Welcome, OBS friends and partners, to another issue of BioOhio, the newsletter of the Ohio Biological Survey. It is hard to believe that the summer is gone and winter is upon us. For some, this might bring about a sense of melancholy as we remember the warm days, visits with friends and family, vacations, field work, life birds (or butterflies or wildflowers or protists—wait, does anyone keep a protist life list? If not, perhaps we should), and time spent with a good book. For OBS, however, the busiest time of our year is just beginning. During the winter, there are a number of things that will be happening, and I want to remind you of some of our regular activities.

Our biggest event of the year is the Ohio Natural History Conference. In 2017, we will once again meet in Columbus on February 25. This year, we are beginning a series of events in which we will highlight different areas of the state from year to year. Look for more information about this as we get closer to the meeting. Keep in mind that this is a great place for students to present oral talks or posters, and we will have a call for abstracts soon.

Applications for Small Grants will be due in February. Please consider applying for a grant this year. This is a competitive process and we cannot fund all proposals, but this is an important part of what OBS does and we fund as many quality proposals as possible. Keep in mind that the OBS Board Members that serve on the Review Committee focus on three OBS objectives for funded proposals: (1) to secure accurate and detailed information concerning the occurrence, distribution, and ecology of the plants and animals in Ohio; (2) to publish the results of biological surveys and scientific studies on the taxonomy, distribution, and ecology of plants and animals in Ohio or in a wider geographical area of which Ohio is an integral part; and (3) to collect, identify, describe, and distribute biological materials that may be of service in education and research. Applicants should make it clear how their research helps OBS meet one or more of these objectives. You can find more information at http://www.ohiobiologicalsurvey.org/projects/.

Finally, one of our favorite things to do each year is recognize individuals that have had a lasting impact on the understanding of Ohio's natural history. We do this by providing two awards at each Natural History Conference. The Herbert Osborn Award, named in honor of the founder and first Director of OBS, recognizes noteworthy accomplishments and service in the field of biology as pertaining to the objectives of the Ohio Biological Survey. This is often considered our “academic” award and focuses on recognizing significant research accomplishments in the broad areas of natural history. The Naturalist Award honors individuals who have made significant contributions to our understanding and conservation of the natural heritage of Ohio. This award is our “education” award and is usually given to folks who have made lasting contributions to public knowledge about Ohio's natural history. I encourage you to nominate people you know who might fit the qualifications for either award. Nomination letters can be sent at any time to info@ohiobiologicalsurvey.org and more information can be found at http://www.ohiobiologicalsurvey.org/projects/.

Happy New Year!

Greg Smith
Executive Director
More Work is Needed to Protect Lake Erie Watershed

While current efforts to curtail agricultural runoff will improve the health of Lake Erie, much more work will be needed to protect the streams that feed the lake, new research shows.

A study of the western Lake Erie watershed found that increased conservation efforts will be needed on most of the farms in the watershed in order to protect arterial streams in Ohio, Michigan, and Indiana. The project, led by researchers at The Ohio State University and The Nature Conservancy, used computer modeling to get a handle on the impact of various conservation efforts in the western Lake Erie watershed. The area includes about 5.5 million acres of cropland, making it the most intensely farmed watershed feeding into the Great Lakes.

In light of harmful algal blooms, conservationists, scientists, and farmers are looking for ways to maintain robust agricultural production without causing damage to the surrounding ecosystem, said Stuart Ludsin, an associate professor of evolution, ecology, and organismal biology and co-director of Ohio State’s Aquatic Ecology Laboratory.

The bulk of that work has focused on reducing phosphorous in western Lake Erie by 40 percent. While that’s an important goal, it doesn’t address the harms from sediment and nitrogen runoff, Ludsin said. Nor does it focus on the health of streams throughout the watershed—waters that supply drinking water, provide habitat for fish, and serve as a playground for anglers, kayakers, and others, he said.

“Until our study, nobody has taken a hard look at how agricultural conservation practices aimed at protecting Lake Erie could influence the health of streams in the watershed. We’re asking what happens to water quality and fish communities if we implement conservation measures,” Ludsin said. “It’s important to not just focus on the lake, but also consider the arteries that feed it. Our streams are as degraded as the lake.”

The study shows that both the streams and the lake will benefit if appropriate conservation efforts are implemented, he said. Conservation efforts include erosion control and nutrient management, including being selective about how much fertilizer is used and when it is applied.

The report includes predictions about the effects of a variety of conservation scenarios to give stakeholders information on which to base plans going forward, he said.

“Our models tell us what sort of difference it would make to streams if we reduced the amount of nutrients and sediments in agricultural runoff and leaching by 20, 40, or 60 percent,” Ludsin said.

In embarking on this work, Ohio State and partners including The Nature Conservancy, the U.S. Department of Agriculture, Ohio Sea Grant, and Texas A&M University aimed to provide information that could optimize efforts to protect waters and the species that live within them from runoff, while maintaining the profitability of farms. They also sought to determine what kind of financial investment will be necessary to achieve meaningful environmental benefits, both under current environmental conditions and taking into account the pressure of continued climate change.

The results highlight the role various farming practices could have in improving water quality in streams and in Lake Erie. To view the full report, go to www.lakeerieceap.com.

Agricultural runoff threatens fish in the majority of the western Lake Erie watershed, Ludsin said. Analysis of state monitoring data has shown that current conservation efforts have improved fish community health, but more work is needed to control erosion and fertilizer runoff into streams, said Conor Keitzer, a former Ohio State postdoctoral fellow who is now an assistant professor at Tusculum College in Tennessee.

Through computer modeling, researchers found that stream health could improve with a modest increase in conservation efforts at farms in about 8 percent of the watershed. “But there’s going to still be a huge part of the watershed where water quality is a concern,” Keitzer said. Nearly half of the farmland in the watershed would need improved runoff controls for widespread benefit for the fish that live in the streams, the analysis found.

The research team used available observational data from the streams and fish populations to create a watershed-wide model to estimate how water quality impacts fish populations.
“We can make a big difference, but it’s going to take a lot of work and a lot of cooperation,” said Keitzer.

Erosion control and nutrient management in high- and moderate-need acres identified in the report could mean cleaner water and healthier fish communities in about half the streams in the watershed, they found. This assessment points to the need to look not only at phosphorous, but at nitrogen and sediment in streams, the researchers said. Each of the three threatens fish in those waters. Based on established thresholds for North American streams, the researchers found that a majority of streams in the watershed had phosphorous and nitrogen concentrations that could lead to algal blooms, which compromise drinking water and kill fish. Almost half of the streams had sediment concentrations that could harm fish.

“Results of our project clearly show that we can achieve significant improvements in both the streams and the lake, but it is going to take a lot of work,” said Scott Sowa, director of science at The Nature Conservancy in Michigan. “It also shows that we can’t just focus on a single problem or stressor, like phosphorous. We are dealing with a multifaceted problem that will require a variety of practices and innovative collaborative solutions,” he said.

The researchers estimated it could cost nearly $150 million annually to treat farm acres deemed “high and moderate needs” based on their predicted contribution of nutrients and sediments to surface waters. Keitzer stressed that the figure was a rough estimate, but one that illustrates that large investments are needed.

“Continued interaction among agencies and stakeholders regarding appropriate management and conservation targets in relation to monetary costs seems prudent,” the researchers wrote in the report. They also pointed out that farms aren’t the sole contributor to problems in the lake and the watershed. Municipal waste systems, rural septic systems and point sources also contribute.

“I think people forget the importance of these streams, to both fish and people. This project will help us identify win-win solutions that benefit Lake Erie and the thousands of stream miles in its watershed,” Keitzer said.

The research was supported by the U.S. Department of Agriculture’s Natural Resources Conservation Service.

— Misti Crane

Can Bird Feeders Do More Harm Than Good?

Many bird lovers put out feeders full of seed for their feathered friends, but those feeders may also attract predators that eat eggs and nestlings. The researchers behind a new study in The Condor: Ornithological Applications tried to untangle these relationships through a four-year study of songbird nests, bird feeders, and predators in urban central Ohio.

Feeders may attract more predators to an area, but the food can also satiate predators so that they’re less likely to target nests. To learn more, Jennifer Malpass of The Ohio State University and her colleagues tracked the relationships between the success of American robin and northern cardinal nests, the presence of potential nest predators like squirrels, domestic cats, and other birds, and the presence of bird feeders in the area. Relationships among feeders, predators, and nest survival were complex—areas with lots of feeders had more cowbirds and crows, birds that are known to prey on songbird nests, but that didn’t generally affect the success of the nests the researchers monitored.

“One key message of our work is that there may be species-specific responses to anthropogenic foods,” says Malpass. Robins did experience increased nest predation in one specific set of circumstances, when neighborhoods contained both high numbers of bird feeders and large concentrations of crows. Human-dominated environments, it turns out, are complicated and variable, not lending themselves to simple solutions.
Two Erie MetroParks Renamed

At the Erie MetroParks Board of Park Commissioners meeting on February 19th two parks were renamed to pay tribute to the communities in which they lie. Highlights of these paths include their closeness to the Huron River and the area’s rich history. The trails run through an area which was once a Moravian and Native American settlement and past the location of a famous trading post once owned by Jean Baptiste Flemmond.

Huron River Greenway South is now the Milan Towpath MetroPark.

This park features 0.9-mile trail where you can see various kinds of wildlife and hear the Huron River flowing beneath a historical bridge. This trail is a beautiful feature of Milan, highlighting the history of the Milan Canal. Just this past week, wild turkeys and many other birds were seen at this park.

Huron River Greenway North is now the Huron River Path MetroPark.

Located at the same entrance of DuPont Marsh State Nature Preserve, this park area features a 0.8-mile trail leading to the Kara Deering Overlook, where you can enjoy views of the beautiful Huron River. The observation deck overlooks marshlands and forested areas, which provide critical food and refuge for bald eagles.

The Huron River Path MetroPark and Milan Towpath MetroPark are linear parks that follow the path of an early canal and railway. Unlike most parks, trails here do not circle back to the starting point.

About Erie MetroParks

Erie MetroParks was established in 1968, starting with only Osborn MetroPark. Currently, Erie MetroParks has grown to include 13 parks or preserves. Many of the properties that are managed by the park district are maintained in their natural state, in keeping with the role assigned by the Ohio Revised Code. Areas used for active recreation are designed to have minimal impact on the natural environment of the parks. Educational programs are offered year-round for all ages. Each park is unique and allows for a variety of activities for people of all ages. To learn more about Erie MetroParks, visit eriemetroparks.org or call (419) 625-7783.

Journal Reference:

New Genus of Bacteria Found Living Inside “Fracking” Wells

Researchers analyzing the genomes of microorganisms living in shale oil and gas wells have found evidence of sustainable ecosystems taking hold there—populated in part by a never-before-seen genus of bacteria they have dubbed “Frackibacter.”

The new genus is one of the 31 microbial members found living inside two separate fracturing wells, Ohio State University researchers and their colleagues report in the Sept. 5 online edition of the journal Nature Microbiology.

Even though the wells were hundreds of miles apart and drilled in different kinds of shale formations, the microbial communities inside them were nearly identical, the researchers discovered. Almost all the microbes they found had been seen elsewhere before, and many likely came from the surface ponds that energy companies draw on to fill the wells. But that’s not the case with the newly identified Candidatus Frackibacter, which may be unique to hydraulic fracturing sites, said Kelly Wrighton, assistant professor of microbiology and biophysics at Ohio State. In biological nomenclature, “Candidatus” indicates that a new organism is being studied for the first time using a genomic approach, not an isolated organism in a lab culture. The researchers chose to name the genus “Frackibacter” as a play on the word “fracking,” shorthand for “hydraulic fracturing.”

Candidatus Frackibacter prospered alongside the microbes that came from the surface, forming communities in both wells that so far have lasted for nearly a year. “We think that the microbes in each well may form a self-sustaining ecosystem where they provide their own food sources,” Wrighton explained. “Drilling the well and pumping in fracturing fluid creates the ecosystem, but the microbes adapt to their new environment in a way to sustain the system over long periods.”

By sampling fluids taken from the two wells over 328 days, the researchers reconstructed the genomes of bacteria and archaea living in the shale. To the researchers’ surprise, both wells—one drilled in Utica shale and the other drilled in Marcellus shale—developed nearly identical microbial communities.

In addition, the two wells are each owned by different energy companies that utilized different fracturing techniques. The two types of shale exist more than a mile and a half below ground, were formed millions of years apart, and contained different forms of fossil fuel. Yet one bacterium, Halanaerobium, emerged to dominate communities in both wells.

“We thought we might get some of the same types of bacteria, but the level of similarity was so high it was striking. That suggests that whatever’s happening in these ecosystems is more influenced by the fracturing than the inherent differences in the shale,” Wrighton said.

Wrighton and her team are still not 100 percent sure of the microbes’ origins. Some almost undoubtedly came from the ponds that provide water to the wells, she said. But other bacteria and archaea could have been living in the rock before drilling began, Candidatus Frackibacter among them.

Shale energy companies typically formulate their own proprietary recipes for the fluid they pump into wells to break up the rock and release oil or gas, explained Rebecca Daly, research associate in microbiology at Ohio State and lead author of the Nature Microbiology paper. They all start with water and add other chemicals. Once the fluid is inside a well, salt within the shale leaches into it, making it briny.

The microorganisms living in the shale must tolerate high temperature, pressure and salinity, but this study suggests that salinity is likely the most important stressor on the microbes’ survival. Salinity forces the microbes to synthesize organic compounds called osmoprotectants to keep themselves from bursting. When the cells die, the osmoprotectants are released into the water, where other microbes can use them for protection themselves or eat them as food. In that way, salinity forced the microbes to generate a sustainable food source.

In addition to the physical constraints in the environment, the microbes also must protect themselves from viruses. The researchers reconstructed the genomes of viruses living inside the wells, and found genetic evidence that some bacteria were indeed falling prey to viruses, dying, and releasing osmoprotectants into the water.

By examining the genomes of the different microbes, the Ohio State University researchers and their colleagues have identified a new genus of bacteria living inside hydraulic fracturing wells. Here, “produced water fluid”—the fluid that is collected at the surface of a hydraulic fracturing well after fracturing—is being filtered. The fluid is orange because it contains large amounts of iron that oxidizes when the fluids are brought to the surface. By analyzing the genomes of microbes in the filtered water, the researchers are piecing together the existence of microbial communities inside the wells. Photo by Rebecca Daly, Courtesy of The Ohio State University.
Researchers found that the osmoprotectants were being eaten by *Halanaerobium* and *Candidatus Frackibacter*. In turn, these bacteria provided food for other microbes called methanogens, which ultimately produced methane.

To validate their findings from the field, the researchers grew the same microbes in the lab under similar conditions. The lab-grown microbes also produced osmoprotectants that were converted into methane—a confirmation that the researchers are on the right track to understanding what’s happening inside the wells.

One implication of the study is that methane produced by microbes living in shale wells could possibly supplement the wells’ energy output.

Wrighton and Daly described the amount of methane produced by the microbes as likely minuscule compared to the amount of oil and gas harvested from the shale even a year after initial fracturing. But, they point out, there is a precedent in a related industry, that of coal-bed methane, to use microbes to greater advantage. "In coal-bed systems they've shown that they can facilitate microbial life and increase methane yields," Wrighton said. "As the system shifts over time to being less productive, the contribution of biogenic methane could become significantly higher in shale wells. We haven't gotten to that point yet, but it's a possibility."

In the meantime, research led by co-author Michael Wilkins, assistant professor of earth sciences and microbiology, has used genomics information to grow *Candidatus Frackibacter* in the lab and is further testing its ability to handle high pressure and salinity.

This work is funded by the National Science Foundation’s Dimensions of Biodiversity program, the Department of Energy and the Deep Carbon Observatory.

Among the study’s co-authors from Ohio State is Paula Mouser, principal investigator on the Dimensions of Biodiversity grant. Other co-principal investigators and co-authors include Wrighton, Wilkins and David Cole, professor of earth sciences and Ohio Research Scholar. Co-author David Hoyt of the Environmental Molecular Sciences Laboratory at the Pacific Northwest National Laboratory analyzed the compounds in the fluids that provided evidence of microbial metabolism.

— Pam Frost Gorder

### What Messages Do Female Birds’ Markings Send?

Both male and female birds use traits like plumage brightness to size each other up, but a new study on northern cardinals in *The Auk: Ornithological Advances* shows that the meanings of female birds’ markings may vary from one place to another, even within the same species.

Though they’re often not as showy as the males, female birds have plumage ornaments that can convey information to other members of their species. A previous study found that among northern cardinals in Ohio, the brightness of females’ facial markings indicated how aggressive they would be in defending their nests. However, when Caitlin Winters and Jodie Jawor of the University of Southern Mississippi repeated the study in Mississippi’s longleaf pine forest to determine if the same held true there, they were surprised to learn that the variation among females’ facial masks in their southern study population had no relationship to their aggressive behavior.

One of the key differences between the northern and southern cardinal populations studied is that unlike in Ohio, the researchers did not observe any evidence of brood parasitism, where one female cardinal sneaks an egg into another’s nest, among cardinals in Mississippi. The Mississippi birds also had more habitat available to them and defended larger territories, leaving female cardinals there with less need to defend their nests. “This is an indication that selection pressures vary between northern and southern populations and that the information a female in the north needs to convey to other cardinals differs from what a female in the south has to say,” explains Jawor, who has since moved on to New Mexico State University.
“The ornament and behavior are both malleable.”

To collect their data, Winters and Jawor captured female cardinals early in the breeding season and measured the brightness of their face masks with a color reflectance spectrometer. They tested aggressive nest defense behavior by waiting until a female left for a break in incubation and then placing a female northern cardinal decoy near the nest, observing the bird’s reaction when it returned.

“This is a timely paper, as current research is demonstrating that the factors involved in the display of female aggression are widely varied throughout species,” according to M. Susan DeVries of Edgewood College, who was not involved in the current study. “Considering that different populations are potentially subjected to different selective pressures that can influence behavior, this study’s findings imply that the rules governing aggressive signals and behavior in females are much more complex than we once realized.”

**Journal Reference:**


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**Climate Change Likely Caused Deadly 2016 Avalanche in Tibet**

With a deadly avalanche, it appears climate change may now be affecting a once stable region of the Tibetan Plateau.

That’s the conclusion of an international team of researchers who have published an analysis of the July 2016 disaster in the Dec. 9 issue of the *Journal of Glaciology*.

On July 17, more than 70 million tons of ice broke off from the Aru glacier in the mountains of western Tibet and tumbled into a valley below, taking the lives of nine nomadic yak herders living there.

To perform a kind of forensic analysis of the avalanche, researchers from the Chinese Academy of Sciences joined with two glaciologists from The Ohio State University: Lonnie Thompson, Distinguished University Professor in the School of Earth Sciences and research scientist at the Byrd Polar and Climate Research Center (BPCRC), and Ellen Mosley-Thompson, Distinguished University Professor in [https://geography.osu.edu/](https://geography.osu.edu/) and director of BPCRC.

The most important fact about the avalanche, said Thompson, is that it lasted only four or five minutes (according to witnesses), yet it managed to bury 3.7 square miles of the valley floor in that time. He said something—likely meltwater at the base of the glacier—must have lubricated the ice to speed its flow down the mountain.

“Given the rate at which the event occurred and the area covered, I think it could only happen in the presence of meltwater,” Thompson said. Other nearby glaciers may be vulnerable, he added, “but unfortunately as of today, we have no ability to predict such disasters.”

Researchers could not have predicted, for example, that a neighboring glacier in the same mountain range would give way just two months later, but it did in September 2016. That avalanche appears not to have resulted in any deaths, and the cause is still under investigation.

The researchers used satellite data and GPS to get precise measurements of how much ice fell in the first avalanche and the area it covered. They’ve since pieced together more answers by working with computer modelers who were able to replicate the avalanche virtually. In those simulations, the only condition that led to an avalanche was the presence of meltwater.

“We still don’t know exactly where the meltwater came from, but given that the average temperature at the nearest weather station has risen by about 1.5

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Sentinel-2 satellite images from shortly before (left) and just after (right) the Aru Glacier collapse that occurred on July 17, 2016 in western Tibet. More than 70 million tons of ice flowed down the mountain, killing nine people. Image courtesy of The Ohio State University.
degrees Celsius (2.7 degrees Fahrenheit) over the last 50 years, it makes sense that snow and ice are melting and the resulting water is seeping down beneath the glacier,” Thompson said.

Glacial collapse is unprecedented in western Tibet, which for decades has resisted the effects of climate change while glaciers in southern and eastern Tibet have melted at an accelerating rate. Increased snowfall has even led to the expansion of some glaciers in western Tibet—and the extra snowfall likely played some role in the avalanche by creating additional meltwater, said Lide Tian, a glaciologist at the Institute of Tibetan Plateau Research of the Chinese Academy of Sciences and lead author of the paper.

Co-authors of the paper include Tandong Yao, Yang Gao, Sher Muhammad, Jibiao Zong, Cheng Wang and Sengqiang Jin of the Chinese Academy of Sciences and Zhiguo Li of Shangqiu Normal University. Funding was provided by the National Natural Science Foundation of China, the “Strategic Priority Research Program (B)” of the Chinese Academy of Sciences and Major Special Project—the China High-Resolution Earth Observation System.

— Pam Frost Gorder

The World’s Oldest Farmers Were Insects

An international team of researchers has discovered the oldest fossil evidence of agriculture—not by humans, but by insects. The team, led by James Cook University’s Associate Professor Eric Roberts, discovered the oldest known example of fungus gardens within fossil termite nests from the Great Rift Valley of Africa in 25 million year old sediments.

Fungus-farming termite colonies cultivate fungi in gardens in subterranean nests or chambers, helping to convert plant material into a more easily digestible food source for the termites.

Associate Professor Roberts said that scientists had previously used DNA from modern termites to estimate the origin of termite “fungus farming” behavior back to at least 25 to 30 million years ago. This has now been confirmed using the new trace fossil evidence from Tanzania, allowing researchers to more accurately characterize the timing and evolution of this behavior, something thought to have significantly modified the environment and landscape.

Patrick O’Connor, professor of anatomy at Ohio University, added “This type of study emphasizes the need for integrating perspectives from the fossil record with modern approaches in comparative biology—it is a holistic approach to evolutionary biology and significantly informs our understanding of environmental change in deep time.”

Study co-author Associate Professor Duur Aanen from Wageningen University said that the transition to agriculture dramatically increased the range of possible habitats for both the fungus-growing termites and their domesticated fungi, very much like humans and their domesticated crops and livestock, tens of millions of years later. While the cradle of termite agriculture presumably was in an African rainforest, the transition to fungiculture helped the termites to disperse to less favorable dry savannas and also out-of-Africa migrations into Asia.

Roberts added, “The phenomenon might have been triggered by the initial development of the Great Rift Valley in this part of eastern Africa, and the dramatic transformation of the landscape around this time.”

“This discovery pushes back the beginning of the termite-fungus symbiotic relationship to at least 31 million years ago,” said Paul Filmer, program director in the National Science Foundation’s (NSF) Directorate for Geosciences, which funded the research. “Since some 90 percent of the wood in the dry environment studied is digested by termites, understanding the development of this symbiotic relationship is important to our knowledge of the history of carbon cycling in these forests,” he said.

The research is part of an ongoing study focused on the evolution of a poorly known portion of the Great Rift Valley known as the Rukwa Rift, which has produced an array of unexpected geologic and paleontologic discoveries in the past few years.

Journal Reference:

An international group of researchers led by Bradley McFeeters, currently a Ph.D. student at Carleton University in Ottawa, Canada, has announced the discovery of a new ostrich-mimic dinosaur, Rativates evadens, from the lower Dinosaur Park Formation near Dinosaur Provincial Park, Alberta. The new species lived about 76 million years ago during the Late Cretaceous Period. Research describing the new species is published online in the Journal of Vertebrate Paleontology.

Based on a partial skeleton collected by the Royal Ontario Museum in 1934 from badlands adjacent to what is now Dinosaur Provincial Park, Rativates (RAT-iv-ATE-eez) would have resembled a modern ostrich, but with long, fingered arms instead of wings, and a long tail. It would have been approximately 3.3 meters (11 feet) long, about 1.5 meters (5 feet) tall, and weighed about 90 kilograms (200 pounds).

"Rativates was previously identified as another specimen of the more common ostrich-mimic dinosaur Struthiomimus altus, but lacks the key diagnostic characters of that species," said McFeeters. "We can tell that it is a new species based on features of its skull, tail, pelvis and feet, including the shape of the long bones of the feet."

Rativates (Latin ratis + vates) means "ratite (large flightless bird) foreteller" and alludes to the paradox of an ostrich-mimic dinosaur existing before ostriches. The name evadens means to evade, in reference to this swift-footed dinosaur's ability to evade predators in the Late Cretaceous, as well as its recognition as a new species 80 years following the discovery of the original fossil.

“The referral of fossils to the named species of ostrich mimic dinosaurs like Struthiomimus is complicated because many specimens are incomplete. The recognition of Rativates helps clear up these problems, and at the same time strengthens a connection between Canadian ornithomimids and their Asian cousins,” said co-author Dr. Michael Ryan, curator of vertebrate paleontology at The Cleveland Museum of Natural History, who was co-supervisor to the lead author.

Although it is a member of the carnivorous dinosaurs (Theropoda), ornithomimids such as Rativates lacked teeth and, similar to birds, had beaked mouths. They are believed to have been omnivorous, meaning they ate plants, insects, and other small animals. Their long, powerful legs would have made them fast runners (like the Gallimimus in the original Jurassic Park movie), whether they were hunting prey or escaping from larger predators, like Gorgosaurus.

Although no skin impressions were found with the fossil, the closely related ornithomimid, Ornithomimus, also from Alberta, is known to have had a downy covering over most of its body. It may have had true feathers as well.

“We histologically thin-sectioned the femur of Rativates to analyze its growth and determined it was at least eight years old and nearly adult-sized at the time of death. This is only 80 percent as long, and half as massive as, the adult size of the closely related species Struthiomimus altus, that is estimated to have weighed approximately 175 kilograms [=385 pounds],” said co-author Thomas Cullen, a Ph.D. candidate at the University of Toronto.

“This suggests that there are at least two differently sized but closely related dinosaur species that lived together on the ancient landscape, similar to what we see today in the closely related predators like foxes, coyotes, and wolves,” said McFeeters’ former co-supervisor and co-author Claudia Schröder-Adams, of the Department of Earth Sciences at Carleton University.

"Rativates is another exciting example of a new species of dinosaur being discovered among museum collections," said Ryan. “These valuable collections allow modern researchers to build on the work of earlier scientists to advance what we know about the ancient Earth and provide new insights into evolution.”
I'm sure you have seen milkweed in nature centers near you, and perhaps even in your own garden. You may be seeing more of it than you know, even if you are familiar with common milkweed (Asclepias syriaca). There are actually at least three varieties of milkweed that are often grown in gardens. Common milkweed is the one kids learn about in school that is the host plant for the monarch butterfly. It has large round flower heads and produces large seed pods with seeds on little parachutes.

You may also be aware of the second milkweed, but by another name: butterfly weed (Asclepias tuberosa). In contrast to common milkweed’s round, pink flower heads, butterfly weed has bright orange flower heads that are more flattened. This plant is excellent for attracting butterflies and is sold at garden centers for that purpose. It’s one of very few orange flowers that are native to Ohio, and it’s inviting to butterflies, which makes it a great addition to a garden.

The third milkweed is swamp milkweed (Asclepias incarnata). It looks like a mix of the other two species. Its flower head is shaped more like butterfly weed and its color is closer to common milkweed. As its name implies, it likes to keep its feet wet in swamps or marshes, which is why you’ll see it on the golf course in areas where it stays wet in the summer.

If we get closer still and literally zoom in on the milkweed plant, we’ll find a whole new world. Hundreds of creatures make their home on the milkweed. Some of them are tiny, smaller than a quarter of an inch. Some of them are so brightly colored they look like gummy bugs.

Butterflies go through metamorphosis. They change from one form to a completely different form; from a caterpillar to a butterfly. Other insects mature in stages; their young ones look like smaller versions of the adults. These immature stages are known as instars. Large milkweed bug (Oncopeltus fasciatus) instars are small and bright red with black accents. In the sun, they are translucent and look like a confection.

Milkweed aphids (Aphis nerii) are smaller still, even as adults. They are bright yellow with little black dots of appendages, like a lemon gummy fruit snack with candy eyes and feet.

Both of these insects are very common on milkweeds, so the next time you see a milkweed, stop and take a closer look. Better yet, plant some milkweed in your backyard and invite butterflies and other interesting creatures into your garden.

Look for more photos from Jim Lane on Instagram at #MedallionWildlife.
**The Herbert Osborn Award**

**Purpose:** The Ohio Biological Survey, in honor of its founder, established the Herbert Osborn Award to recognize noteworthy accomplishments and service in the field of biology as pertaining to the objectives of the Ohio Biological Survey. The Award is presented on an annual basis, and was initiated in 1991.

**Qualifications:** Recipients of the Herbert Osborn Award will be individuals who have made an exceptional contribution through consistent research publications to the advancement of knowledge concerning the occurrence, distribution, taxonomy, and/or ecology of the flora and/or fauna of Ohio. The intent of the Award is to recognize relevant accomplishments and service over a period of years.

**OBS Naturalist Award**

**Purpose:** The Ohio Biological Survey wishes to honor those individuals who have made significant contributions to our understanding and conservation of the natural heritage of Ohio.

**Qualifications:** An individual selected to receive the Ohio Biological Survey Naturalist Award will have worked energetically to acquire or disseminate knowledge, conserve natural areas, and/or foster our understanding of the fauna and flora of Ohio. The awardee will be an active contributor over a period of years in pursuit of the activities concerning the natural heritage of Ohio.

**Small Grants**

OBS offers small grant programs to support work that occurs partially or wholly in Ohio, and that promotes the Survey’s objectives. The Survey offers this support to individual members and institutional/corporate members from monies derived from a portion of dues income. Applicants for individual small grants must be current individual members of the Survey or employees/members of the institution or corporation that is a Survey member. Proposals should be received on or before February 1 of each granting year.

You can find more information, including an application form, at www.ohiobiologalsurvey.org/projects/.

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**Ohio Biological Survey - Individual Membership**

The Ohio Biological Survey, an inter-institutional agency dedicated to the natural history and conservation of Ohio’s flora and fauna, has opened its membership to individuals. Individual members are entitled to a 20% discount on all Survey publications, will receive the Survey’s newsletter, BioOhio, can participate in hosted or co-hosted workshops, field trips, or lecture series, and are eligible to apply for research monies through the Survey’s Small Grant Program. All dues money will be returned to the membership through these benefits.

**Dues schedule:** Students and Retired Members: $15/year; Regular Members: $25/year; Lifetime Regular Membership: $500; and Lifetime Retired Membership (60 or older): $100. If you are interested in becoming a member, please send your name, address, and dues to Ohio Biological Survey, P.O. Box 21370, Columbus, OH 43221-0370.