top right) or the stag beetle (bottom right) reached the size of some of the ancient dinosaurs, such as the 30-foot Tyrannosaurus or the 90-foot Diplodocus?

Some primitive people still think head lice are something akin to household pets.

Prior to World War I, some people thought cockroaches carried cancer from person to person.

There may be more than 1,500,000 different species of insects in the world.

There are people who suffer from entomophobia, which is an extreme fear of insects. True entomophobia is not a laughing matter, as it may lead to nervous disorders or sensory hallucinations, and may require the help of medical personnel or spiritual advisors.

Stewart (1959) reported that a phasmid walking stick squirted a fluid a distance of two feet into a person's eye, causing excruciating pain, and interfering with his vision for some five days.

*Dr. Tom Eddy is Associate Professor of Biology at ESU. His field of specialization is Entomology (the study of insects).
Residents along shores of lakes may become so allergic to the cast skins of mayflies that they have severe attacks of "asthma".

The "water bug" or "croton bug", probably the best known of the cockroaches, is a native of Europe.

The larder beetle, Derestes maculatus, is commonly used to clean dried flesh from bones for museum use.

Larvae of the carpet beetle may sometimes enter the ears of a person and cause much discomfort.

Bedbugs, like lice, have been constant companions of man for centuries.

As many as 10,428 lice and 10,253 nits (louse eggs) have been reported on a shirt taken from a heavily-infested person.

Many mosquitoes do not bite humans. Only those that prefer a diet of human blood are important in the transfer of such diseases as malaria and yellow fever.

The larvae of some species of the mosquito genus Psorophora are beneficial in that they feed on the larvae of other mosquitoes.

The heartworm of dogs that may affect your family pet here in Kansas is spread by the bite of an infected mosquito.

Though dragonflies ("mosquito hawks" or "snake doctors") readily catch and devour mosquitoes, they do not control them as much as some people think. One good reason is that dragonflies do not fly at night when night-flying mosquitoes are on the wing.

One of the most useful of all fishes for mosquito control is the little mosquito fish, Gambusia affinis, which has now been transplanted to many parts of the world for this purpose.

The ever-increasing use of fast airplanes for the transport of people and merchandise has greatly added to the danger that a disease-carrying mosquito might be transmitted into a country by accident, and cause a serious epidemic with heavy loss of life.

One researcher reported that honeybee workers spent a total of 109 minutes and 37 seconds actually feeding a single larva. This did not include the time spent in collecting and preparing the food. Besides, there may be thousands of larvae present in the colony. And you think feeding your kids takes a lot of time!

Some termite mounds may be eighteen feet high. The material from which the mounds are constructed is almost as hard as concrete.

The insect respiratory system bypasses the blood and delivers the oxygen directly to each and every one of
This is a sketch of a young grasshopper, believe it or not. The stick-like shape is believed to help hide it from would-be enemies.

the millions of cells buried deep in the various organs and tissues of the body. It is as if each cell of the insect’s body had its own private lung.

Certain honeypot ants become living jars holding the liquid food supply of the colony. These bloated members hang suspended from the roof of the underground chambers, where, when a hungry ant stops by, they regurgitate some “goody” for it to feed on.

The insect commonly called a “velvet ant” is not an ant at all, but rather a solitary wasp.

The fire ant, about the size of a grain of rice, has a bite as bad or worse than the sting of a hornet. One victim in Georgia who was unusually sensitive was bitten on the foot. He was rushed to the hospital, but died less than an hour later from cardiac arrest.

Fire ants are native of South America, but “hitch-hiked” their way into the United States in the soil of imported plants.

Fire ants presently infest at least 230,000,000 acres in at least nine states.

State and federal governments have spent over $150,000,000 in an attempt to control the fire ant. So far such efforts and huge expenditures have been largely futile.

Fire ants seem to thrive on many toxins that would kill ordinary insects.

Fire ants are moving westward at the rate of fifty to one-hundred miles every ten years.

The reproductive potential of insects is almost beyond comprehension. For example, Hodge (1911) calculated that, “A pair of flies, beginning operations in April may be the progenitors, if all were to live, of 191,010,000,000,000,000,000 flies by August. Allowing one-eighth of a cubic inch to a fly, this number would cover the earth 47 feet deep”.

The fly that gives you the painful bite about the ankles when on a picnic is a stable fly, not a housefly. Houseflies have lapping mouthparts, and cannot bite a person.

The housefly is an infamous germ carrier. Esten and Mason (1908) claimed “The numbers of bacteria on a single fly may range from 550 to
6,600,000.” They claimed flies may average about one and one-fourth million bacteria each.

Be sure to dispose of your lawn clippings properly this summer. A pile of such clippings in warm, moist weather may become infested with a mass of housefly and stablefly larvae --- followed by a veritable plague of flies about your house a short time later.

The first recorded pandemic of bubonic plague ("Black Death"), which is spread by infected fleas, was that of Justinian in the sixth century, starting in Egypt in 542 A.D. and spreading to Constantinople. It lasted 50 to 60 years, and was estimated to have claimed 100,000,000 victims.

The female of most insect species is larger (often much larger) than the male. Also, there are some species of insects for which a male of the species has never been found.

Head lice and body lice can interbreed, and produce fertile offspring.

Body lice are largely confined to those adults and children who do not change their underwear frequently.

Even in civilized communities there are always some chronically lousy individuals.

One of the earliest references to bedbugs in English was that of Humphrey Lloyd who translated the following statement made by Pope John XXI in the sixteenth century: “Small stynkinge worms which live in paper and wod, called Cimices”.

The venom of the tiny parasitic wasp, Microbracon hebetor, is so potent that diluted to one part in 200,000,000 parts of the host’s hemolymph (“blood”) is enough to cause permanent paralysis.

Each molt of an insect is called an ecdysis; the molted exoskeleton is called the exuvium; each period of activity between molts is called a stage or stadium; and the form that the animal has during a stadium is called its instar.

Insects include some of the most beautiful, some of the most destructive and deadly, and some of the most useful creatures in the animal kingdom.

A housefly hums in the key of F and beats its wings over 20,000 beats a minute.

Some beetles can pull over 40 times their own weight. At the same rate, a 200 pound man could pull over 8000 pounds!

A caterpillar has about 4000 muscles, compared to the about 800 muscles a man has.

Insects are probably man’s greatest competitor for survival on Earth—other than humans.
The giant fossil dragonfly, *Meganeura monyi*, had a wingspread of about 36 inches—larger than most model airplanes.

Only male cicadas and katydids “sing”. Imagine being able to serenade your lady friend by rubbing your legs together!

Some tropical cockroaches may reach a length of over three inches.

Woodroaches and termites eat wood, but they can’t digest it. Digestion is done by great numbers of tiny one-celled organisms (protozoa and bacteria) that live in their digestive tracts.

Fortunately, roaches have not been incriminated as carriers or vectors of human diseases, except as possible mechanical vectors—that is, they might carry germs into your home on their bodies.

A female cockroach may carry around her egg case, or ootheca, until the eggs hatch.

The tiny ensign wasp parasitizes the egg cases of cockroaches.

Cockroaches were common on Earth during the Carboniferous period, millions of years ago.

Though the mantid holds its front legs in an attitude of peaceful meditation and prayer, the legs are actually powerful “traps”, armed with spines and teeth, that give a deadly grip on the mantid’s prey.

Moslems claim that mantids always “pray” properly—facing toward Mecca.

In the southern United States, mantids are sometimes called “devil’s coach horses” or “mule-killers”, and superstitious people regard them with some fear.

Large tropical mantids have been reported to capture and devour small birds.

A female mantid often eats her mate during or after courtship—and some men think they are henpecked!

The Asian “stick insect” may reach a length of over a foot.

Some “walking sticks” change their color in response to changes in light intensity, humidity, and temperature.
Some species of locusts may build up enormous populations that migrate in monstrous swarms. Scientists still don’t know all the factors involved in such outbreaks.

One swarm of locusts that flew over the Red Sea was estimated to be two thousand miles in extent.

During a single infestation thirteen hundred tons of locust eggs were collected and destroyed on the island of Cypress.

Dried locusts, or meal made from them, was almost a staple with many primitive humans.

The long, pointed extension from the posterior end of the abdomen of a female cricket isn’t a “stinger”, but is used for placing her eggs into cracks and crevices.

Sometimes the large lubber grasshopper of the southern and western United States may cross the highway (they can’t fly) in such numbers that their crushed bodies may cause the road to become so slippery as to be a possible hazard to traffic.

Some katydids can give a nasty bite when picking them up if you aren’t careful.

When the Mormon cricket threatened the crops of the early Mormon settlers in Utah, they were saved by a flock of sea gulls.

Tree crickets are very sensitive to changes in temperature. The temperature in Fahrenheit can be calculated quite accurately by counting the number of chirps in fifteen seconds and adding 39. You may multiply the temperature by four and subtract 160 to predict the number of chirps per minute.

A termite queen may live a dozen years or more. She may lay up to 30,000 eggs per day.

Soldier termites cannot eat, but must be fed by nymphs and workers.

Some species of termites are cannibalistic, eating crippled and old individuals in the colony.

Earwigs may have gotten their name from the superstition that they crawl into the ears of sleeping persons.

Unlike most insects, the female earwig watches over her eggs until they hatch, and then protects the larvae after hatching.

The female giant waterbug glues her eggs to the back of the male, and he carries the eggs until they hatch.

Aquatic insects are almost entirely limited to fresh water. The oceans have few if any aquatic insects.

The adult stage of a mayfly may last only a few hours.
There are many groundless tales about dragon flies—such as that they will sew up your nose or ears, sting horses, or doctor sick or injured snakes.

Most dragonflies are beneficial. However, some may capture honey bees, and the predaceous nymphs may cause problems by eating the newly-hatched fry in salmon hatcheries.

The bacterium (germ) that causes the dreaded disease, bubonic plague, or the "Black Death", kills the flea that transmits it.

Bird lice can only live a few days away from the host. Most of them perish with the host when it dies.

The crab louse, though a widespread and sometimes abundant parasite, is not known to transmit any human diseases.

A female louse may lay about 300 eggs at the rate of eight or twelve a day.

Louse bites may cause the victim to be unable to sleep, become irritable and subject to mental depression.

The body louse is the vector of the dreaded disease typhus fever.

Among some people it is considered to be a sign of manliness to be infested with lice.

There are many people in the world whose religion forbids the killing of lice. However, it is alright to pick the louse off and put it on someone else.

The elongated beak of a snout or elephant beetle may be longer than the insect’s body. The jaws are at the end of the beak. A human equipped like that wouldn’t need a soda straw!

There are more than a thousand kinds of fleas known.

The female of a species of flea known as the "jigger", chigoe, or sand flea may get under the victim's toenail, where she may swell up with eggs to the size of a garden pea. Sometimes a heavily infested host is almost entirely incapacitated, or may even lose his leg from gangrene or tetanus. This species of flea is also thought to be responsible for the expression "Well, I'll be jiggered!"

The dog flea is the intermediate host for the common cat or dog tapeworm. The host becomes infected when it nips at a flea.

Flea-borne bubonic plague ("Black Death") killed so many people in the Dark Ages that death carts traveled up and down the streets of London, with the driver crying, "Bring out your dead!"
The front leg of a praying ("praying") mantid is specialized into a powerful and efficient weapon for capturing its food items, such as flies.

Though most species of fleas are on mammals, there is one species that is parasitic on snakes.

Stinkbugs produce a nauseating secretion from glands on their backs. In spite of this, some species are eaten by humans in Mexico, India, and Africa.

The bug known as the masked hunter is beneficial because it feeds on bedbugs. However, it may also occasionally inflict a painful bite on a human.

The bite of the cone-nosed bug, Triatoma sanguisuga, has a bite so toxic to some people that it may be as dangerous to them as a poisonous snake bite. This species has been collected in Kansas.

A bedbug may go for as much as a year between meals.

Though bedbugs suck blood from humans, they have not been proven to be a vector of disease to humans.

The *periodic cicada* (often mistakenly called the 17-year locust) takes seventeen years to complete its life cycle.

Aborigens in Australia collect and eat the sweet honeydew from the sugar lerp insect, a species of plant louse.

The *Australian lady beetle* ("ladybug") was brought to the United States to help control the cottony-cushion scale insect, which killed hundreds of thousands of citrus trees after gaining entrance into California in 1868.

The females of one species of scale insect cover themselves with a layer of resin that hardens upon contact with the air. Since as early as 1590 this has been collected for use in making varnishes. It is estimated that it takes about 150,000 lac insects to make a pound of lac---and some 90 million pounds of lac stick may be collected yearly!

A gall-like coccid insect in Palestine secretes great quantities of a sweet honeydew which solidifies on the leaves and the ground below. This is believed to have been the "manna" the Children of Israel ate during their 40 years in the wilderness.
The red dye, cochineal, is made from a species of scale insect that lives on the prickly-pear cactus. It was once used to give the red to lipstick, medicine, and beverages, but today has been largely replaced by synthetic dyes.

The tough, waxy film that is secreted by the pit scale insect was once used as “chewing gum” by early-day Indians in California.

A female of the destructive San Jose' scale, which has killed hundreds of acres of apple trees, could have as many as 30,000,000 progeny in a single year.

Ants may use aphids as “cows”, defending them from enemies, building shelters around them, and may even take them into their nests in bad weather. In return the aphids furnish the ants with honeydew.

The hellgramite, eagerly sought by fisherman as bait, it the immature stage of the dobson fly.

The beautiful little golden-eyed lacewing produces a strong, unpleasant garlic-like odor that most would-be predators seem to find offensive.

The larva of the ant lion, or “doodle bug”, digs a large, conical pit, in which it lies in wait for passing ants that might fall in.

Caddis fly larvae build intricate homes of little pebbles or sticks.

There may be over 250,000 different species of beetles.

The hercules or Goliath beetle is the most massive of all insects.

The beautiful, iridescent green ground beetle, Calosoma sycophanta, was introduced into this country to help fight the gypsy moth.

The orange and blue-gray bombardier beetle “explodes” a smokelike gas when disturbed. There may be as many as four or five distinct “pops” of the irritating, iodine-like gas.

Some specialized beetles live only in ant nests. Ants get a sweet secretion from the beetles, and the beetles in turn feed on ant eggs and larvae.

Do not put one of the large tiger beetles in your aquarium, as they will probably kill and eat any fish present.

The common whirligig beetle secretes a fluid that smells like fresh apples.

Two carrion beetles can completely bury the body of a mouse in a few minutes in soft ground.

There is a very small beetle, Platypus castoris, that lives only in the fur of the beaver.

Man has never been able to devise a means of producing a cold light as efficient as that produced by fireflies and glowworms.
Blister beetles contain a powerful chemical, cantharidin, that will produce large, watery blisters and intense burning when it comes in contact with the skin.

Powder-post beetles may sometimes weaken a house so much that it collapses.

Death-watch beetles, which live inside wood, may make clicking sounds that are audible to human ears by striking their heads or jaws against the walls of the burrow. This gave rise to their common name, for superstitious people once thought that a person’s days are numbered and the moments are being counted off by the ticks that may be heard coming from the wood.

Much of the expense of running a museum is due to dermistid beetles, who are a constant danger because they do irreparable damage to valuable museum specimen unless kept under careful control.

During the building of the Panama Canal a doctor performed an emergency operation by the light given off by the large luminous click beetle, Pyrophorus notiluca, when all other sources of light failed.

The shiny, brightly-colored wing covers of metallic wood-borer beetles were collected by the thousands and used by the ancient Incas in making ceremonial dress. Some natives still do so today.

There are over four thousand species of ladybird beetles that are highly beneficial to man in both the larval and adult stages by feeding on harmful insects.

Some long-horned beetles may be six inches in length, not including the antennae.

The huge larvae of one of the long-horned beetles are greatly prized for food by the Maoris of New Zealand.

The infamous Colorado potato beetle was first discovered in the upper Missouri River region about 1823 during Long’s expedition to the Rocky Mountains.

During World War II German propagandists accused the United States Air Force of deliberately liberating large numbers of live potato beetles over Germany, even though they had been eating away on German potato crops for over 60 years.

In olden days at sea, finicky sailors would tap the ship’s biscuits hard against the table to drive out the weevils before they ate them—the biscuits, that is.

The cotton boll weevil first appeared in 1892 in southern Texas, having come in from Mexico.

In spite of modern insecticides, it is estimated that the cotton boll weevil may cause an annual loss of three to five million bales of cotton a year.
Since its introduction into the United States it has probably caused a total loss of four to five billion dollars.

The sacred scarab was regarded by the ancient Egyptians as possessing divine attributes.

Fabre recorded that a dozen little dung beetles, each less than an inch long, buried 60 cubic inches of manure apiece in a single night!

June beetles are the intermediate host of the parasitic spiny-headed worm, *Macroacanthorhynchus hirudinaceus*. Pigs, the usual final host, gets infected with the worm when they eat June beetles or grub worms.

Two hundred seventy-eight Japanese beetles were once counted on a single apple.

Some beetles that live among flowers resemble bumblebees, and even buzz loudly when flying.

Native children sometimes catch the Giant African Goliath beetle, and let them fly around on the end of a string. Their great black, leathery wings are much larger than those of many sparrows.

Monarch butterflies have been shown in tests to be able to detect solutions containing no more than 1/120,000 part of sugar per 1000 parts of water—-a sensitivity of taste over 2400 times as great as that of a human's tongue.

A termite king is dwarfed by the size of his massive queen.

The hercules moth of Australia has a wing spread of nearly a foot and a wing area of almost a hundred square inches.

A few caterpillars are equipped with spines and poison-secreting glands which can cause severe rashes if brought into contact with human skin.

The silkworm moth is the only insect we can call truly domesticated to such an extent that it cannot any longer maintain itself without man's help.

The yucca moth gathers a ball of pollen from the anther of the yucca flower. She then carries the ball of pollen to another flower and pushes it down on the stigma, so that cross-pollination occurs. The moth then lays one or two eggs in the ovary of the flower. When the larvae hatch, they eat some of the seeds, which would not have developed except for having been fertilized by the moth. There are always some uneaten seeds left over to start new yucca plants. Thus the moth and the yucca plant are mutually dependent upon each other.
Dry cleaning and modern synthetic materials have made life a lot tougher for the clothes moth than it was years ago.

There are some species of bagworms so specialized (degenerate?) that the female moths have not only lost their wings, but their legs as well.

Females of the Emperor moth give off a sex attractant so powerful that it may cause males to come from as far as five miles away. Think of what a lonely woman would give for a small bottle of such a chemical that worked on men!

A large hawkmoth resembles a hummingbird when it hovers above a flower to secure nectar by means of its long proboscis. Some people call them hummingbird moths.

There is a widespread superstition that the length and thickness of the "hairs" on a "wooly bear" caterpillar (the larva of a moth) tells how severe the coming winter will be. However, records show that, as weather prophets, they are more often wrong than right.

The butterfly called the "painted lady" is the most migratory of all insects. Large numbers regularly cross the Mediterranean Sea from Africa to Europe each spring, and large flocks have many times been seen hundreds of miles out at sea. The American species of painted lady, however, does little if any migrating.

Milkweed butterflies appear to be distasteful, or even poisonous, at all stages of development.

The giant "Texas-sized mosquitos" (up to three inch wing spread) that may stray into your house in the summer are not mosquitoes at all, but craneflies. They don't bite humans, but the larvae, or "leather jackets", may do considerable damage by destroying roots and turf.

Punkies are blood-thirsty little flies so small they can hardly be seen with the naked eye, but their bite leaves an intensely itching welt larger than that produced by the bite of a mosquito or deer fly a hundred times their size. In the north woods of America they may be called "no-see-ums" by the Indians.

An African species of mosquito, *Anopheles gambiae*, which was accidentally introduced into northern Brazil in the 1930's, spread malaria that killed more than 60,000 people before it was brought under control and finally exterminated with the aid of the Rockefeller Foundation.

The serious wheat parasite, the Hessian fly, which causes losses of many millions of dollars annually and is very difficult to control, got its name because it is believed to have been imported from Europe in straw used for horse fodder by the Hessian soldiers brought over at the time of the Revolution.
The larvae of one species of hump-backed fly live within the head of an ant, where they eat away until the head of the host falls off.

There are reports that state that some species of bot flies can fly at speeds up to 800 miles per hour. The claim is no doubt highly exaggerated.

The expression "blind staggers" was probably first applied to the serious fits of vertigo (dizziness) experienced by sheep when larvae of the sheep nostril fly invaded the sheep's sinus cavities and took up residence there.

The human warble fly has a strange and round-about way of infecting its human host. The female fly will seize a female mosquito belonging to the genus *Psorophora*, where, holding her unharmed she cements a number of eggs onto the mosquito's lower surface, after which the mosquito is released. The fly eggs do not hatch until the mosquito lights on a human to feed. Then the larvae burst out of the egg shells and attach to the new host's skin, later boring in or entering the hole made by the mosquito as she fed. The fly larvae then develop into large bots or "warbles" under the skin of the victim.

Army ants are savage predators, and nearly every form of small animal life in the path of a hunting column is instantly attacked and killed and torn to pieces if it cannot make good its escape--- and this includes man and his penned or cooped livestock. Whole villages may take to mass flight when the cry of an approaching column of African driver ants it heard.

The peculiar-looking South American "lantern fly" is not a fly, and it does not give off light.

The New World Ecitons, not as dangerous as the African driver ants, are often welcomed by natives whose villages they invade, for they clean out the hordes of cockroaches, bedbugs, and other pests that have been accumulating since the last raid. They also work cheaper than Schendel's.

On the basis of fossil evidence, entomologists think that insects appeared on Earth some 350 to 400 million years ago. In the light of what humans have done to our environment in a few thousand years, what do you think our chances are of surviving on Earth as long?
AN INVITATION ---

Children are great, as any dedicated Elementary Teacher will tell you. However, like too many helpings of fresh strawberry ice cream or home-made apple pie, they can, by the end of the year, be almost "too much of a good thing".

To help get you away from the animated little bodies and the crowded classroom, the Division of Biology will offer a field course this summer entitled "Workshop in Environmental Ecology" (EB 736), to be held primarily at one of the Federal Reservoirs near Emporia.

You will not only have the opportunity to learn to recognize many of the common plants and animals of our area, but also the ecological relationships that exist between these plants and animals and man. Both terrestrial and aquatic aspects will be emphasized in the course.

The course starts June 4 and runs for a three-week period. It will carry three hours credit. Two staff members will serve as instructors for the course. For information, write:

Division of Biology
Emporia State University
Emporia, Kansas 66801

Other Summer School offerings:
Aquatic Biology, GB 510, and Aquatic Biology Lab, GB 511
Plants Useful to Man, BO 459
Microbiology of Foods, MC 459 and MC 859
American Birds, ZO 459 and ZO 859