Airborne Twists

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INTRODUCTION

UP IN THE AIR

Though most of the stories of the rare, unusual and unexpected are about animals, we could not resist including the Yurchenko vault. The gymnasts who have accomplished its height are diving and twisting in mid air. The lovely informational graphic by The Post’s Artur Galocha illustrates the sequence of technical moves where words are limited.

Emily Giambalvo’s “Flipping the script” puts the moves into words and perspective. Be sure to note that interviewees include Natalia Yurchenko. Students are meeting one of the international stars of gymnastics and learning the origin of one of the most challenging routines — pushing young gymnasts to the limits.

KidsPost also offers a twist on our understanding of vampire bats. Yes. They do suck blood to survive, but not human blood. And they have been observed to share with weak members of the colony and care for offspring. After reading and discussing “For social Vampire bats, sharing is caring,” give students the close reading worksheet (or quiz) Not Scary. Smart and Social.

Restoration of the dome of the Jefferson Memorial is finally completed. As mysterious dark splotches appeared in 2015 and covered more of the white marble, the National Park Service had a monumental problem to solve. After six years of work, how long the cleaning will last is unknown. “Reclaiming marble from biofilm,” another informational graphic, illustrates the process of defining and removing biofilm.

Teachers Notes provides additional suggestions for activities, tips for teaching and resources. These include student work on the Jefferson Memorial biofilm project. We provide these resources so you are not left up in the air.
The Yurchenko Vault

Most Yurchenko vaults have the same entry:
The round-off turns a gymnast around so she can dive backward onto the vault. Some Yurchenko-style vaults require a gymnast to twist during the back handspring as she reaches for the vault, but the majority of the variation comes during the flip.

Yurchenko tuck full
Natalia Yurchenko unveiled this new vault technique in 1982 at an international competition in Zagreb, Yugoslavia.

Yurchenko double full
Many elite gymnasts compete a Yurchenko with a double twist in a layout position. This is one of the most common vaults at top U.S. competitions.

Yurchenko two-and-a-half (Amanar)
A handful of top vaulters have performed a two-and-a-half twisting Yurchenko, but no woman has ever competed a triple.

Yurchenko double pike
Simone Biles became the first woman to compete a double-flipping Yurchenko last month, and this vault will be named for her once she successfully performs it at the Olympics.

Source: Competition footage.
Flipping the script

Biles is revolutionizing the Yurchenko vault, which has its roots in Russia

BY EMILY GIAMBALVO

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Simone Biles became the first female gymnast to perform a double-flipping Yurchenko at the U.S. Classic event in May 2021.

EMILEE CHINN/GETTY IMAGES

Four decades ago, in the Russian city of Rostov-on-Don, a gymnastics coach envisioned a future that included more flips, more twists and more difficulty on every event. At his training facility, he and his fellow coaches would instruct beginners to jump from a balcony into a foam pit as a way to gauge their fearlessness.

Natalia Yurchenko arrived at that club from Siberia at age 11. Her coach then noticed her potential and took her to Rostov-on-Don to introduce her to Vladislav Rastorotsky, the innovator who was imagining how the best young gymnasts might challenge the sport’s limits. Yurchenko didn’t return home. She began training in Rastorotsky’s gym and attended boarding school. She practiced multiple times per day with other talented girls.

“It was just a dream life for a gymnast,” said Yurchenko, who went on to become the 1983 all-around world champion.

During one practice, Rastorotsky had an idea: Gymnasts always had jumped toward the vault facing forward, but he envisioned a round-off onto the springboard and a back handspring onto a vault they couldn’t see. It seemed inconceivable. But when Yurchenko and her teammates first practiced the skill over mats, rather than the horse, it seemed possible — and more powerful than other techniques.

Yurchenko debuted the vault in an
international competition in 1982, and this entry with a round-off back handspring has carried her name since. Even then, as she and the other gymnasts experimented with more difficult vaults into the foam pit, she wondered how much her eponymous skill could evolve. So as she watched Simone Biles recently take this skill to unparalleled heights, Yurchenko felt overwhelmed.

Biles became the first female gymnast to perform a double-flipping Yurchenko at the U.S. Classic [May 22]. In doing so, she thrust this skill into the spotlight. Kerri Strug performed a version of the Yurchenko (with a one-and-a-half twist), landing it on an injured ankle at the 1996 Olympics. So did McKayla Maroney, the 2012 Olympian with a near-perfect two-and-a-half twisting Yurchenko in the team final.

At gymnastics’ highest levels, Yurchenko vaults are as prevalent as fastballs in baseball, but until Biles soared off the table and completed two flips rather than one, the term had never truly pierced the world outside gymnastics.

“It’s as important as it gets,” said Christian Gallardo, the coach of Gabby Douglas entering the 2016 Olympics and now Olympic hopeful Shilese Jones. “Your fundamentals and strength are probably your water for your gymnastics, and doing Yurchenkos is probably like a food group. That’s your protein or your vegetables.”

Assuming Biles successfully performs the Yurchenko double pike at the Olympics, it will become the fifth skill named for her. But it also will remain part of the Yurchenko family of vaults.

Growing up in the Soviet Union, Yurchenko read books about high-achieving individuals in various pursuits — music, mountain climbing, anything — and it left her with similar aspirations.

“You were dreaming that, ‘Okay, if I accomplish something in life, I need to do it that big that it would stay in history for the future generation,’” said Yurchenko, who now teaches these vaults at a club she owns in Chicago. “I still cannot believe that dream really came true.”

‘The fear is real’

Vaults are categorized into groups based on their entry — what happens onto the springboard and table before the flip. Tsukahara vaults, named for Japan’s Mitsuo Tsukahara, have a forward entry in which a gymnast punches off the springboard and does a round-off onto the vault. Other vaults require a gymnast to perform a front handspring onto the table. In the Yurchenko, the flipping off the table garners the most attention, but the round-off onto the springboard is key; that’s the piece Gallardo says he spends the most time perfecting with his gymnasts.

“From the moment your feet hit the springboard to the moment your hands hit the table,” said Alex McMurtry, a former University of Florida gymnast and the 2018 NCAA vault champion, “that’s where the magic happens.”

When Yurchenko watches a vault, she looks for the push off the table, called the block, and she references Maroney as a perfect example. As a young kid, Maroney loved seeing how high she could flip, and this block came naturally for her. She jammed her arms into the table with her hands turned outward and exploded off the vault.

“You need that maximum pressure,” said Maroney, the 2011 and 2013 vault world champion. “It’s got to make the vault shake. But you cannot stay on the vault for more than literally a millisecond. It’s got to be a slap, then full speed coming off the vault.”

After the 2000 Olympics, the sport swapped the narrow horse (similar to the men’s pommel horse but without handles) for a three-foot wide, four-foot long, tongue-shaped table. That revolutionized the event, Yurchenko said. When learning her eponymous vault, she occasionally missed with her hands. The adrenaline of competition prompted unexpected power toward a narrow piece of equipment with little room for error. With the modern table, gymnasts can generate momentum without worrying about the precise placement of their hands.

As Yurchenko vaults evolved, gymnasts added more twists to the flip. In 2000, Romanian Simona Amanar debuted a Yurchenko with a two-and-a-half twist. Numerous elite gymnasts, including Biles and Maroney, have performed the Amanar in competition, but more than two decades later, no woman has successfully performed a triple-twisting Yurchenko.

“I’m a quick twister, but if I don’t have
Yurchenko double pike

Simone Biles became the first woman to compete a double-flipping Yurchenko last month, and this vault will be named for her once she successfully performs it at the Olympics.

that block at a certain angle, the triple twist, no matter how hard you try, isn’t going to work,” Biles said. “And it’s a little bit risky to try to replicate that block every single time, so the double pike just seems a little bit more manageable for myself.”

Maroney didn’t like triples, either, even though she practiced them with soft landing mats. She spent nearly six months when she was about 13 years old working on a Yurchenko double tuck before practicing the vault at a national team training camp. She remembers Martha Karolyi, then the national team coordinator, saying: “No, no, no. You are not doing that vault.” Maroney said Karolyi didn’t think the double-flipping Yurchenko was safe, and she never seriously considered it again for competition.

“The fear is real,” said Maroney, now 25 and living in California. “And I don’t know if Simone feels that way, but I definitely didn’t ever feel like: ‘Wow, this is a breeze. I feel good doing this vault.’”

Coaches worry about the risk. If a gymnast feels something is off during a twisting vault, she can more easily adjust in midair to an easier version. Double-flipping vaults don’t leave room for similar modifications, because the only safe way to land is by finishing the second flip.

“It was never worth it,” said Gallardo, who coached an elite gymnast, Nia Dennis, who practiced a Yurchenko double tuck into the pit with two mats. “But I always knew somebody was going to do it because I knew it was possible. I had seen it in my own athletes.”

Pushing the limits

Gymnastics is driven by these risk-reward calculations. In 2012, Amanars had a 6.5 difficulty value, compared with the 5.8 of the double twist. Now only four-tenths of a point separate those vaults, so Amanars have become less common. Jones, the current elite gymnast who trains with Gallardo, can do an Amanar but chooses to perform a clean double twist instead.

Elite male gymnasts, who use a higher vaulting table and generally have more power, already have performed double-flipping Yurchenkos in competition, but it’s still not common. Biles’s accomplishment is not just that she can do it; it’s that she executes it consistently enough to feel it’s safe for competition. On nearly all of her attempts seen publicly, she has landed the double pike upright with no more than a couple of steps — the byproduct of having too much power on a skill that already requires so much height.

Gymnasts often practice skills that are much harder than what they will perform in competition. That experimentation keeps athletes engaged and might help with the simpler versions. Even in the 1980s, Yurchenko attempted double tucks when she vaulted over stacked mats into the pit. Biles said she tried double-flipping Yurchenkos for fun years ago. Last year, she trained those vaults as a way to develop her block off the table to improve her Amanar for the Tokyo Olympics. But after the Games were postponed for a year, the Yurchenko double pike seemed like a reasonable challenge.

“There’s a girl who was born to break every record,” Yurchenko said of Biles. “And we are all so lucky to live in a time when she’s here and performing those upgraded skills for us.”

Biles performing this vault in competition, seemingly with ease, doesn’t change how remarkably difficult it is. Biles could remain an outlier. McMurtry’s club gym didn’t have a foam pit. She learned a Yurchenko at age 9 and later excelled. She imagined adding only extra twists — never a double-flipping Yurchenko. So now, she wonders whether the next wave of great vaulters will see this skill as a challenging but realistic option.

“I don’t think I thought of it,” McMurtry said. “I had a really good Yurchenko, but Simone opened that door, for sure — absolutely opened that door to women’s gymnastics.” ■
For social vampire bats, sharing is caring

The tiny bats, which are likely to spread north from Mexico in next 2 decades, don’t pose a threat to humans.

Vampire bats aren’t the scary creature sometimes shown in movies. They feed off the blood of animals, mostly cattle.

Scientist Simon Ripperger spends his days strapping tiny computers to the furry backs of vampire bats in Panama.

Contrary to their name, vampire bats don’t suck blood from unsuspecting humans. They typically target cattle, using their teeth to make a tiny puncture wound, then lapping a teaspoon or two of blood with their tongue. They live mainly in Mexico, and Central and South America. But the U.S. Department of
Agriculture (USDA) recently reported that vampire bats could arrive in the Southern United States in the next two decades.

Toni Piaggio, a USDA scientist, reported in May that development in the vampire bats' native habitats and warming temperatures have inspired the winged mammals to move north to Mexico.

"It's getting warmer, farther north and south," Ripperger explains. "So bat species that occur in the tropics can move further away from the equator."

There are three species of vampire bat: common, white-winged and hairy-legged. All depend on blood to survive. A bat that goes without a meal for two or three days can starve to death. Fortunately, they have a social network made up of several partners who feed one another.

"One bat licks the mouth of another bat, and that one starts [spitting up swallowed] blood," Ripperger explains. "As well, bats that are fatter will notice that someone is starving, and then approach them and feed them."

Vampire bats look out for their colony members in other ways, as well. Ripperger describes how a doctoral student from his lab at Ohio State University observed two female bats who groomed each other and shared food.

"They had a strong social bond," he said. "And then one of the females who had a very young pup got sick and died. The mother’s friend took over and adopted the offspring. It was amazing."

Other species of bats have obvious roles in nature. Some pollinate flowers. Some scatter seeds, and others eat mosquitoes. This type of role is less obvious for vampire bats, but that doesn’t cause Ripperger to admire them less.

"Not every species needs to serve a purpose in the eye of a human to find a place in the world," he says. "When you hear about vampire bats, you think of blood, and it’s scary. But if you work with them, you figure out that they are super-social and super-interesting creatures."
Not Scary. Smart and Social.

After reading “For social vampire bats, sharing is caring” complete these questions

**Fill in the Blank.** Provide the most accurate word in the blank.

1. Vampire bats live primarily in _____________________________, _____________________________, and _____________________________.
2. _____________________________ and _____________________________ have influenced vampire bats to move north.
3. Groups of vampire bats are called a _____________________________.
4. Without _____________________________ vampire bats would starve to death.
5. Vampire bats live or roost in _____________________________.

**Short Answer.** Answer the following questions.

6. What is the main source of meals of vampire bats?

7. How do vampire bats locate blood vessels?

8. How do scientists know about social interactions between vampire bats?

9. What surprising behaviors have scientists discovered in vampire bats? Give an example.

10. Scientist Simon Ripperger states: “Not every species needs to serve a purpose in the eye of a human to find a place in the world. They’ve conquered a certain niche — drinking blood — which is quite amazing for a mammal. It’s really rare, and I think it’s reason enough to exist.”
   a. What credentials make Ripperger an expert on vampire bats and species?
   b. State his quotation in your own words. What is his main idea?
   c. What do you think of this idea or another idea about vampire bats in this article?
As early as 2015, anyone viewing the Jefferson Memorial from a distance — say, from Independence Avenue across the Tidal Basin, or an aircraft window on approach to Reagan National Airport — could see that something was wrong. One of the capital’s signature monuments, a priceless piece of the nation’s heritage, was starting to look downright shabby. Dark splotches were growing on the iconic white dome. Growing fast.

Faced with the speed of change, and the increasing number of visitors and residents asking what was going on with the memorial, National Park Service analysts concluded they couldn’t fight what they didn’t fully understand. They took a patient approach, calling in scientists and their own conservation experts and embarking on a years-long analysis to determine what was attacking the memorial’s 78-year-old marble dome.

“It was maybe 15 years between the time we first realized the problem and when we finally acted on it,” said Audrey Tepper, a Park Service historical architect with the National Mall and Memorial Parks. “There’s a real logic in not acting too quickly.”

The culprit, they eventually determined, was something that probably had been present on the monument, and nearly every other outdoor structure in most cities, for decades: biofilm.

“It’s a microbial community of bacteria, fungi and algae,” Tepper said. “It occurs all over the place. It’s existed for eternity, but it’s more visible on white marble buildings.”

It’s usually barely visible, and in fact...
no one knows for sure how long it’s been
growing on the Jefferson Memorial dome.
It only became a pressing problem when —
for reasons scientists are still working to
understand — it began to darken.
In collaboration with commercial
restoration experts, National Park Service
analysts determined that, as bad as it
all looked, the biofilm infestation was
superficial. If it could be cleaned off,
it would leave the underlying marble
undamaged. But there was a catch. “Most
people in the preservation industry use
essentially antimicrobial agents, chemical
cleaning agents primarily developed for
the health industry and the food industry,”
said Judy Jacob, National Park Service
senior conservator and an in-house expert
on biofilm. But the Jefferson Memorial sits
in the sensitive biome of the Tidal Basin.
Under the constraints of the 1972 Clean
Water Act, the risk of toxic runoff made
any use of chemicals to clean it look like a
very bad idea.

Why the sudden change?

No one knows for sure why this biofilm
suddenly became a visible problem only
over the last 20 percent of the Jefferson
Memorial’s life. One theory suggests that
hydrocarbons from partially combusted jet
fuel might feed the infestation; increased
traffic into Reagan National Airport over
the past couple of decades might explain
the change.

Cleaner air may also be to blame: Since
the enactment of the federal Clean Air
Act in the 1960s, the amount of particulates
in the air has lessened. The cleaner air has
allowed more ultraviolet light to reach the
dome surface, possibly feeding the biofilm
colony.

And the specter of climate change
may offer an explanation. Summers are
generally longer and hotter now than
years ago. Could this be having an effect?
National Park Service conservators would
love to know. “We need more people
studying this,” Tepper said.

One thing preservation experts do
know, according to Jacob, is that the
Jefferson Memorial’s marble surfaces have
weathered over the years.

“Rain alone will slowly erode the
surface,” Jacob said. “New marble has a
sanded or rubbed finish with a satin sheen
to it. That will erode first. With time,
that beautiful smooth surface becomes
eroded and it has a topography. That
texture provides a surface that will stay
wet for longer periods of time from rain,
condensation, mist. This provides just the
perfect environment for microorganisms.”

What’s next?

As restoration jobs went, this was never
going to be one of D.C.’s biggest — the
$14.5 million budget to restore the Jefferson
Memorial is dwarfed by, for example,
the $60 million restoration of the Capitol
dome in 2016. Still, as the nature and extent of the biofilm infestation became clear to analysts, it also became clear that this job would eat every dime they had allocated, and contingency funds as well.

And as anyone who’s stood in the swamp-like murk of a Tidal Basin summer day will hardly be surprised to hear, it’s a job that will need to be done again. “We think this biofilm will come back and we are continuing to study it,” Tepper said. And they’re not alone.

Conservators across the Potomac at Arlington National Cemetery are dealing with very similar biofilm on their Memorial Amphitheater, which is built of the same Vermont marble as the Jefferson Memorial. The Folger Shakespeare Library’s ongoing $72 million renovation includes abating biofilm discoloration from its facade, constructed of slightly softer Georgia marble. The District of Columbia War Memorial on Independence Avenue across the Tidal Basin from the Jefferson Memorial also features a Vermont marble dome, visibly afflicted with an extensive — and growing — biofilm infestation.

Government funding addressing maintenance shortfalls at National Park Service properties, specifically the 2020 Great American Outdoors Act, along with the agency’s usual dexterity in working the government’s patchwork funding channels, leaves NPS officials cautiously confident that when dark splotches reappear on the Jefferson Memorial dome — “when, not if,” as Tepper puts it — they will be able to respond.

And as for how soon that might happen? “I have no guess,” said Jacob. “We’ll just have to wait and see.”

William Neff creates static and motion graphics and generates original video content for the Washington Post’s Local desk. He joined The Post’s graphics team after 3 1/2 years on the Video desk, and before that as a senior news artist and multimedia content producer at the Cleveland Plain Dealer.

Aaron Steckelberg contributed to this report.

Information sourced from National Park Service; Center for Biofilm Engineering at Montana State University; EverGreene Architectural Arts

Identifying an Infestation and Removing the Problem

After reading the article and reviewing the informational graphic, form five groups. Each group will work on one of the following topics. Become the expert in this area. Write five questions and answers to the questions about the group’s topic.

Group 1 | Source of dark splotches and theories about its growth
Group 2 | Concerns surrounding the cleaning of the dome
Group 3 | Solution — benefits and drawbacks
Group 4 | Characteristics of marble — aesthetics and science
Group 5 | Ongoing concerns of conservators and their work
On Land, In the Air and Within the Water

Teachers Notes provide additional activities and resources to use with the suggested activities and the reprinted Post articles, opinion pieces and informational graphics.

Yurchenko Vault | “Flipping the script”
Use the informational graphic to illustrate the step-by-step movements the gymnast must make to accomplish the vault.

As a follow-up to “Flipping the script,” teachers could have students read “Gymnasts understand Biles’s battle with ‘twisties’” (A1, July 29, 2021) that explains the relationship of mind to trained body/muscle actions. And will answer the question of whether Simone Biles has another skill named for her. Also see “Recognizing the greatness in Biles’s decision to step back” found in the October 2021 Post NIE curriculum guide.

“Scientists become detectives to identify ‘Ghost nets’”
The article states three places around Hawaii where ghost nets are found.
For more information about Papahanaumokuakea Marine National Monument and activities, see the resource guide, “Papahanaumokuakea,” in From Yellowstone to Arcadia and Zion.

Word Study | Not Just Any Group
In this curriculum guide, the Word Study focuses on one type of collective noun — venery, groups of animals. Longer than most Word Study activities, we wanted to give you and your students the etymology and the remnants of its past found in place names.

In Italy a palace and in France a museum bear names and provide evidence of the long tradition of hunting. In northern Italy near Turin, La Venaria Reale, a UNESCO World Heritage site, preserves the palace and hunting grounds. North of Paris in Senlis, France, Musée de la Vénerie exhibits the rich history of hunting on horseback with hounds. Language teachers may have students find these places on maps and online. Also locate other places and works that have the venari root.
One of the venery related is wisdom of owls. In Italy the association of owls with wisdom is kept alive. An owl is a typical graduation gift with hopes of continued good luck. In Greek myths, an owl sat on the shoulder of Athena, goddess of wisdom and war. The owl was believed to reveal truth and inner light. If Greek soldiers saw an owl before a battle, they thought it was a sign of their victory. (In Roman mythology Athena is Minerva.)

As a sign of how much today’s Greek culture holds to the symbolism of the owl, take a look at the Greek one euro coin. Pictured (above, left) is a one Euro and an Athenian tetradrachm of the 5th century B.C., its early inspiration for design.

“Turkey launches massive effort to vacuum up thick layer of ‘sea snot’ choking its coast”

Lisa Wu suggests The Science of Slime, another activity or demonstration that teachers could do when reading the Post article.

There are many recipes, or in science, protocols, for creating slime. Students love this hands-on activity that enables them to talk about the chemical and physical properties of mucus. Mucus is mostly sugars and protein. The long fine strands that you see when you move it around are protein molecules sticky and able to stretch much like muscilage strands in sea snot.

Steve Spangler has lots of recipes. This short “Spangler Science MIT” 2-minute and 48-second video is good to use as an introduction. “The Science Behind Slime,” a 14-minute illustrated tutorial on making slime and the science behind the polymers, is another good resource.

In addition to the videos, these articles provide helpful background:
• What in the world is sea snot?
• The Science of Slime by Anne Trafton December 19, 2018
Monumental restoration

Lisa Wu and Juliana Gruver, her former student at TJHSST, share a project.

When a multi-disciplinary team of conservators, architects and molecular biologists began studying the growth of biofilms on the Jefferson Memorial it became exciting fuel for authentic student research. In 2016-17, students at the Thomas Jefferson High School for Science and Technology, put their lab coats on and began several projects inspired by this effort of the National Park Service. With projects ranging from identification of the biofilms to the conservation of stone, disciplines and technologies used by the students needed to be just as diverse. Microbiology, chemistry, biotechnology and environmental science topics were explored using technologies such as simple soil and pH kits to PCR and image analysis.

Did the biofilms growing on the northern side of the monument have a different composition, from those growing on the south side due to differences in light levels, humidity, and other location-based differences?

Juliana Gruver chose to study the lichen growing alongside the biofilm. Very slow growing and formed from a relationship between fungi and algae/or cyanobacteria, lichen are believed to have evolved from biofilms and in some studies are considered biofilms. Sensitive to air pollution and accumulating chemical elements as they grow, lichen can be used as biomarkers to document pollution exposure in which they are growing and serve as an archive of air quality over time.
Monumental restoration | continued

“I was interested in studying the impact of the biofilm on the Thomas Jefferson Memorial and the local ecosystem by examining the effect on native lichens. The biofilm coverage markedly increased during my high school years. Lichen is … used as a biomarker to determine exposure to environmental conditions.

“The only difficulty I had in data collection was the strange looks I received from park rangers as I took photographs and analyzed the pH of the biofilm and lichen growths.

“Since my graduation I have earned a B.S. in Physiology & Neuroscience at the University of California, San Diego, and I am now a first-year medical student at George Washington University School of Medicine and Health Sciences.”

— Juliana Gruver

Representative images of lichen and biofilm: ABOVE: Biofilm: A close up image of the biofilm from the lower section of the Thomas Jefferson Memorial. BELOW: Lichen: A close up image of native lichen from the lower section of the Thomas Jefferson Memorial.

Additional article