The Buzz

Advocates *for* Snake Preservation

Changing how people view & treat snakes

2026 • #14

Stacking

Doublenicks, male Western Diamond-backed Rattlesnake, is perched on top of a female in a behavior known as *stacking*. *Stacking* is a form of mate-guarding in rattlesnakes, thought to help conceal the female from other potential suitors.

I encountered and photographed this pair in one of my first field trips with Roger Repp in March, 2004.

- Melissa Amarello, ASP

Musings from Melissa

Last fall I was on an emotional roller coaster. I visited Costa Rica for the first time, and it is an amazing place. The weather was perfect, vegetation breathtaking, and wildlife so abundant that every turn held a new discovery. More than the scenery, though, it was refreshing to spend time in a culture that defaults to appreciating and protecting wildlife and wild places, rather than seeking to dominate and exploit them.

I would probably still be riding that high if not for the heavy news that met me upon returning home: the loss of two dear friends. You can read more about one of them in this issue's *Snake Hero*. The other, Bets, was both a friend and role model. She was never afraid to speak her mind and stayed fiercely active, championing the causes she cared about until the very end.

Another hero of mine, Jane Goodall, also passed last year. Jane was a trailblazer who entered the field when it was almost unheard of for women to study wildlife in the wild.

Roger and Melissa pause for a photo while helping a Gophersnake safely cross the road.

Bets (left) and Dave (middle) admire a Gila Monster held by Jeff (right; AZGFD LIC #SP939967).

She did things her own way and made groundbreaking discoveries — not in spite of her unique approach, but because of it. She referred to her study subjects by names rather than numbers and refused to let the fear of anthropomorphism prevent her from accurately describing the complex behaviors she observed. And when she realized the plight facing Chimpanzees and the natural world, she pivoted her life toward advocacy.

I am inspired by these powerhouse women to keep fighting for what I love. We've taken many opportunities in the past year to respond to attacks on wildlife and the places they need to survive. But our focus continues to be proactive: busting myths, fostering coexistence, and sharing stories to show what snakes are really like. You'll find examples right here in these pages.

I hope you enjoy this issue of *The Buzz* as much as we enjoyed putting it together for you. Let me know what you think! And please keep sharing with your friends, neighbors, and family. Spreading positive messages is like a superpower, turning "EEK!" into "AWW!" when it comes to snakes. Together we can keep the peace between people and snakes, and that's seriously awesome.

Melissa Amarello (she/her), Executive Director
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Research News

Snakes are NOT Deaf!

There is a long-standing myth that snakes are deaf. Presumably this comes from two places:

1. Snakes lack external ear holes, and
2. Snakes often stay still as you walk past them.

But neither of these things prove that snakes are deaf. For example, dolphins and moths can hear exceptionally well, yet neither of them have external ears. Regarding point #2, snakes are cowards by default, wanting to escape detection by predators (like humans) whenever possible. This means that they hide most of their lives under cover and try to escape detection via crypsis: staying still to avoid detection. You can walk right past a Death Adder (*Acanthophis* sp.) without them moving a muscle, which led to their nickname of "deaf adder." But a lack of reaction still doesn't mean they're deaf; maybe the snake is just smart and trying to avoid detection by a massive predator.

With only a trickle of old studies on the topic, and just one species represented under anaesthetic, we decided to put this theory to the test with many free–moving snakes, one at a time. A few of us from The University of Queensland and Australian Reptile Academy partnered with the Creative Industries department at the Queensland University of Technology in Brisbane to conduct 304 experimental snake trials inside a (hot) soundproof room – a room usually occupied by musicians in air conditioning, mind you! We wanted to test:

- Whether free-moving, non-anaesthetised snakes were able to detect airborne sounds (as distinct from groundborne vibrations felt by their belly), and
- How did this change their behaviour?

With zero funding, all volunteer time, and many favours, we managed to pull off the world's first study about how unrestrained and undrugged snakes respond to airborne sound.

Christina and Chris prepare a Taipan for a trial; photo courtesy of Dr Christina Zdenek.

So, what did we find??

Snakes exhibited many different behavioural responses to airborne sounds, and these behaviours generally differed by snake type. For example, Taipans (*Oxyuranus* sp.) became very defensive to the sound, making hissing noises, fixating their heads toward the sound while moving the rest of their body preparing to strike, and dropping their lower jaw in preparation to strike and/or possibly to show their fangs in intimidation. Death Adders, on the other hand, which are basically vipers morphologically but just not genetically, stayed still most of the time, or if they did move, tended to move away from the sound. This makes sense for an ambush predator that is very vulnerable to being trotted on by large animals moving through the environment.

In contrast, our big nocturnal pythons, Woma Pythons (*Aspidites ramsayi*), became intrigued by the sound and actually went toward the sound more often than not. They also exhibited an interesting behaviour called periscoping: elevating the first third of their body to get a better sense and viewpoint of what's going on around them. These top-dog predators don't have much to fear when they're that big. No nocturnal aerial predators are large enough to get them.

Snakes are NOT deaf! *(continued)*

While we convincingly proved snakes can hear airborne sounds, they cannot hear as well as humans. They likely have a more muffled version of what we can hear, and only up to about 800 Hz in sound frequency – so low frequency sounds. For comparison, a human voice is 250 Hz, and a bird call can be as high as 10,000 Hz. The sound probably also needs to be a little bit louder for them to hear it, kind of like as loud as someone screaming. Indeed, media lines about our paper carried titles like, "Snakes can hear you scream!"

Our work is just the tip of the iceberg though. Really, we still know relatively little about snake hearing. And despite no funding agency wanting to support our work, the public thirst for this knowledge was abundantly clear after its publication. The media coverage of our article reached 779M people globally, including being featured on The Stephen Colbert Show in America – the advertising equivalent of $7.1 million AUD ($4.75 million USD). I think that proves it's time that funding bodies and governments wake up to the fact that people love learning about snakes, so start funding snake research. Without it, their thirst gets quenched by fear mongering, myths, and misinformation.

CN Zdenek, T Staples, C Hay, LA Bourke, D Candusso. 2023. *Sound garden: how snakes respond to airborne and groundborne sounds*. PLOS ONE 18(2): e0281285.

- Dr Christina Zdenek, Australian Reptile Academy (find her on Instagram @Chris.and.Christina)

Gophersnake

Snake Relocation is Complex, Problematic, but Misunderstood

Is relocating a snake always a death sentence? No, but it's complicated, and it certainly can be. Here I'll discuss some misunderstandings of the practice, what is working, and where there's room for future study and improvement. This is within the scope of Arizona-native reptiles, specifically rattlesnakes, so relevance to other locations and species may vary... but that's kind of the point, as you'll see.

First, I must divulge my involvement: I operate a private business that performs snake relocation services in Arizona. Over the years, as we've acquired more data on the problem, the mission has become increasingly focused on prevention. So while funds generated from these services do pay my mortgage, I'd gladly never relocate another snake if that were possible. I relocate many snakes each year, which is exactly why I am also a vocal critic of the practice as it exists and want better.

A Gophersnake caught in bird netting is unlikely to survive without help.

The real problem: us

As we often tell homeowners when describing rattlesnake behavior, an encounter takes two. Rattlesnakes in the desert aren't a problem until we show up and build cities on it.

When a large, venomous snake appears on a doorstep, what can the homeowner do? They may choose to ignore him, move him... or kill him.

Snake Relocation *(continued)*

Assume that a homeowner does not want to kill the snake (yay!), but has small children and a puppy, and doesn't feel that a Western Diamond-backed Rattlesnake sleeping in the pool toys is an ignorable event. That leaves one option a typical homeowner is willing to take: relocation. But the details are everything. Catching a snake to put somewhere else can be simply an act of feel-good futility, but it doesn't need to be.

The state of snake relocation practice is oversimplified and misunderstood

There are a thousand ways a relocated snake can die, which is the root of that "death sentence" line. Those who harshly critique the practice as a whole do so with good reason. It's a well-studied topic, and most studies show poor outcomes for the snake. Moving a snake outside their established home range most often results in increased movement and surface activity, which could eventually cause the animal's death.

But there is a problem with terminology here. Carefully moving a snake from an area of immediate conflict to the neighboring tree line is also relocation. And there is a huge difference between that and the old "drive them a few miles out in the desert and let them go."

These are distinct methods with different outcomes. Long-distance translocation, where a snake is moved outside of their home range, should be avoided whenever possible. Short-distance relocation, where a snake is moved within their home range, does not show the same detrimental effects on individual snakes.

This does not mean that short-distance relocation is a perfect solution. But, as part of a larger, more sustainable process, there is promise. And the blanket statement that relocating a snake will kill them is inaccurate.

So where do we go from here? Despite extensive research on the topic, there are aspects yet to be addressed. Here are some issues and inconsistencies in the current state of snake relocation, revealing areas where additional research may improve outcomes.

The natural history of the animals can't be ignored

Far too much focus is spent on the task of capturing the snake and putting them in a bucket, with little effort spent on learning about what to do next. In reality, once the snake is captured, the real work begins.

The home range of a snake isn't an arbitrarily-placed circle, but a collection of many important features. These essential microhabitats, and how critical they are to survival, vary greatly between species, conditions, time of year, and other factors.

This poor Western Diamond-backed Rattlesnake was discovered halfway out of a rodent trap box in a front yard. The head was clamped badly for an unknown amount of time. Amazingly, once they carefully got him out, he showed signs that he'd be ok once the swelling went down, and was released.

Paying closer attention to how the snake is using the capture site, and trying to emulate that situation within their estimated home range, could improve outcomes for relocated snakes. A snake found hiding in deep cover on a hot day needs to be released to a similarly cool refuge, even if it is a bit further away than the closest habitat. On that same day, a snake moved only a dozen feet away, but placed in the wrong microhabitat, likely won't survive for even a minute. Distance may be just one of many factors impacting the success of a relocation.

Snake Relocation *(continued)*

The temporal-spatial data required for developing specific relocation methods may not yet be sufficiently detailed for all species and areas. But this is an opportunity for improving relocation methods that could provide solutions for animals stuck in no-win conflict situations.

The elephant in the room, and an opportunity

Even if all snake relocation efforts were overwhelmingly successful, the real problem remains: growing human population, massive expansion of developed areas, and a changing climate.

Whether the snake is killed on the spot or relocated as perfectly as possible, we're addressing a symptom, not the problem. A property that maintains lush vegetation, sources of water and food, and deep access to cool places may always be useful to snakes. Homeowners who ignore these factors can expect future snake encounters. Snake relocators who fail to recognize and educate are missing an opportunity to have a greater impact than on the individual snake by providing more sustainable options.

What does success look like?

This is the goal: solve the immediate conflict, educate, prompt local habitat modification, and leave resident animals in place. I often refer to this as the "battle of 40 feet" to describe the relative microscale of the conflict to be solved. This can sometimes be accomplished with an action as simple as removing a bush or cleaning up pavers alongside the home. The snake (and their relocation) is often the catalyst for a more productive and educational relationship with the homeowner. The combination of information about the ecological importance of snakes and a positive experience can change minds. A common situation experienced by me and my team: a snake relocation leads to a shift in perspective of the requesting party that makes future encounters irrelevant. It's a foot in the door, often where information would be otherwise rejected or ignored. We're not typically working with people who will come

A Western Diamond-backed Rattlesnake hunting in a raised garden bed.

to a lecture at the local nature center to learn how to peacefully coexist with wildlife. This is a conversation that may be most impactful over a container, filled with a venomous snake found moments earlier on the doorstep. **It should be the goal of anyone who relocates a wild animal to never be called again by that homeowner.**

A recommended process, greatly simplified

While there's obviously much work left to do, the practice used by our team is based on the best available studies of snake natural history, relocation, and the human side of the picture. This could be another article itself, but here I present a simplified version of what we do when a snake relocation is requested.

Evaluate the situation

Does the snake actually need to be moved, or can the conflict be resolved with a combination of photos and discussion? Is there truly a "problem" to solve? Does the snake's position represent an immediate threat (including to the snake)? If not, this should be the start of an ongoing educational support relationship, as needed.

If the snake needs to be moved, or you suspect the homeowner will kill the snake if action is not taken, capture the snake as safely as possible, without unnecessary antics.

Assess the overall area, which may include using satellite imagery. Treat the snake's presence as a result of a larger system; these are not random events.

Snake Relocation *(continued)*

Provide the homeowner with as much information as possible about why the snake is there, what they can do about it, and what they may expect in the future. Establish yourself as an educational resource. **This step should be the bulk of time spent on a property.**

Find a suitable release spot

In the car, where there is time to evaluate carefully, use satellite maps and property boundary tools to assess habitat in the area. Estimate the snake's home range using features like drainages, rocky outcrops, and riparian zones.

Based on the individual snake's characteristics (species, sex, condition), season, and weather, find suitable potential release sites that are legally accessible and ethically appropriate. The release site should be the nearest accessible microhabitat that is appropriate for this species and situation, within, or as close as possible to, their estimated home range. If possible, select a second site to use if the primary location doesn't meet expectations when you arrive.

If this sounds complicated: good! It is, and should be. We're working with the life of an animal, so now's not the time to skimp on the details.

Release the snake

Hike the snake into the location to release. If the site looks suitable, use it. If not, keep looking for the ideal spot. The snake should be released directly into deep cover whenever possible. That may be a caliche cave, packrat midden, tree stump, or other temperature-stable situation. If possible, place the snake next to the cover and let them discover and retreat to it at will.

Do all of this as efficiently and discreetly as possible, for both your and the snake's safety.

Luckily the recipient spotted the Western Diamond-backed Rattlesnake sitting behind her package before grabbing it.

Why this matters, and a goal for the future

A motivating factor, and symbol of where this topic lives in the minds of many, can be summarized in this remark I heard at a conference years ago. Referring to a rattlesnake found at a residence, the speaker said:

"If the snake was relocated, there is a chance he could die, so he was humanely euthanized."

This ironic statement hit me over the head. I realized that, despite having learned so much, we may just not be doing the math. Snake relocation is a polarizing topic that seems to generate a strong opinion due to personal reasons more than careful understanding.

Thanks to the massive effort by countless individuals over many years to help unvilify snakes in the eyes of a fearful culture, more people than ever want to preserve the lives of snakes. They're putting down the shovels and shotguns, and it's less and less socially acceptable to kill snakes. Even those who still do often express that they wish they didn't have to.

But now they're asking, "what comes next?" They may not want to kill the snake, but when the local wildlife expert tells them that moving him to the bushes down the way is the same thing, what are they to do? The practice of snake relocation is full of problems, failures, and complexity. But some successes, too. More importantly, a lot of room for improvement... if we aren't so quick to insist on futility.

We have the ear of the general public. They're listening and asking what to do when a rattlesnake is found by the front door. It is up to us all, as people who want the best for both the snakes and people who encounter them, to have a good answer.

- Bryan D. Hughes, Rattlesnake Solutions

Photographs courtesy of Rattlesnake Solutions. The full version with references is available at www.snakes.ngo/relocation

Snake Hero

Roger Repp, *Herp King of Southern Arizona*

> *"Under NO circumstances are you to touch the snakes at this site.* Ever."

Roger Repp left us in November 2025.

Roger Repp's proviso reverberated in our heads above the happy hour din at Bob Dobbs. We were grab-'n-tag field biologists, schooled in the old ways of herpetology, and put here to render data unto Ecology... *right?* To us, just observing meant the snakes might get away, depriving us of the currency of our profession — those indisputable readings from ruler, scale, and thermometer.

We had come expecting the usual swapping of field findings over beer, but we'd been unwittingly cast into Roger's orchestration. Behind the scenes, he had convinced our mutual friend Young to share a magnificent Western Diamond-backed den with us. This site — an iconic maw at the base of a granite wall — was the hub of a secret society of rattlesnakes, one that careless or "handsy" interlopers would surely disrupt.

At the time, the idea of research without capture seemed crazy, even impossible. How would we tell individuals apart without tags or paint? *Could we answer scientific questions through observation alone?*

Young was the original guardian of the den and, rightly, wary of sharing this jewel with a couple of upstart researchers. But Roger saw potential in us. He and Young had learned to witness behaviors that scientists often missed by the very imperative to capture, and they proposed a challenge: if we could suppress our urge for quantification and learn to simply watch, they would show us a world we'd been missing. We didn't hesitate to take the deal — we'd have done anything to see piles of snakes! Little did we know, this new door would eventually lead us in directions we couldn't have imagined.

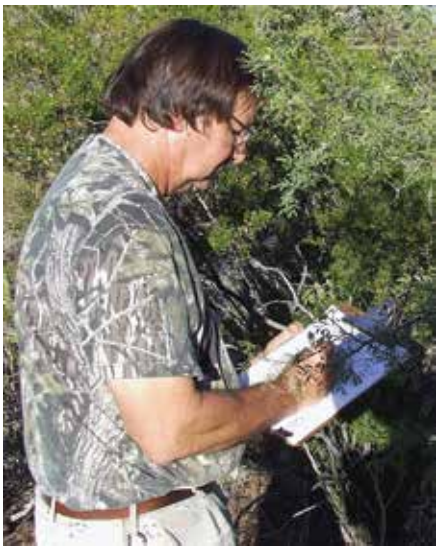
Western Diamond-backed Rattlesnakes resting inside the first den we ever studied, November 2004.

And what a world it was. Unlike most dens in the Sonoran Desert, this was not a mere crack in the rock, but a cave with an opening large enough for an adult to crawl inside. You could set up lawn chairs yards away and watch a reptilian soap opera unfold. Twenty years and dozens of dens later, we have still never seen anything like it.

Snake Hero

But before we could truly begin our study, tragedy struck: yahoos found the den and slaughtered virtually all of the snakes. That heartbreaking loss illustrated the desperate need for a new way of being around snakes. It planted the seeds for what would eventually become Advocates for Snake Preservation.

We were fortunate to have taken many trips into the field with Roger, looking for reptiles in new places or visiting reliable cracks and enjoying every minute, whether we saw anything or not! By standing back and leaving the hooks in the truck, we learned how to witness their world without disrupting it. When we began our study of Arizona Black Rattlesnakes, we were ready to put this new method to the test. We applied that quiet discipline to produce the first description of a snake social network, showing that snakes have friends and social preferences.



Roger took detailed notes of his field observations.

A Western Diamond-backed Rattlesnake drinking snow outside his den, March 2006.

For many years, Roger's uproarious email missives were inbox gold for the Tucson Herpetological Society and a dedicated personal following. In a singular style that blended field reports with miscellaneous rantings, he delighted readers with observations of previously undocumented behaviors and the antics of the pursuit. He chronicled the triumphs and follies of the absurd tribe of humans obsessed with reptiles while ennobling their targets by faithfully rendering the secret lives and struggles of the animals themselves. His stories — earned over thousands of hours of wandering in the desert — put you right there with him: navigating a flash flood in his little pickup, watching snakes drink snow, or following Doublenicks across the road for the third and final time.

Roger's engaging brand of storytelling inspired our *Social Snakes* blog and became the heartbeat of our education programs. He taught us that the most profound insights don't come from the readings off a ruler or scale, but from the realization that the disciplined human observer is the only instrument capable of seeing the whole story. By widening our focus, he opened a window into the complex social lives of rattlesnakes that we might have otherwise never seen. He didn't just show us where the snakes were; he showed us how to see them.

Arizona Black Rattlesnakes snuggling in the spring sun.

- Jeff Smith & Melissa Amarello, Co-founders, ASP

Books for Buzz Readers

Three recent books have added to our knowledge and appreciation of snakes. The most general, inexpensive, and accessible is *Slither: How Nature's Most Maligned Creatures Illuminate our World*, by Stephen S. Hall (2025, Grand Central Publishing, New York). Comprised of eight chapters and a historical epilogue, Hall brings much modern research on multiple aspects of snake biology and behavior to life through a mix of scientific rigor, storytelling, myths, and intimate portraits of the work of some leading scientists. He provides the latest details on snake sex and reproduction, venom, their sensory worlds, and how they can digest gigantic prey, often more than half their body weight. Advances in field methods such as tracking individuals in the field and using trail cams at den sites are revealing that snakes are far more social than older herpetologists could have imagined. Even how snakes move turns out to involve unimagined complications, as in sidewinding and concertina movements. The difficulties of trying to manage captive snakes gone wild, like Burmese Pythons in Florida, are illustrated through the daily life of the Python Queen of Florida. The book is a successful and sympathetic effort to bring the lives of serpents and those who study them to the fore.

Two other edited books from 2023 provide research-rich overviews of select aspects of snake research around the world. Somewhat technical in places, both books provide deep insights into the private lives of snakes, often with excellent color photographs along with graphs and tables.

The first is *Snakes: Morphology, Function, and Ecology*, edited by David Penning (Nova Science Publishers, New York). This book has 14 review chapters covering many topics, including: the evolution of head shape and dentition and relation to capturing prey, constriction, foraging, drinking, aquatic adaptations, antipredator behavior, stress, and issues of venom and dealing with venomous species along with human-snake interactions and why people either love or fear snakes.

The other book is *Islands and Snakes (Volume 2): Diversity and Conservation*, edited by Harvey B. Lillywhite and Marcio Martins (Oxford University Press, New York). Containing 15 chapters, the book covers the ecology, behavior, and conservation of snakes from islands around the world, including those off New Guinea, Japan, Brazil, Florida, India, Mexico, as well as the Galapagos archipelago situated almost 1000 km off of Ecuador in South America. These are all oceanic islands but there are two chapters on islands in freshwater lakes in Macedonia and Lake Michigan in the United States. The latter focuses on the Common Gartersnake, with which most readers will be familiar. The book covers a wide range of species and how they have adapted in size, appearance, and behavior to island life. The book is an excellent introduction to how snake researchers study their animals and test hypotheses, rather than providing authoritative reviews of existing work as excellently done in the Penning volume. All three books are recommended to any who want to learn the latest on our serpentine brethren.

- Gordon M. Burghardt, PhD, Board of Directors, ASP

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100% of proceeds fund our work.

Advocates for Snake Preservation

Just before founding ASP, Jeff and Melissa worked at a nature preserve full of snakes. Most visitors came for birds or butterflies, but left with a new appreciation for snakes. We introduced a couple who "hoped not to see any snakes during their visit" to Porter, one of our resident Black-tailed Rattlesnakes, and shared her story with them. They returned from their hike excited to share photos of the "cute snake" they spotted and wanted to learn more. Another time, we spoke with a scout leader who routinely killed any rattlesnake that showed up in his yard. He decided to reconsider his behavior after hearing about the protective behavior of mama rattlesnakes. ***Stories engage people in a way that simply stating facts and figures do not.***

In 2014, we founded ASP to change how people view and treat snakes. We use storytelling to make snakes more familiar and less scary. To minimize human-snake conflicts and ensure safer coexistence with venomous snakes, we recommend changes to landscapes and our own behavior. While education and changing attitudes are the heart of our work, we also take action and advocate on pressing issues that impact snakes by voicing their importance and the need for their protection.

We are grateful that you are on this journey with us. Without you, we couldn't have:

- Killed the Arizona snake-shooting bill;
- Changed the conversation on rattlesnake roundups;
- Organized the first symposium on coexisting with snakes;
- Ended wildlife-killing contests targeting reptiles and amphibians in Louisiana; and
- Reached tens of thousands of people annually, on and offline, with our multimedia snake stories.

Ornate Cat-eyed Snake

Supporters like YOU make this happen — not grants, not megadonors. We genuinely mean it when we say we couldn't do this work without you. Thank you!

Who We Are

- Melissa Amarello, Executive Director
- Jeff Smith, Co-founder, Treasurer
- Steve Marlatt, Chair
- Jesús A. Rivas, PhD, Vice-Chair
- Julie Ray, PhD, Secretary
- Gordon M. Burghardt, PhD, Director
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The Buzz

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The Buzz

Advocates *for* Snake Preservation

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Many winter and spring days were spent with Roger looking for new dens or visiting old reliable ones.

The Sonoran Desert has mild winters, so it is often possible to see reptiles snoozing inside their den. Our friend Roger (see *Snake Hero*) had an eye for finding these windows into reptiles' winter world. In January 2020, he led us to a crevice where a male Tiger Rattlesnake was spending the winter (above). Another fun find with Roger was a den shared by Western Diamond-backed Rattlesnakes and Gila Monsters (right), who we were lucky enough to see basking together in the spring sun.

Please Share!

When you're done, please leave *The Buzz* where others can read it and learn to love snakes too.

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