ALABAMA PRISON ARTS + EDUCATION PROJECT

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Dear Student, Artist, Thinker,

If you ask a child what they think of insects, you'll probably either get a "Eww, Gross!" or a "Coooooool!" We're in the second camp, but we can appreciate the instinct to avoid these creepy-crawlies. Some insects sting, or bite, or swarm, or burrow, or buzz, and that can be annoying if you're just looking for some peace and quiet.

Still, if you're not busy telling insects to bug off, they can be just plain fascinating to learn about. A vast amount of plant life depends on bees to pollinate their flowers, and the world's food supply would be in big trouble if they stopped going into work (so we can forgive a sting or two). Silkworms allow humans to produce silk, and many cultures around the world dine on roasted insects as a healthy snack. Maggots love to feast on dead flesh, but leave living tissue alone, so some doctors will even use them to clean and disinfect the wounds of patients with conditions like gangrene (okay, that last one is pretty gross, but it works).

Other insects help us out in more indirect ways, often by assisting in the decomposition of leftover food and other garbage humans don't want anymore. Toss an old sandwich on an anthill, and the ants will happily gobble it up in a matter of hours. Even the bugs who don't always have a clear purpose/benefit (we're looking at you, mosquitos) usually occupy a necessary place in the global food chain.

Poets and writers throughout history have written on the symbolism of a caterpillar's radical transformation into a butterfly. It's a lovely thought to know that a creature who is just inching along the ground today may travel hundreds of miles once it grows wings. Maybe we can think about the radical transformation of a butterfly in relationship to our own lives and honor what we can become. And maybe, just maybe, you think twice before squishing the next insect you see.

Kyes Stevens and the APAEP Team

"An insect is more complex than a star ... and is a far greater challenge to understand."

MARTIN REES // British cosmologist and astrophysicist

WORDS INSIDE

FROM "COCKROACHES ARE"...

metamorphosis | the process of transformation from an immature form to an adult form in two or more distinct stages; a change of the form or nature of a thing or person into a completely different one, by natural or supernatural means

scourge | a whip used as an instrument of punishment; a person or thing that causes great trouble or suffering

xenophobia | intense or irrational dislike or fear of people from other countries

FROM "WITHOUT BUGS"...

catastrophic | involving or causing sudden great damage or suffering; involving a sudden and large-scale alteration in the state of something; extremely unfortunate or unsuccessful

smorgasbord | a buffet offering a variety of hot and cold meats, salads, hors d'oeuvres, etc.; a wide range of something; a variety

algorithm | a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer

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HISTORY

Insects Flew Before Anything Else Did. So How Did They Get Their Wings?

BY ASHER ELBEIN | *The New York Times* | March 26, 2018

Beetles don't have more than two sets of wings — unless they're in Yoshinori Tomoyasu's lab. Recently, biologists Dr. Tomoyasu and Dr. David Linz genetically engineered beetle larvae with wings on their abdomens, in attempts to unpack one of evolution's greatest mysteries: how insects gained the ability to fly.

Insects took to the empty skies sometime around 350 million years ago, long before birds, bats or pterosaurs. Wings allowed them to conquer new habitats and ecological niches, and Insecta quickly established themselves as one of the most diverse and successful animal classes, a position they still hold today.

The vast majority of living insects either have wings or evolved from flying ancestors, said Dr. Linz.

"When the average person thinks about an insect wing, they think about a dragonfly — these two pairs of really pretty, long wings. But it's different in different lineages," he said. "When you see a dung beetle flying around, it's like a bomber coming at you. Which is terrifying, or beautiful, depending on [your perspective]."

There's a frustrating lack of fossil evidence from the period when insect flight evolved, said Dr. Tomoyasu. "There's as much variety in origin ideas for insect wings as in insect wings themselves," he said. "With the flight wing in vertebrates, there's a clear origin." But insect wings evolved so long ago, he added, "it's hard to tell what happened."

That hasn't stopped researchers from trying to figure it out. According to Floyd Shockley, an entomologist at the Smithsonian, there have long been two competing hypotheses.

The "tergal hypothesis" suggests that wings originated on the tergum — the top of the insect body wall — perhaps as gliding membranes. The "pleural hypothesis" argues that wings were created from ancient leg segments that merged with the body before ending up on the back.

The rise of evolutionary developmental biology, along with advances in genetics, has lent weight to a third possibility, Dr. Linz said.

Originally proposed in 1974, the "dual origin" hypothesis suggests that insect wings actually began with a fusion of the two separate tissues: the dorsal body wall provided the membrane, while its articulation arose from leg segments.

This sort of evolutionary fusion sounds bizarre, Dr. Linz said, but there is some precedent. The ancient ancestors of insects probably had relatively symmetrical body segments, each with a pair of legs. These segments have become modified over the millenniums in wildly different ways. In some insects, legs have been lost in the abdomen; in others they have moved to the head, becoming antennas.

Dr. Tomoyasu and Dr. Linz worked with flour beetles, a common subject because of its fully sequenced genome.

In an initial study, the team used master switches in the beetles' genome to manipulate which segments of the body had wings. To their surprise, doing so disrupted portions of anatomy that had seemed unconnected to flight.

This offered some support for the idea that wings were composite tissues. But how might the ancestral wing structures have formed?

The researchers turned their attention to the pupae, which have defensive sets of miniature pinschers along their abdomens. These so-called gin-traps sit near the top of the insect, which make them likely models for early wing structures.

To add support for the dual origin hypothesis, Dr. Linz said, evolution would have had to fuse a structure on the dorsal region of the segment and one from the pleural tissue.

The team introduced a fluorescent green protein into the beetles that marked the expression of certain wing-related genes, making it easy to tell which tissues were affected by genetic tampering. After manipulating genes of the abdomen, they were delighted to see two green tissues: one at the dorsal gin-trap, and one down in the pleural tissue.

By doing so, they were able to produce pupae in which both tissues fused to form pairs of tiny wings.

The debate about how insect wings evolved is far from over, Dr. Tomoyasu said. "We're still relying on one species," he said. "Although we see that there are two tissues that are contributing to make wings, that could be unique to this lineage."

"It's crucial for us to study more insects," he added. "In my lab, we're now studying cockroaches to see if the process repeats the same way."

In the meantime, he holds out a bit of hope that the fossil record someday might help solve the mystery. ●

Edited for space.

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SO OFTEN I AM
NOT AROUND/
YOU'LL KNOW
IT BY THE
ABSENT SOUND/
AND THOUGH
YOU MAY SEARCH
CAREFULLY/
THERE MAY JUST
BE A SHELL OF ME
WHAT AM I?

Riddles source: *Athens Science Observer*

BIOGRAPHY

Cockroaches Are His Friends

BY ANDY NEWMAN | *The New York Times* | Dec. 29, 2016

Aaron Rodriques has his priorities in order.

When he got off the train at Pennsylvania Station to come home for winter break, coat pockets stuffed with beetles and giant cockroaches, he did not go see his girlfriend on the Upper East Side or his parents in the Bronx. He headed straight for the nearest Petland.

He picked up 10 crickets, 10 waxworms, 13 tobacco hornworms and 15 darkling beetle larvae.

The next day, Mr. Rodriques, 26, sat in his childhood bedroom, surrounded by glass tanks, and reflected on his metamorphosis from isolated bug nerd to minicelebrity and ambassador for the creepy and crawly, performing regular show-and-tells at art spaces and schools.

"Every major event in my life," he said, "has been around insects."

A wide horn hissing cockroach crawled across the front of his shirt. The wide horn is three and a half inches long and appears to be wearing an oversized black frog mask. The bulging "eyes" are his horns. Mr. Rodriques said he used them "sort of like a ram would use its horns" to fight other males over territory.

Mr. Rodriques took out a few tobacco hornworms — ridiculous creatures, turquoise and green with false eyes along their bodies and false horns on their rear ends.

Mr. Rodriques wrote his master's thesis at New York University about hornworms. "They have an amazing defense where they collect the nicotine found in the tobacco they eat and exhale it as a gas to scare away predators." But they are also his friends.

A gentle, quiet man, Mr. Rodriques marks his life by the bugs he has loved. When he was 4, he would scoop up pavement ants in front of his house and keep them in jars. "They looked like a weird combination of robots and aliens," he said.

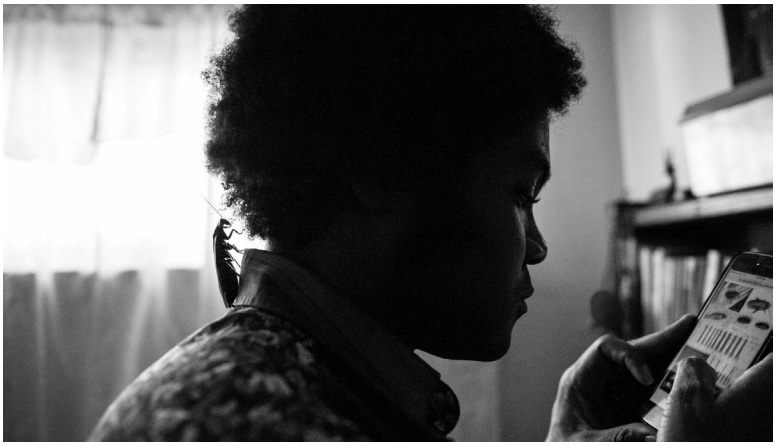
When he was 6, his family moved to their current home, on a cul-de-sac near the end of the 5 train. Its modest backyard contained a wealth of beetles. In third grade, he brought in a cockchafer beetle grub for show-and-tell, hoping to impress his classmates. "They were just completely apathetic," he recalled.

When he was 7, Mr. Rodriques's house got infested with German cockroaches, the common household scourge. "I tried to make them pets," he said.

His parents — a nurse and a security guard who came to New York from Jamaica — encouraged his passion, except for the cockroach episode.

Adolescence brought a deeper interest in larvae. "For me, one of the highlights of high school was staring at mealworms," he said.

In 2015, he was asked via Facebook to do a space called the Tarot Society. One thing led to another: more shows, and a social life. He met his first girlfriend when she took a liking to Maximillion, his giant African millipede, as long as a man's forearm. He met his second girlfriend when she was looking for someone to wrangle green bottle flies for a music video. *The Daily Mail* filmed him helping a woman conquer her fear of spiders.



Aaron Rodriques with a pet death's-head cockroach, at home in the Bronx.

Photo by Elias Williams

There have been mishaps along the way. At a performance and hands-on session in Brooklyn, an audience member dropped Maximillion. A couple of days later, he began leaking dark fluid and died. Mr. Rodriques said he cried, just as he had when he lost his twig mantis, his pink toe tarantula and Mr. Crabs the blue land crab.

Bugs, it turns out, have a lot to teach us about empathy and difference. And Mr. Rodriques believes they can help fight xenophobia. "When you change your thought process from seeing something and being afraid of it, to seeing it and not knowing what it is and then learning more about it, that spills over into other avenues," he said.

Mr. Rodriques is pursing his doctoral research at Purdue University on the seductive tergal secretions of German cockroaches. ("The male secretes it, she eats it, and while she eats it, he'll mate with her.")

Eventually, he hopes to conduct research on the lesser marsh grasshopper, which lives near Chernobyl and seems to thrive on radiation. Learning why, he said, could lead to medicines to ease the side effects of chemotherapy.

He has other goals, too.

"I would also like to make giant insects," he said. Bigger creatures would make better study specimens for students. He thought for a second. "Maybe like a 24-inch tarantula." ●

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YOU SEE ME
BLINK BUT NOT
MY EYES/
I WINK AND WINK
TO FRATERNIZE/
AND IF I WINK AT
HER JUST RIGHT/
THEN I MAY FIND
MY LOVE TONIGHT
WHAT AM I?

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MATHEMATICS

Sudoku

#33 PUZZLE NO. 8271199

		4	8			7		
		9						
2			9	3				
	2							5
		5			9	3	2	
9	4				5			
				5			3	
	8	6	4				1	
				7	1	6	9	

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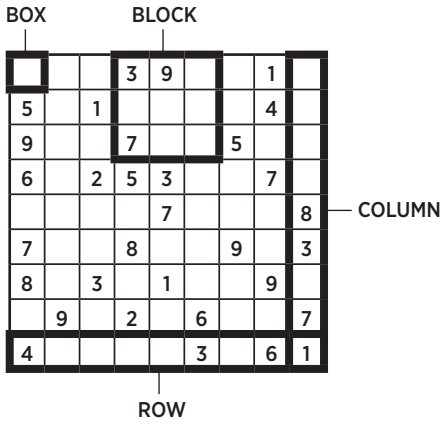
#34 PUZZLE NO. 2959495

		9	8			1		
			2					9
			4	1			2	5
		3			1		6	4
8						9		
				7				1
5	6		1			2		
					3			7
	1			9	2			

©Sudoku.cool

SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1–9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.



What the example will look like solved

2	4	8	3	9	5	7	1	6
5	7	1	6	2	8	3	4	9
9	3	6	7	4	1	5	8	2
6	8	2	5	3	9	1	7	4
3	5	9	1	7	4	6	2	8
7	1	4	8	6	2	9	5	3
8	6	3	4	1	7	2	9	5
1	9	5	2	8	6	4	3	7
4	2	7	9	5	3	8	6	1

"God in His wisdom made the fly
And then forgot to tell us why."

OGDEN NASH // American poet

Icons from the Noun Project

DID YOU KNOW?

Beetles are the most biodiverse group of creatures, making up **40% of the insect species**.

When fruit flies are infected with a parasite, they **self-medicate** with booze — they seek out food with higher alcohol content.

A dung beetle can pull **1,141 times** its own body weight.

The Hybomitra hinei weighti house fly can fly up to **90 mph**.

Termite queens can produce **6,000-7,000 eggs** in a single day.

A flea can jump 350 times its body length, the equivalent of a human jumping the **length of a football field**.

Idiom

"A fly in the ointment"

Meaning a small but irritating flaw that spoils the whole. In the 20th century the expression has also come to be used to describe a small flaw that comes to light to spoil an otherwise faultless plan.

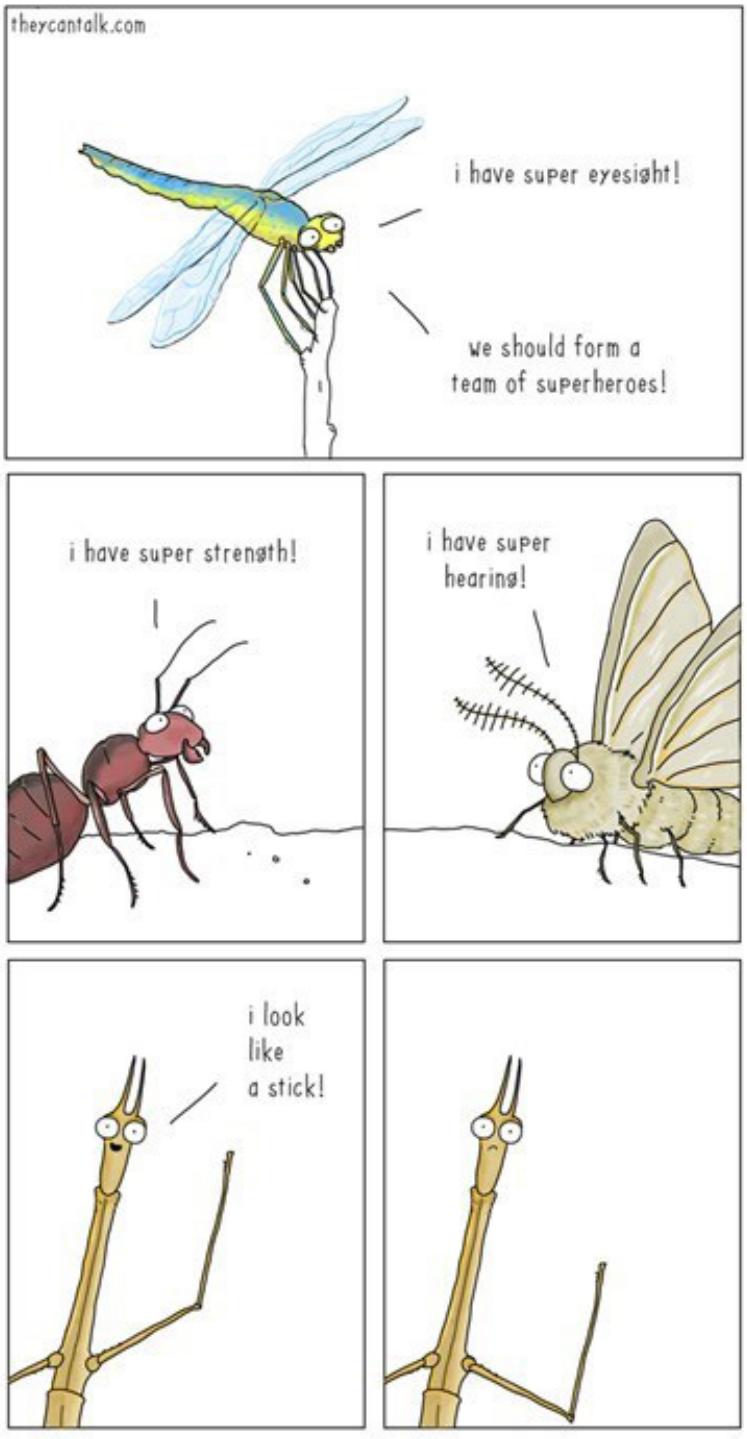
Origin These days ointments are chiefly for medicinal use - just the thing for rubbing on that nasty rash. In earlier times, ointments were more likely to be creams or oils with a cosmetic or ceremonial use. Literally, ointment was the substance one was anointed with. There is considerable anointing in Bible stories and it isn't surprising therefore that this phrase has a biblical origin. Ecclesiastes 10:1 (King James Version) has:

"Dead flies cause the ointment of the apothecary to send forth a stinking savour: so doth a little folly him that is in reputation for wisdom and honour."

Our contemporary phrase 'the fly in the ointment' didn't appear until later. The earliest example I have found in print of that precise wording is in John Norris' *A Practical Treatise Concerning Humility, 1707*: "'Tis that dead fly in the ointment of the Apothecary."

Source: Phrases.org

IT WOULD TAKE **1,200,000 MOSQUITOES**, EACH SUCKING AT ONCE, TO COMPLETELY DRAIN THE AVERAGE HUMAN OF BLOOD.



TODAY'S HEFTIEST INSECT IS FOUND IN NEW ZEALAND. KNOWN AS THE **GIANT WETA**, IT IS A CRICKET-LIKE BEAST THAT CAN WEIGH MORE THAN 1 POUND.

Source: *Factinate.com*

ART + CULTURE

Swell

BY HOA NGUYEN

Swell you can dream more the earth
swells seeds pop
I glance at the prize
eyes closed in the glancing

It's not a time to run
I wear soft shoes
and it took a long time
to walk here

Insects nudge me in my dreams
like the 5 honey bees plus
the strange one
Intelligent bee glances buzzing

to say Let me out The fake
lights confuse us
confuses the source

Worker bee buzzed my neck
directly me not turning off
lamps fast enough

Please
just open the door
to the sun

WRITING PROMPT

While different types of insects may either intrigue or annoy us humans, we aren't really more than background scenery to them. Bees, flies, ants, beetles, dragonflies, mosquitoes, and more live their own distinct lives with little to no awareness of the rest of us. Write a poem that investigates the life of one of these small creatures--what are its desires, its obstacles? What lessons might we learn from it?

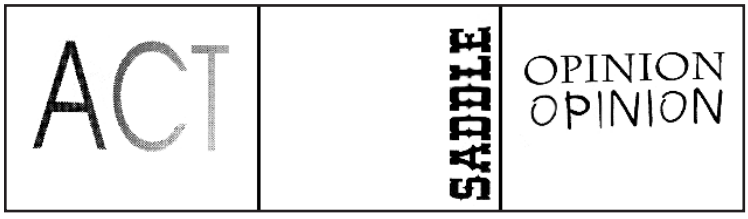
Source: Poets.org

Hoa Nguyen was born January 26, 1967, in the Mekong Delta near Saigon, Vietnam. When she was eighteen months old, she moved to the United States and was raised in the Washington, D.C., area. Nguyen earned her MFA at the New College of California in San Francisco, where she studied with Tom Clark and Lyn Hejinian, and remained active in the Bay Area poetry scene for years before moving in 1997 to Austin, Texas, where she lived for fourteen years. Nguyen is the author of five poetry collections. She currently teaches poetics at Ryerson University and lives in Toronto.

Word Search

A	E	R	T	S	T	R	A	N	G	E	E	A	E
L	C	D	S	N	O	T	G	Z	C	C	B	E	S
D	R	O	G	Z	E	H	S	S	H	N	E	N	U
E	O	O	U	S	E	G	N	A	R	A	E	U	F
Z	A	R	M	H	H	E	I	E	F	L	S	S	N
Z	I	S	A	O	O	E	G	L	Z	G	P	L	O
U	O	D	R	E	N	K	C	D	L	I	I	U	C
B	O	E	T	S	E	N	H	O	U	E	R	N	H
R	P	E	E	I	Y	I	C	M	F	N	T	P	G
O	E	S	R	M	M	S	O	U	R	C	E	N	T
S	O	K	C	E	E	E	S	P	M	A	L	U	I
E	E	P	R	F	M	P	D	R	E	A	M	A	C
G	P	O	O	O	S	P	S	U	L	C	E	L	D
L	O	E	H	P	W	O	K	E	Y	G	D	G	G

PRIZE
INTELLIGENT
TIME
FAST
GLANCE
WORKER
HONEY
BEE
SUN
STRANGE
SHOES
NUDGE
LAMPS
DOOR
CONFUSE
DREAM
BUZZED
SEEDS
POP
SOURCE



WORD PLAY

A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*

NATURE

Praying Mantis that Catches Fish is a Guppy's Worst Nightmare

BY MINDY WEISBERGER | *Live Science* | September 20, 2018

With their folded, spiky arms and large-eyed, triangular faces, praying mantises are instantly recognizable, and are well-known for their predatory prowess. Praying mantises can turn their heads 180 degrees to scan surroundings. They also have five eyes – two large with three smaller located in between. Adult females are known to eat their partners after mating. But while mantises typically prey on other insects, one opportunistic individual in India has developed a taste for fish.

For the first time, scientists observed a praying mantis hunting guppies, a type of tropical freshwater fish. The long-armed predator snatched up and snacked on the tiny fish in an artificial pond in southwestern India, demonstrating a behavior that was previously unknown in these insects.

The hunter, a male a giant Asian mantis, measured about 2 inches in length, and it captured guppies measuring 0.8 to 1.2 inches long, according to a new study.

Over five nights in March 2017, the mantis visited the artificial pond in a roof garden planter. It perched on water lilies and water cabbage plants on the pond's surface and "fished" for its dinner, capturing and devouring up to two fish per night, feasting on a total of nine guppies, the study reported.

The scientists' unique observations describe the behavior of only one insect. Nevertheless, some interesting conclusions can be applied more broadly to help with the general understanding of how mantids hunt, lead study author Roberto Battiston told *Live Science*.

"Many mantids are known to be sit-and-wait predators, and there is evidence at least some species carefully choose their habitat and hunting field," Dr. Battiston said.

For example, there was no shortage of food in the garden; there were plenty of flies and other insects that the mantis could have eaten. Yet the hunter returned to the pond every night for five consecutive days, choosing to fill its belly with fish rather than flies.

"This behavior sounds very much like a precise hunting strategy — not random choices," Battiston said.

When mantids are on the prowl for food, their eyes are drawn to movement, rather than to shapes or colors. In the case of the fishing mantis, the insect was probably attracted to a sudden movement of the guppy's large, flag-like tail under the water's surface. And when the mantis lunged with its powerful forelimbs, it caught the fish.

But catching a squirming meal in water is very different from plucking it out of the air. That the mantis was able to do this over and over again suggests an unexpected adaptability in mantis vision and hunting abilities, Battiston explained.

Mantises are voracious hunters that eat anything they can catch (including other mantids), and the larger the mantis, the bigger the prey it can nab. Birds are a frequent menu item for big mantids; last year, researchers described examples of mantises hunting small birds in 13 countries, targeting hummingbirds and small passerines (the group that includes finches, sparrows and canaries).

Dead in the water? Not quite — this male praying mantis (Hierodula tenuidentata) started eating its partly-submerged prey while the unlucky fish was still alive.

Source: Rajesh Puttaswamaiah

Encounters between mantids and large prey — such as tarantulas, snakes, mice and lizards — are documented in videos on the internet, Battiston said. But the overwhelming majority are staged matches in which the mantis is introduced to its meal under artificial conditions that wouldn't occur naturally.

"Mantids are well known to be excellent predators, so it is easy to put them in a cage and make them fight or feed on any sort of strange animals," he said.

On the other hand, a mantis in the wild is usually more cautious about approaching bigger prey. But when mantises are hungry, "nothing can stop them," Battiston said.

"Once I observed a large female grabbing a bee with one leg," he said. "While the insect was fighting like hell, trying to sting and kill the mantis, she caught another bee with her other leg. She finished this spicy double meal in half an hour, with calm elegance!"

Other studies have shown that mantids can learn from harmful experiences — a technique called aversive learning. However, these new findings suggest that mantids can also formulate new methods for accomplishing a task — catching prey — suggesting that they may also be capable of more complex cognitive goals. ●

Edited for clarity.

SCIENCE

Without Bugs, We Might All Be Dead

BY SIMON WORRALL | *National Geographic* | August 6, 2017

There are 1.4 billion insects for each one of us. Though you often need a microscope to see them, insects are "the lever pullers of the world," says David MacNeal, author of *Bugged*. They do everything from feeding us to cleaning up waste to generating income. Today, many species are faced with extinction. When *National Geographic* caught up with MacNeal in Los Angeles, he explained why this would be catastrophic for life on Earth.

I think, like me, most people regard bugs as annoying little critters that sting us or spoil our picnics. Why are you so enchanted by them? *David MacNeal:* Individually, insects are not incredibly interesting, unless you get down on the ground or view them under a microscope to look at their complexity. But they are the invisible force working throughout the world to keep it running.

Almonds in California or watermelons in Florida wouldn't be available if it were not for bees. Insects also return nutrients to the earth. If they weren't around, the amount of decay and rot all over the place would be terrible.

We don't notice these services because insects are so small and we often see them as this nuisance.

You suggest bugs actually do billions of dollars of work. Unpack that for us. *DM:* Mace Vaughan and John Losey, two entomologists, did in-depth research on how much insects contribute economically to the U.S. What they found was, it's about $57 billion, not including pollination. Most of this comes from wildlife, which insects keep going along because they are the base of the food chain for fish, birds, or mammals. Pest controlling insects add a further half billion. There is no way to account for how much it costs to recycle a dead body or decompose plant life.

You say that 2,086 species of insect are eaten by 3,071 different ethnic groups in about 130 countries. Give us some highlights from that global menu. *DM:* If you go to Mexico, they are selling chapulines—grasshoppers—in brown paper bags filled with spices. In Borneo, they eat rice bugs blended with chilies and salts, cooked in hollow bamboo stems. Caterpillars are very popular in Africa and are a great source of zinc, calcium, iron, and potassium. On Sardinia and Corsica, they eat "crying cheese"— Casu Marzu—that literally has maggots inside it.

In Japan, we went to three restaurants in Tokyo and Shinjuku. At first, they had these bamboo caterpillars that you could tell had obviously been dead for a while. They got caught in the back of my throat. I needed a swig of beer to get them down.

The next place we went to had a smorgasbord of various insect species. One was this locust that ate rice leaves. It was cooked with soy, with a nice glaze, and because it ate rice leaves, when you ate the insect, you got this crunch, followed by this bright herbal taste that was unique. I've never experienced an ingredient like that.

Wasp larvae tasted like the white raisins you get in couscous. They were sweet, had a little pop as you ate them. When chefs regard insects as an ingredient filled with potential, you end up getting fantastic things.

If humans went extinct tomorrow nothing too much would happen to the planet, but insect extinction could be cataclysmic. Why? *DM:* Bug extinction is one of the most extensive extinctions on the planet. It's scary because you don't notice it until it's too late. Migration patterns are shifting

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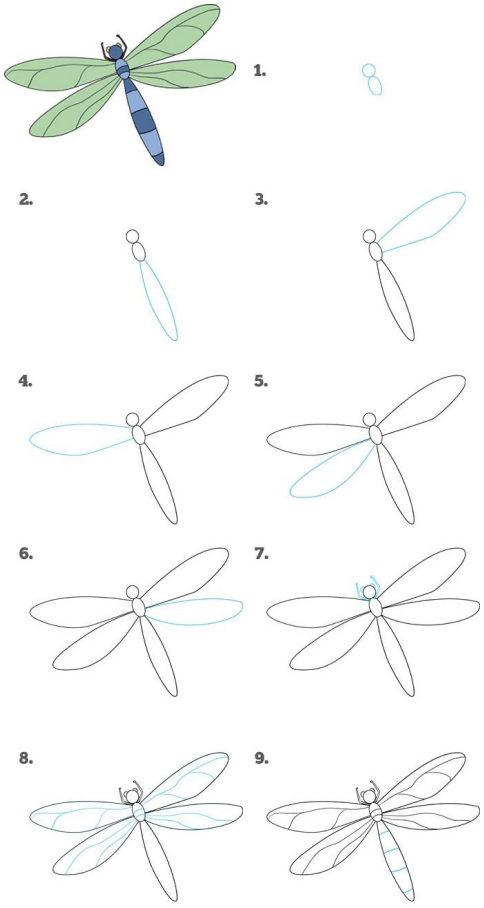
OH YES, I'M FOND OF FOULER THINGS/
I'LL NEVER BE A FOOL THAT SINGS/
I USE THE STARS TO FIND MY WAY/
YOUR REFUSE IS MY ARTIST'S CLAY
WHAT AM I?

HOW TO DRAW ...



due to climate, and insects offer a great way of looking at that. A collector went to the Antioch Dunes in California, in the 1960s, and caught a range of bugs. When scientists returned decades later, they found many species were gone, and the host plants with them. These creatures rely on plants and certain weather patterns and temperatures, an adaptive power they've gained over the past 400 million years.

Twenty years ago you could have seen one billion monarch butterflies migrate to Mexico. The latest count is 56.5 million. To combat the decline, the Obama Administration, working with Fish & Wildlife, enacted this migration highway running from Texas to Minnesota. They planted milkweed along the way, which is the host plant for monarch butterflies, hoping to quadruple that 56.5 million by 2020. I am an optimistic cynic, so I feel that insects will outlive us, if we haven't totally screwed the planet.

You end your journey on the Greek island of Ikaria. What took you there? *DM:* That's a good question! I'm just a stupid, curious individual. When I see something that interests me, I pursue it to its end. So, when I heard about this specific type of honey, to which local villagers attribute their longevity — it is common for people to live into their late 90s and 100s. This honey is called reiki, thick as peanut butter and full of vitamins and nutrition.

I went from being this jack*ss who, as a teenager, emptied a can of Raid on a spider, to discovering we are surrounded by these small, incredible things. Now I go around with my neck craned towards the ground. I have learned to stop and observe and appreciate. We're only here for a short amount of time. So it's comforting to know that there is something that will outlive us for millions of years. ●

Edited for space.

Tell us about how insects are being used in medicine. *DM:* In human clinical trials in the U.S. and Australia they are looking at "tumor paint," a venom derived from deathstalker scorpions, which attaches to tumors, like a magnet. Biologists have paired it with fluorescents so now, during brain surgery, instead of relying on an MRI chart, you can actually see the tumors fluoresce in someone's brain. Brain surgeons can see exactly where they need to cut so they are not cutting away healthy tissue. In some cases, other parts of the brain light up, where you might have missed a tumor. It's revolutionizing brain surgery.

Cockroaches are helping scientists resolve antibiotic resistance. They love sh*t! They live in some of the filthiest areas although they themselves are very clean, and so they have developed a resistance to many infections. Instead of looking at plants and fungi for new cures, scientists are finally starting to look at insects.

E.O. Wilson has called leafcutter ants, "Earth's ultimate superorganisms." Tell us about these amazing creatures — and what social organization in ants can tell us about our own societies. *DM:* We used to think that there was this class-based structure with ants. You had the worker, the soldier and, sitting above it all, the queen. However, entomologists today are finding that a lot of it is self-governance and that ants are communicating to each other at great speeds. You'll have ants passing each other along a trail, making antennal taps, like Morse code: Hey, we gotta go this way, or go here for foraging.

Deborah Gordon is doing this fantastic research into a species of ants that crawls along the leaves of the trees where they reside. She found that if a leaf suddenly broke, the ants team together and rapidly repair it, using a sort of algorithm pattern, where they're communicating at rapid speed. From that we might be able to study ways of repairing systems or mapping brains, and finding connectivity. Along with honeybees, ants are some of the most intelligent beings on the planet, along with dolphins and humans.

RANDOM-NEST

Entomophagy | The international Art of Eating insects

US NEWS TRAVEL SECTION

Thailand | Many Thais love snacking on grasshoppers, crickets and woodworms. The bugs are seasoned and fried in a wok until crispy, then served to passers-by at local food markets.

Ghana | During the springtime, when food is scarce, Ghanaians rely on termites as their main source of protein. The insects can be roasted, fried or even used to make bread.

Mexico | In Mexico, bugs are eaten in a variety of ways: fried, buttered or even dipped in chocolate. But perhaps the most renowned method is to drink them. *Mezcal*, a Mexican liquor (sometimes confused with tequila), is often served with a worm ready for swallowing.

China | In China, roasted larvae from insects like bees are a delicacy served in high-end restaurants. But on the street, you'll find fully grown insects like these water bugs roasted or fried and then skewered to make them easy to eat on the go.

Brazil | Queen ants, or *içás*, were traditionally consumed only by poorer families. Today, these bite-sized morsels are a popular snack in the town of Silveiras in southwest Brazil. Townsfolk claim that these winged bugs taste just like mint.

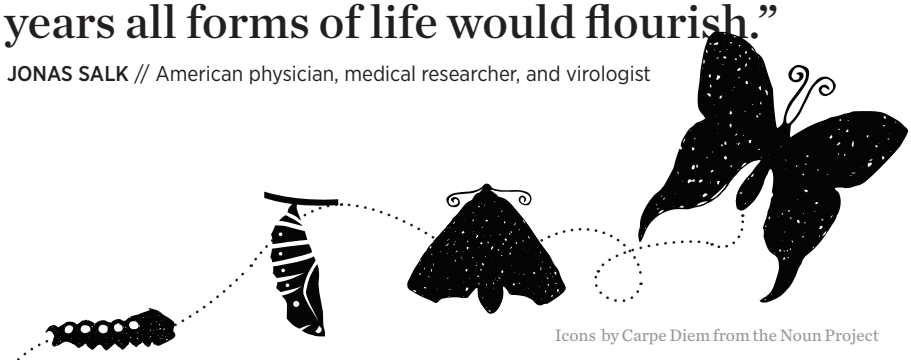
Australia | Insects like the honey-pot ant have been consumed by Australia's Aboriginal tribes for centuries. These bugs ingest food and store it in their bodies, making them an excellent source of essential nutrients for bug-eating humans.

Japan | Bugs are crawling on to menus all across Japan. Some favorites include *inago* (fried grasshopper), *sangi* (fried silk moth pupae) and *Zaza-mushi* (a type of larvae).

The Netherlands | Johan Van Dongen, head of the meat department for the Dutch food distributor, Sligro, is helping to encourage the Dutch to rely on insects like crickets as a source of protein by offering a free taste from a stand on the sidewalk in the city of 's-Hertogenbosch.

"If all the insects were to disappear from the Earth, within fifty years all life on Earth would end. If all human beings disappeared from the Earth, within fifty years all forms of life would flourish."

JONAS SALK // American physician, medical researcher, and virologist



Icons by Carpe Diem from the Noun Project

Words of Encouragement

"Education ... means emancipation. It means light and liberty. It means the uplifting of the soul of [humanity] into the glorious light of truth, the light only by which [we] can be free."

FREDERICK DOUGLASS // a famous 19th century African American writer and orator

Frederick Douglass's words have motivated others to free one's mind from the burdens of circumstance. Born in 1817, Douglass's journey began as a slave trapped in a society that reserved freedom for white people. Denied access to the education he craved; Douglass never bowed to the inferior position society had chosen for him. During the strongest of storms, he kept the flickering light of education and freedom burning deep within his soul. Despite numerous obstacles, Douglass never lost faith that what started as a dim light at the end of a long tunnel would grow as he strengthened his mind. He learned that ignorance was the sole limit of human ambition. Douglass proved that no one has the power to determine your destiny if you obtain the freedoms afforded by education. After years of struggle, Douglass became a free man who inspired millions to discover the "glorious light of truth." May he serve as an inspiration to you and those around you.

Keith

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Answers

SUDOKU #33

5	3	4	8	1	2	7	6	9
8	1	9	5	6	7	2	4	3
2	6	7	9	3	4	8	5	1
3	2	1	7	4	6	9	8	5
6	7	5	1	8	9	3	2	4
9	4	8	3	2	5	1	7	6
1	9	2	6	5	8	4	3	7
7	8	6	4	9	3	5	1	2
4	5	3	2	7	1	6	9	8

SUDOKU #34

2	7	9	8	3	5	1	4	6
1	4	5	2	6	7	3	8	9
6	3	8	4	1	9	7	2	5
7	9	3	5	2	1	8	6	4
8	5	1	3	4	6	9	7	2
4	2	6	9	7	8	5	3	1
5	6	7	1	8	4	2	9	3
9	8	2	6	5	3	4	1	7
3	1	4	7	9	2	6	5	8

Brainteasers

Page 2 Cicada
Page 3 Firefly
Page 6 Rebus Puzzle:
1. Disappearing act
2. Side saddle
3. Difference of opinion

Page 8 Dung beetle

Send ideas and comments to:

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UNTIL NEXT TIME !