Sean Murray calls No Man’s Sky Beyond the game’s “2.0” version—we believe it

Enlarge / Want to strap into VR? It’s optional. Want to play with friends or strangers? It’s optional. Want to, er, milk the game’s bizarre creatures? That’s optional, too. But it’s all here, along with tons of other updated features, entirely for free, starting August 14.
Hello Games

reader comments

64 with 49 posters participating

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When I caught wind of a new *No Man’s Sky* update launching on August 14, free for all owners, I went through the usual routine of emailing its makers at Hello Games to request some form of access. Anything from a beta branch to a list of patch notes might support whatever I’d end up writing, I said. In response, Hello Games offered a high-class upgrade: a phone conversation with the game’s director.

That’s Sean Murray himself, the man whose name kept getting attached to stories about disappointed fans—and who thus went into media-blackout mode for some time. Since launch, *NMS* has benefited from a series of patches, and I looked forward to hearing about even *more* new content coming to the game, like a VR update (which I’d briefly tested at a Valve Index reveal event in April) and an emphasis on online play.

Of course, hours before my phone rang, my game-news feed lit

up with the *No Man's Sky* community losing its danged mind.

Murray had just hopped onto Twitter and announced that *NMS'* upcoming "Beyond" patch encompassed "three pillars," and then posted the fuzzy-math equation of "30-40%" of the patch being about VR, and 30-40% being about online play. That left a few percent unexplained. At the game's biggest Reddit community, the highest-ranked thread about these tweets was simply titled, "AAAAAAAAAAAAAAAAAAAAAAAAA!!!!!!!"

Once my phone rang, I asked Murray a pointed question. *NMS* fans are currently frothing at the mouth with speculation and hope for features. We've been down this road before. Does this mean you're not done putting your foot in your mouth?

Murray laughed nervously—the fitful laugh I remembered so clearly from our last lengthy chat in February 2016—and blurted, "Oh, you know. Never say never, right? But I'd like to be."

"We've had a crazy old journey"

- This is what it looks like to fly into the landing pad in the new Nexus hub.
- The Nexus, as it appears in a standard system of planets.
- We don't yet know what every hub and interface in the Nexus does.
- What does this thing do? Milk the game's wild creatures? (Seriously, there's milking in this game… scroll down for more on that.)
- More Nexus.
- Happening upon new structures.
- None of the new footage shows off the game's VR mode, but we've tested it at Ars, and it really is a thrill to use hand-tracked controllers to manipulate the joystick and throttle.

- A switch to a Vulkan rendering process means soaring vistas like this can run with more particle-filled effects than ever before.
- Don’t adjust your monitor’s gamma; this is just another eerie *NMS* atmosphere.

Perhaps Murray’s return to the public eye, and newfound confidence in teasing the game’s updates, has something to do with his sense of shock—shock over the positive reception of last August’s massive *No Man’s Sky* update, the 1.5 “Next” patch, was successful by every measure.

“None of us had super high hopes for [Next],” Murray said from Hello Games’ headquarters in Guildford, England. He recalled the game’s age at that point—two years since launch, and a year after its last significant update—and assumed Next would largely be received by “those already playing the game.” Instead, Murray said the free patch drove “millions” in new sales across all platforms combined. (He did not clarify how many of those came from the game’s 2018 premiere on Xbox One consoles.)

“That was a surprise,” Murray said. “We were very nervous before [Next]’s release, wondering how people would react. After all, we’ve had a crazy old journey on *No Man’s Sky*. Then we said to ourselves, ‘We’re definitely never doing *that* again.’ That was a huge update, and it was stressful, so we’re done with those. Let’s do what any normal studio would do: small updates.”

Some smaller-scale quality-of-life patches followed, each propelling the game back into Steam’s top-25 “concurrent player” rankings. Then the team began toying with ideas for three separate patches to round out the next few months of development: a VR mode, an expansion of the game’s 2018 multiplayer options, and a “2.0”-worthy slate of under-the-hood fixes. Murray explains that each began modestly, only to spiral beyond their individual scopes.

For VR, the studio planned to deliver a “direct, straightforward port in VR,” which he compared to 2017’s *Elder Scrolls V: Skyrim* VR version. Upon hearing this comparison, a red flag went off for me; the amount of VR-specific optimization needed to map *Skyrim*‘s traversal and combat to VR controllers was not insubstantial. And in the case of *No Man’s Sky*, plans for a simpler scope (meaning, unchanged UI and non-VR gamepad restrictions) evaporated the first time Murray sat in its VR cockpit.

“This awesome moment, to sit in the ship, to grab the [virtual] joystick with one hand, the throttle with another, and fly the ship properly?” Murray gushed. “That was it. We were done. We had to do that for the entire rest of the game.” This meant a top-to-bottom rework of 20 control mechanics to support 3D-tracked VR controllers, including terrain deformation, submarine controls, and freighters. (VR modes will also work just fine with standard gamepads, too.)

While Murray didn’t offer specifics about VR comfort, I can at least point to my brief test of the mode in April as a good indicator of what’s to come. An in-helmet UI while walking over a planet and a stable cockpit view while blasting into space grounded my sense of presence in a way that didn’t feel dizzying. Still, we’re waiting to see how that all feels for more than a 10-minute demo.

Why, you may ask at this point, did Hello Games choose to increase the scope of this completely free, no-extra-charge VR feature update? That became a recurring theme in our conversation.

https://arstechnica.com/?p=1547751

What Sharp’s IGZO display technology will mean for the Nintendo Switch

reader comments

8 with 7 posters participating

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[embedded content]
A Sharp-produced video shows off IGZO’s advantages over traditional amorphous silicon TFT displays.
Nintendo will partner with Sharp to put the company’s IGZO (indium gallium zinc oxide) displays in the Switch, according to a report from the Wall Street Journal.

The Journal reported back in March that Sharp was set to be a new supplier for the Switch’s display technology, which is currently a silicon display provided by Taiwanese suppliers. Now, Executive Vice President Katsuaki Nomura says the company will be providing IGZO displays to “a video game client,” according to the Journal.

It’s not clear if the new display technology will show up in the portable-only Switch Lite (due in September), the new standard Switch model with improved battery life (coming this month), or both. Sharp’s IGZO displays first showed up in Japanese cell phones in late 2012, and these were soon being integrated into large-scale touchscreens, designed for desktop computer use. The new type of thin-film transistor (TFT) backplane in these displays allows for “electron mobility” that’s 20 to 50 times faster than traditional “amorphous

silicon” IPS displays, like those found in the Switch currently, Sharp says.

That, in turn, allows the display to be quickly switched on and off while showing still images, leading to “reduce[d] power consumption to a fifth or even a tenth that of conventional screens.” Such power reductions could help improve the Switch’s portable battery life, a selling point Nintendo has been stressing for both of its upcoming models.

Improved electron mobility also means IGZO displays can have slightly faster response times than traditional displays. Monitor comparison site Display Ninja suggests the change could help get those times down from 4ms to around 1ms. That’s not the kind of change most users would consciously notice, but it could help at the margins for games with high frame rates.

IGZO displays are also capable of providing greater color accuracy, increased brightness, and better pixel density than more widespread panel types, according to Display Ninja. The last of these could be particularly important for the Switch Lite, which packs the Switch’s 720p portable resolution into a 5.5″ diagonal display instead of the standard Switch’s 6.2″.

https://arstechnica.com/?p=1548159

$13,000 NES cartridge found at the bottom of a Safeway

sack

reader comments

65 with 54 posters participating, including story author

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SEATTLE—In the decades since 1990's Nintendo World Championship tournament, its unique prize for participants—a competition-class cartridge with timed versions of classic games *Super Mario Bros.*, *Rad Racer*, and *Tetris*—has become a sought-after collector's item. It's among the few "holy grail" games for high-end NES collectors, with an apparent grand total of fewer than 200 in the world. It represents a golden era when Nintendo could host a tournament that captivated a nation (and followed the two-hour commercial of a film that was *The Wizard*).

Hence, the discovery of *any* Nintendo World Championship cartridge is a newsworthy event for a certain class of retro-gaming enthusiast. But this week's discovery of a new copy, brokered by Seattle retro-gaming shop Pink Gorilla Games, might be the weirdest one yet.

"You wouldn't believe this," Pink Gorilla co-owner Cody Spencer told Ars Technica in his shop's storage room on Wednesday, after a whirlwind 24 hours concluded with the game's sale to a collector. "It's like anybody's dream come true, when they hear about rare and valuable video games."

"Bored out of my mind"… but not for long

Enlarge / The most recently discovered Nintendo World Championship cartridge was buried in a brown paper sack, beneath this pile of unremarkable, unboxed NES fare.

The seller, a man in his mid-30s, wasn’t recognized as a regular customer when he walked into the chain’s south-Seattle

location on Tuesday with “a Safeway bag full of the most boring NES games you can imagine.” Spencer held up his phone to show me the rest of this seller’s haul, including common NES fare like *Rush’n Attack*, *NES Play Action Football*, and *California Games*. (We’ve embedded this image, above.) A selection like this, without boxes or instruction manuals, isn’t what whets retro shops’ appetites.

“I’m going through these, bored out of my mind, and a little sick from the night before,” Spencer said. “At the bottom… that’s it. It’s the last one I pull out of the bag!”

The Nintendo World Championship label was clean and clear enough to make Spencer immediately assume it had been slapped onto a “reproduction” cartridge containing the game’s leaked ROM, which you can buy from hobbyists and other retro-gaming shops for roughly $75. (Pink Gorilla doesn’t stock repro carts.) After physically picking the cartridge up, however, Spencer changed his tune.

“Wait a minute. This is really heavy. What’s going on?”

In a recent YouTube video (embedded below), Pink Gorilla co-owner Kelsey Lewin explained how she had confirmed the authenticity of a previously discovered NWC cartridge. Professional sellers like her are about as good as you’re going to get, since Nintendo didn’t include certificates of authenticity with these prizes. Spencer had that wisdom in mind when he carefully unscrewed and examined this new find: “[I looked at] how old the chips are, how much they’ve been used… I do a lot of soldering, and you can tell when the solder joints have been worn out with time. This [cart] wasn’t made last year.”

[embedded content]
Pink Gorilla Games on determining the authenticity of a Nintendo World Championship cartridge.
Armed with this knowledge, Spencer approached the seller and asked, “Are you pranking me?” The seller replied that he

honestly had no idea about the Nintendo World Championship *or* about this cart's specific origins. He explained that he was simply "a collector when nobody was collecting this stuff." Attempts to connect his name to anyone involved with the original NWC came up short, and Spencer "couldn't get any history out of him." (Since the cartridge is gray, not golden, that means it's likely sourced from the competition, not a Nintendo Power-affiliated raffle.)

Spencer and Lewin were immediately suspicious: "How can you *not* know where you got this?" But they came to the conclusion that the seller may very well have picked the cartridge up at a random garage sale. (Perhaps a Seattle-area resident tossed it before the eBay era, Spencer concedes; he says "it's not out of this world" in Seattle to stumble upon Goodwill rarities from nearby tech companies like Nintendo and Microsoft.)

"A sense of disbelief—you can't even register excitement"

After doing his due diligence to confirm the seller's identity, Spencer made an offer on par with other recent gray-cartridge sales: a $13,000 check on the spot. (This amount was decided upon after the pair reviewed other recent NWC cartridge sales… but not the fake bids.)

"I was surprised by his lack of surprise," Spencer said about the offer. "He was certainly taken aback, but he wasn't jumping up and down. But I get it—I got the same feeling when I found it. It's a sense of disbelief. You can't even register excitement."

I admitted my own surprise: that the seller bit on PG's offer, considering his brown paper sack was suddenly worth thousands of dollars via newfound information. Spencer nodded his head in agreement. "Right?" he said. "That's what I thought. If I

walked in and didn’t know what I had, then all of a sudden, it’s worth that much, I’d probably say, ‘OK, I’m gonna take this and research it.’ I think what led him to being comfortable with it was how up front I was about everything.”

Spencer paused for a beat. “Literally, we could’ve gotten that [cartridge] for, like, 20 bucks. Or a dollar! He had no idea at all.”

Shortly after the sale’s conclusion, Spencer asked a staffer to cover his shift so he could “go and hide the cartridge.” Meanwhile, Lewin announced the news via social media. It didn’t take long for emails, DMs, and phone calls to pour in. That deluge included one interested buyer from Florida who began “non-stop calling,” but the store elected to sell to a different collector. That party had been in Pink Gorilla only a day earlier to buy a slew of PC Engine games while visiting Seattle for a business trip. The NWC cart’s buyer is only in Seattle until Thursday of this week. (Talk about a lucky coincidence; Spencer said he preferred selling to “a more local guy” to make things “easier.”)

The quick sale—within 24 hours of stumbling upon the cartridge—came for the same reason that Spencer was eager to “hide” the game after acquiring it: out of fear for the game’s preservation. “It feels uncomfortable to hold onto something so small—that could be water damaged, fire damaged, or stolen—that’s worth so much,” Spencer said.

Pink Gorilla’s owners say they’re content to have sold the game for a profit (the buyer asked PG to not disclose the final price) and to be a part of retro-collecting history. Though the shop occasionally serves as a handler and go-between for rare-game sales, including two other NWC carts and two copies of *Little Samson*, it mostly dabbles in affordable games and swag. And with the game shuffled so quickly from a seller to a buyer, Pink Gorilla’s hands are washed clean of the scrutiny typically applied to retro carts’ legitimacy and

rarity. Retro gaming collectors will surely want to figure out how the heck this NWC cart went undiscovered for so long—and whether this offers hope for *more* copies hiding in the wild. But at least those fans won't be blowing up Pink Gorilla's phones any time soon.

"I was surprised by how many people were willing to throw that much money at a game," Spencer said about the deluge of calls and interest. "I haven't met that many super-wealthy collectors who can drop that much. That's big."

Listing image by Cody Spencer / Pink Gorilla Games

https://arstechnica.com/?p=1547873

Severe local 0-Day escalation exploit found in Steam Client Services

Enlarge / Breaking bugs are as described—a security flaw in Steam's client service allows easy execution of arbitrary code as LOCALSYSTEM.

reader comments

134 with 91 posters participating, including story author

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Earlier today, disgruntled security researcher Vasily Kravets released a zero-day vulnerability in the Windows

version of the ubiquitous gaming service Steam. The vulnerability allows any user to run arbitrary code with LOCALSYSTEM privileges using just a very few simple commands.

The vulnerability lies within Steam Client Service. The service may be started or stopped by unprivileged users. This becomes a problem because, when run,Steam Client Service automatically sets permissions on a range of registry keys. If a mischievous—or outright malicious—user were to symlink one of these keys to that belonging to another service, it becomes possible for arbitrary users to start or stop *that* service as well. This becomes even more problematic when you realize that it’s possible to pass arguments to services that run under extremely privileged accounts—such as msiserver, the Windows Installer service.

Enlarge / Following a demonstration I saw from Redditor /u/R_Sholes today, I used an unprivileged user account to write a file to C:\Windows\System32 as LOCALSYSTEM. That’s game over, for those of you playing along from home.

Jim Salter
The image walkthrough above follows a few simple steps:

1. Demonstrate that I cannot write to C:\Windows\System32\. System error message is in red.
2. Demonstrate that I cannot arbitrarily monkey around with registry keys under HKLM\CurrentControlSet\Services. System-error message is in red.
3. Delete the NSIS installer key for Steam (to give myself a target for shenanigans), then recreate it as a symlink to msiserver's registry key. Success in green.
4. Demonstrate that Steam's NSIS key now points to Windows' msinstaller key. Success in green.
5. Attempt to modify the msiserver key to run my shenanigans. I haven't started Steam Client Services yet, so this fails. System-error message in red.
6. Start Steam Client Services, *then* modify the msiserver key once Steam has helpfully opened it up for me. Success in green.
7. Start the newly-modified msiserver service. msiserver runs as LOCALSYSTEM, so it successfully creates a file under C:\Windows\System32. Success in green.

I did this test on a clean Windows VM; aside from Steam itself, the only code I needed to download was regln-x64.exe, a simple utility for the linking of registry keys, which requires no installation. Windows User Account Control was never triggered during this process, and the whole thing only took a few minutes. I did not have any Steam games installed, so I just monkeyed with the Steam installer.

A genuinely malicious user might use this procedure to directly pop a locally or remotely accessible shell with LOCALSYSTEMprivileges, after which they can do whatever they like with no further tricks necessary.

Professional driver on a closed course

Do not follow this procedure on a Windows machine you care about; this demonstration left both Steam's installer and the Windows Installer service broken, because this is a throwaway virtual machine.

The vulnerability demonstrated here is only 45 days old. Normally, publicly disclosing an exploit this quickly would be a big no-no in the Infosec community—the typical grace period for response is 90 days. In this case, it's difficult to point any blame to the researcher. Upon first reporting the bug via HackerOne, it was rejected as out-of-scope, with «Attacks that require the ability to drop files in arbitrary locations on the user's filesystem» as the reason given.

The attack does not require any file to be dropped anywhere or any special privileges. Although we downloaded regln-x64 to make the proof of concept prettier, I could have accomplished its task—symlinking registry keys—directly inside regedit.exe.

When the researcher argued with HackerOne's staff, a second HackerOne employee eventually reproduced the exploit, confirmed the report, and sent it off to Valve. But a few weeks later, a third HackerOne employee rejected it again. The employee reiterated «Attacks that require the ability to drop files in arbitrary locations on the user's filesystem» and added «Attacks that require physical access to the user's device» as reasons the vulnerability is supposedly out-of-scope.

Rejected

The second reason for rejection is no more valid than the first: a malicious "game" developer could easily create a free-to-play "game" that reproduces all the steps of this

exploit. Such a bad actor could pop a shell with LOCALSYSTEM privileges and own the user's machine.

With this second rejection, Vasily decided there was no further recourse but public disclosure, and he informed HackerOne that he would disclose after July 30. He alleges that on August 2, yet another HackerOne employee forbid the disclosure of the vulnerability, despite HackerOne having closed it repeatedly as out-of-scope while Valve itself never weighed in one way or the other.

Ars has reached out to Valve about this story, and we will update with any response.

https://arstechnica.com/?p=1547805

Tensions rise between humans, mythical creatures in new Carnival Row trailer

reader comments

44 with 36 posters participating

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[embedded content]
Orlando Bloom and Cara Delevingne star in Amazon Prime's neo-Victorian noir-fantasy series *Carnival Row*.
Mythical creatures fleeing their war-torn homeland live

uneasily alongside humans in *Carnival Row*, the new "neo-Victorian noir" fantasy series from Amazon Prime, starring Orlando Bloom and Cara Delevingne and directed by Jon Amiel. Amazon must be excited about the series, because it has already ordered a second season. The studio just dropped the latest trailer, and visually, at least, it's gorgeous and chock-full of sumptuous detail at a level rarely seen on streaming television.

Carnival Row is based on a feature film script by Travis Beacham when he was still in film school, some 17 years ago, and it made the infamous Hollywood Black List in 2005. Legendary Entertainment bought the script in 2015 and reimagined it as a series for Amazon Prime. Oscar-winning Director Guillermo del Toro was originally tapped to direct the series—the neo-Victorian setting and fantastical creatures would have been very well-suited to his idiosyncratic style. But del Toro left the project before production officially began to focus on his feature-film commitments. He was replaced by Paul McGuigan, who was in turn replaced by Amiel.

Judging from Beacham's comments at San Diego Comic-Con last month, the budget for the series is significant. Some of that budget no doubt went toward the numerous reshoots—often a sign of trouble for a project—although Bloom called the reshoots "a gift" during the Comic-Con panel. Beacham agreed, per Deadline Hollywood:

> *The advantage of when you have a true series order like this is that you shoot all eight episodes, then you can go back and look at the whole and watch as well as we can watch. Are we setting up the things that pay off as well as we can set them up? It's a function of the size of it and the scope of what we've been allowed to do. There's stigma when it comes to reshoots, but increasingly in this world of peak TV, where shows are getting bigger and bigger, it becomes necessary.*

Here’s the official synopsis: “Feared by humans, [these mythical creatures] are forbidden to live, love, or fly with freedom. But even in darkness, hope lives, as a human detective and a faerie rekindle a dangerous affair. The city’s uneasy peace collapses when a string of murders reveals a monster no one could imagine.” Or, as Comic Years put it, “Think *Game of Thrones* but with better technology and set in Narnia.” (The supporting class includes Indira Varma, who played Ellaria Sand in *Game of Thrones*, as well as Tamzin Merchant, who was the original Daenerys Targaryen in the failed pilot, before she was replaced by Emilia Clarke.)

- An army of faeries overhead.
  YouTube/Amazon Prime
- Orlando Bloom plays Rycroft “Philo” Philostrate, a human who falls in love with a faerie.
- Cara Delevingne plays Vignette Stonemoss, who falls hard for Philo.
  YouTube/Amazon Prime
- I know it’s prurient, but what does she do with her wings?
  YouTube/Amazon Prime
- An invading army ruins everything.
  YouTube/Amazon Prime
- Grief-stricken because she believes Philo is dead.
  YouTube/Amazon Prime
- The governing officials of the Burgue aren’t happy about the influx of refugee creatures.
  YouTube/Amazon Prime
- Indira Varma plays Piety Breakspear.
  YouTube/Amazon Prime
- A thug takes out his resentment on the street.
  YouTube/Amazon Prime
- “They will never accept us.”
  YouTube/Amazon Prime
- Philo is now a police detective.

YouTube/Amazon Prime

- There have been a string of brutal attacks on magical creatures.
  YouTube/Amazon Prime
- Philo and his men make an ugly discovery.
  YouTube/Amazon Prime
- Those attacks escalate to murder.
  YouTube/Amazon Prime
- “Something neither human nor fae.”
  YouTube/Amazon Prime

The first trailer dropped last month, featuring a sonorous voiceover by Bloom’s Philo that mostly lays out more details of this fantastical brave new world. This is probably a wise move, given the complexity of the world-building here, particularly since *Carnival Row* is not tied to an existing franchise or an adaptation of a bestselling novel, which will make finding its audience more of a challenge. Philo explains that he is an orphan of the Burgue, where humans and other fantastic creatures (faeries, fauns, etc) used to live peacefully together, “until war changed everything.”

It was during his military service that he met and fell in love with the faerie Vignette (Cara Delevingne). The new regime didn’t take kindly to inter-species romance, and the lovers were forced to flee separately. Now, all the species have retreated to the Burgue, stoking what can only be described as anti-immigrant sentiment among the humans. Creatures are treated as subhuman, and Philo has vowed “to protect those that couldn’t protect themselves, whatever it took. For her.” Oh, and apparently some kind of darkness is coming.

This new trailer reinforces those elements of the story and fleshes out a few more details. We see Philo and Vignette meet for the first time, as well as their inevitable coupling and being torn apart. She believes Philo is dead and finds herself a refugee in the Burgue, working (it seems) as a ladies’ maid.

She’s peeved when she learns he’s still alive and confronts him in his bed one night with a knife to his throat, demanding to know why he left her “in the ashes of my homeland.” She looks like she forgives him, though, and they start to rekindle the old flame.

Philo has a lot of other things on his mind, of course. He is now a police detective working to solve a string of heinous murders, and anti-immigrant sentiment among humans in the Burgue is on the rise. “Our streets are safe no more!” one pompous politician declares. And it looks like the culprit behind the murders might be something (or someone) completely different: “She was taken by something unnatural. Neither man nor fae.”

Carnival Row debuts on Amazon Prime August 30, 2019. We’ll soon see if Amazon’s investment in the series paid off.

Listing image by YouTube/Amazon Prime

https://arstechnica.com/?p=1546949

Review: iZombie sets up strong fifth season, then whiffs the series finale

reader comments

0 with 0 posters participating

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- Liv Moore (Rose McIver) whipping up another creative recipe to make brains more palatable.
- Clive (Malcom Goodwin) tries to calm Liv while she's under the influence of street thug brain.
- Ravi (Rahul Kohli) does street thug brain too, with style.
- Swole Liv relishes being on personal trainer brain.
- Liv and Ravi check out their rivals when they go undercover in a dance competition.
- Ravi and Liv become super competitive on car salesman brain.
- Liv on 1990s beauty pageant contestant brain.
- Mmmm, a brainy chef's creation
- Liv on perfectionist chef brain doesn't like the arrangement of those table settings.
- What better way to eat drag queen brain than with a lovely rainbow cake?
- Liv on diva drag queen brain throws some shade
- Liv channels Raymond Chandler while on private eye brain.
- Ravi creates the perfect grilled cheese-and-brains sandwich

Everyone's favorite crime-fighting zombie show made its final bow last week after five glorious seasons of murder, mayhem, and tasty brains. Alas, despite an otherwise solid (and occasionally inspired) fifth season, *iZombie*'s finale proved to be an over-rushed, dissatisfying conclusion to one of my favorite shows on television.

(Spoilers for all five seasons of *iZombie* below, but no spoilers for the series finale.)

The show is based on the comic book series created by Chris Roberson (writer) and Michael Allred (artist) for DC Comics. In the comics, the central zombie is a gravedigger named Gwen

in Eugene, Oregon, who can maintain the appearance of normalcy so long as she consumes brains once a month. Her gravedigger profession comes in handy in that respect. There's one big side effect, however: she inherits some of the memories and personality traits of whatever dead person's brain she consumed.

That basic premise is preserved in the TV adaptation, except the main zombie is Liv Moore (Rose McIver), a medical intern in Seattle, Washington, who takes a job as a morgue assistant after she's turned into a zombie following a boat party gone horribly wrong. But show runners Rob Thomas and Diane Ruggiero-Wright paired that premise with a standard police procedural, expertly mixing together horror, humor, and crime-solving into a winning combination. *iZombie* has justly earned critical raves—the first three seasons hold 100% approval ratings on Rotten Tomatoes, and season four has a 92% rating—even if that praise was rarely reflected in viewership numbers.

Liv eats the brains of murder victims to access their memories—their personality traits are a bonus, and the source of much hilarity, thanks to McIver's versatility and comedic gifts. Each episode also typically features a new recipe to make the brains more palatable as a meal. (There are unofficial cookbooks for the dishes featured in season one and season two, and an accompanying Twitter feed.) Then she passes the relevant information onto Seattle PD homicide detective Clive Babineaux (Malcolm Goodwin), who thinks she's a psychic (at least in early seasons).

Hi Zombie!

- Major Lilywhite (Robert Buckley) struggles to adapt to his new position as head of military organization Fillmore Graves
- Ravi and Clive in the morgue

- Clive is looking forward to seeing Liv on beauty pageant contestant brain.
- BFFs 4-evah! Liv and Peyton (Aly Michalka) share a moment.
- Peyton joins Liv for a meeting with her long-lost biological father, Martin (Bill Wise), who has an unsavory past—and might be up to no good in the present.
- Zombie extremists engineer a version of full-on Romero zombies that can be controlled.
- A human militant extremist crew has been itching for war with the zombies.
- Blaine (David Anders) traffics in the brains of children with a rare disease because they hold the secret to a cure.
- Investigative reporter Al Bronson (Gage Golightly) has a lead for an expose on Blaine.
- Don E. (Bryce Hodgson) thinks Liv can help him find the woman of his dreams by eating a murdered match-maker's brain.
- Liv has a heart-to-heart with her estranged mother Eva (Molly Hagan)
- Liv and Ravi make a pretty good team.
- Enzo Lambert (John Emmett Tracy) is the new head of Fillmore Graves.
- Major is a little worse for the wear after he loses control of Fillmore Graves in a coup.
- Clive and his wife, Dale (Jessica Harmon), welcome the birth of their child.
- Liv rages out.

Meanwhile, Liv's boss at the morgue, Ravi Chakrabarti (Rahul Kohli), is the only person who knows her secret, and is surprisingly understanding of her predicament. He used to work for the CDC, but was fired despite his repeated warnings to superiors that this kind of outbreak was bound to happen. He sets himself the task of finding a cure for the zombie virus—ultimately tracking the source to a combination of an

energy drink called “Max Rager” with a tainted batch of a hipster drug called “utopium.” And Liv learns she’s not the only zombie in Seattle: there’s also Blaine (David Anders), a charming former drug dealer (of utopium, of course) who is the one who scratched Liv on the boat, turning her. Old habits die hard, so Blaine sets up a lucrative business turning Seattle’s wealthy inhabitants into zombies and then charging them exorbitant prices for brains to survive.

The first two seasons mostly stuck with the procedural comedy/drama format, with a broader narrative arc focusing on Ravi’s hunt for the cure and the Max Rager connection to the zombie outbreak. The company’s amoral CEO, Vaughan du Clark (Steven Weber), is developing an advanced formula of the drink in hopes of snagging a lucrative contract with private military contractor Fillmore Graves (get it?). But Fillmore Graves turns out to be staffed by zombies, and they execute a behind-the-scenes coup to make Seattle a safe haven for their kind. By the end of season three, the zombie virus had spread to some 10,000 Seattle residents, thanks to a deliberately tainted vaccine. Instead of protecting humans from the zombie virus, it infected them.

Season four is when the series really started to move beyond its police procedural roots, for both better and worse, as humans and zombies struggled to coexist within a walled-in city—the US government essentially puts Seattle under quarantine. On the one hand, we lost some of the tight focus on relationships between a reasonably sized group of central characters that made earlier seasons so emotionally resonant. The cast expanded, and so did the subplots (romantic and otherwise), adding a lot of complicating and confusing elements that didn’t always work.

Battle for Seattle

On the other hand, the show’s exploration of the variability

and unpredictability of human behavior in the face of an epidemic is laudably ambitious, and pretty darned believable. There is prejudice and distrust/fear of the Other on both sides; bad actors trying to make a profit off the outbreak; ineffectual and/or corrupt political leaders; desperate humans trying to get out of Seattle lest they become infected; equally desperate humans trying to sneak into Seattle because they have terminal illnesses and actually *want* to become zombies; and even a crazy zombie religious cult. Plus there's our central group of well-intentioned would-be heroes, caught in the middle of all these ethically challenging complications and trying to make the best moral decisions they can under impossible circumstances.

There is a welcome return to the classic case-of-the-week format in the fifth and final season, giving the writers a chance to have plenty of fun with inventive brain recipes and Liv's many personality shifts. Liv on murdered ballroom dancer brain is especially delightful, as she strong-arms Ravi—who can't dance—into going undercover with her for a dance competition. This yields a clever *Dirty Dancing*-meets-*Footloose* montage as Liv and Clive try to teach Ravi some moves.

Those witty elements help bring a bit of light to an otherwise gloomy scenario. Liv is solving crimes with Clive, and also running an underground operation to smuggle dying humans into Seattle to turn them into zombies. Ravi is on the verge of a zombie cure—but not all zombies want to be cured at this point. Is it possible to maintain a small population of zombies, without risking a global pandemic? Liv's roommate and BFF, Peyton (Aly Michalka) is acting mayor of Seattle, since no one else wants the job. Blaine's brain smuggling operation is now essential to zombie survival, because the US government has cut off all support from Seattle. Without them, Seattle's zombies will deteriorate into "full-on Romero" mode, dooming the rest of the human inhabitants. That makes Blaine

effectively untouchable, despite his many ongoing criminal schemes.

> *It's like the writers tried to pack an entire season of plot twists into one 42-minute episode.*

There are human extremists committing terrorist attacks on zombies, and zombie extremists plotting to unleash the zombie virus on the rest of the world. Liv's former fiance and on-again, off-again romantic interest, Major (Robert Buckley), has taken over Fillmore Graves and is trying for a less militant, more diplomatic approach to human/zombie relations. This alienates some of his own men, who are hungry for revenge after seeing so many comrades fall, and itching for an internal coup. Seattle is, in short, a powder keg of simmering tensions and occasional violent outbursts. A cheery YouTube comedy show with an uplifting message about zombie and human neighbors learning to get along—called *Hi Zombie!*—probably isn't sufficient to defuse the situation. A zombie vs. human war might be inevitable.

I thought *iZombie*'s fifth season was remarkably strong overall, which is why it's so very disappointing that the show completely whiffed the big series finale. It's like the writers tried to pack an entire season's worth of plot twists into one 42-minute episode, mechanically checking off various plot threads to be "resolved" one by one. I mean, a major character is killed, zombified, and cured in the space of maybe 15 minutes, and then we just move on to the next plot point on the list. What was even the point of that? There's no time to process any of the twists, and hence no real sense of cathartic resolution.

The final sequence flashes forward ten years to a virtual talk show host discussing the "Battle for Seattle" with his virtual guests—which is how we ultimately learn about the fates of our favorite characters. I hate to say this about a show I love so much, but that's just lazy writing—from a super-talented team

of writers who were otherwise crushing it all season long. It's mystifying. I know Rob Thomas was stretched thin, between the final season of *iZombie* and the new season of *Veronica Mars*. It seems like he just checked out on the former entirely at the end, and that's a shame. *iZombie* deserved better.

Listing image by YouTube/The CW

https://arstechnica.com/?p=1544865

Whitney Cummings—and her sex robot—take on modern womanhood

Yes, Whitney Cummings did have a sex robot made in her likeness for the laughs.
David Giesbrecht / Netflix

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102 with 66 posters participating

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I never really understood catcalling until Whitney Cummings explained it in front of a live audience. Rather than waxing snarky about backward oafs who don't get why harassment is bad, she says she understands the impulse, and launches into a story about seeing a service dog in an airport terminal. One that was wearing a vest that says "Dog Working. Do Not Pet."

The kind of dog you're never supposed to touch. "Now I'm in a pickle, because I'm going to pet that fucking dog. I mean, it's a dog. It obviously wants it," she says, as the audience bursts out laughing. "I get your logic." Maybe women need vests, too.

The punchline gets more, but different laughter. Sarcasm about "wanting it" is standard fare for women comics, but trading working woman for working dog is sneakily, bleakly brilliant. You can almost hear the laughter change as it sinks in—how hilarious, how accessible, how grim.

Throughout her new Netflix standup special, *Can I Touch It?,* Cummings takes easy gender jokes and delivers them slightly askew, updated for the off-kilter moment women are living in right now. #MeToo-ed has become a verb, but guys still think it's OK to call a coworker "wife material." Women worry about being replaced by sex robots, but still have to be afraid while walking to their cars, clutching keys between their fingers like "a shitty Wolverine." These are the days of future/past. So, naturally, Cummings shares the stage with an ultra-modern version of one of the most outdated comedy props imaginable, the ventriloquist dummy: a laughing, talking sex robot that looks just like her.

Some of the jokes, especially early in the set, you'll have heard before. Cummings tells one anecdote from almost two decades ago, when she joined an old man in his trailer as a teenager, naively thinking the request was work related. What do you think happens next? You're right, of course. Same deal with beats about walking to your car at night, and the no-win choice between risking it alone and allowing a solicitous "chaperone" to walk you there. Or the perils of getting into an elevator with men. Their familiarity doesn't keep them from being funny because, while the jokes feel like they could have

been written in any of the last four decades, the situations they're spoofing are still happening. It feels good to let out a long(-suffering) laugh over them.

[embedded content]
The trailer for Whitney Cummings' new Netflix special, *Can I Touch It?*
Cummings isn't afraid to take women to task for their outdated behavior, either. The post-#MeToo world is a different place—better, but one that takes adjusting to. Cummings squats down to strategize with a huddle of imaginary women: "Um, they give a shit about us all of a sudden, and we have absolutely no practice being listened to," she says. "So we need to level the fuck up right now." Time to put the Rosé All Day shirts away. No more calling each other "hooker." "Free the nipple? Not this month." Beneath the irony, Cummings is saying something not all women want to hear right now: Being taken seriously will require seriousness, creating change will require changing, and uniting 50 percent of the population will take more than a hashtag.

One thing she doesn't want women to take too seriously, though, is the coming of the sex robots. Over the last few years, sex robots have been creating moral panic in some circles. People worry men will abandon human women in favor of compliant inanimate replicas, or else develop (even more) hostility and unrealistic standards for women's appearance and behavior. Cummings doesn't buy it, and after you meet her sex robot, you won't either. Her silicone doppelganger's deadpan awkwardness makes it a great foil for Cummings' highly expressive face and wild gesticulations, and also makes Cummings' point. Sex robots, as they are now, are just appliances you'll develop bizarre empathy for. (Cummings felt bad about leaving the robot in the garage, but also wishes it could make guacamole.) In fact, Cummings thinks every man should have one to care for. At least until they learn to ask before they touch.

This article first appeared on Wired.com.

https://arstechnica.com/?p=1545573

Roll over, Beethoven: Decoding the maestro's musical style with statistics

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[embedded content]
EPFL researchers analysis of Beethoven's writing style, applying statistical techniques to unlock recurring patterns. Famed Classical/Romantic composer Ludwig van Beethoven had a distinct statistical signature to his compositional style, according to an innovative analysis published in a recent paper in PLOS ONE. The study is part of the rise of so-called "digital humanities," although much of the work to date in this burgeoning subfield has focused on textual analysis.

"New state-of-the-art methods in statistics and data science make it possible for us to analyze music in ways that were out of reach for traditional musicology," said co-author Martin Rohrmeier, head of EPFL's Digital Humanities Institute, which is devoted to achieving a better understanding of how music

works. “The young field of digital musicology is currently advancing a whole range of methods and perspectives.”

Per co-author Markus Neuwirth, “Our approach exemplifies the growing research field of digital humanities, in which data-science methods and digital technologies are used to advance our understanding of real-world sources, such as literary texts, music, or paintings under new digital perspectives.”

For their study, the Swiss team focused on the composer’s 16 string quartets—over eight hours of music in total, with 70 individual movements. From there, they built up a dataset (the Annotated Beethoven Corpus, or ABC) based on nearly 30,000 chord annotations made by music theorists. Then they applied a variety of statistical techniques to hunt for patterns within that dataset.

The team focused its efforts on looking for structural regularities in the dataset, noting that tonal harmony is the most central concept when it comes to Western music, most dominant from the mid-18th through the late 19th century. But the researchers note in their paper that previous theoretical approaches to this subject “suffer from a lack of empirical foundation,” relying more on qualitative descriptions of just a few examples. In contrast, they believe they can offer a more “quantifiable and testable hypothesis.”

So what makes Beethoven sound like Beethoven? The Swiss researchers relied on a harmonic perspective to decode the maestro’s distinctive compositional style. Dominant and tonic chords (aka V and I chords) are the most common in classical music, playing a vital role in musical phraseology, and there are many variants within those two broad classifications. The researchers assigned a symbol to each chord in the musical scores, counting how often each appeared. According to the EPFL team, Beethoven’s string quarters contain more than 1,000 different types of chords.

“We found that, indeed, dominant and tonic chords are very, very common in this dataset,” said co-author Fabian Moss, who also happens to be an accomplished pianist. “We also found that very few chords make up the largest portion of the data. And we found, importantly, that the order in which the chords appear matters a lot, so you cannot play the music backwards.”

Furthermore, by studying the distribution of chords Beethoven used in his string quartets—how often each occurred, for instance, and how often one transitioned to another—they were able to define a statistical signature for the composer. In the future, the Swiss team hopes to expand the application of their statistical techniques to other 19th-century composers, such as Frederic Chopin or Franz Liszt, and perhaps add other musical dimensions into the mix, like rhythm, meter, and instrumentation.

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Listing image by YouTube/EPFL

https://arstechnica.com/?p=1517199

Here’s why Nintendo Switch consoles keep frying

Enlarge / The “overcooked” game listing in this shot is a little on-the-nose, for a lot of Switch owners who tried using third-party cables, chargers, or docks with the portable console.

reader comments

86 with 64 posters participating, including story author

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For over a year, Nintendo Switch owners have wondered about—and outright feared—plugging their “hybrid” portable console into unofficial docks. And for good reason: scary, anecdotal reports about third-party Switch docks “bricking” the machine popped up soon after the console received its version 5.0 update in early 2018. What gives?

Many people suspected that the Nintendo Switch is not properly USB-C PD (power delivery) compliant. Thanks to a recent deeper dive from an engineer’s research, we have more insights as to the real cause—and reason to believe that users’ initial suspicions weren’t quite accurate. As Redditor “VECTORDRIVER” explained on Thursday, the Switch uses an M92T36 Power Delivery chip—and that’s the part that most frequently burns out after use of third-party charging equipment.

There doesn’t appear to be a datasheet available for the M92T36, but there is an available datasheet for a very similar chipset, Rohm Semiconductor’s M92T30. The literal smoking gun here is the maximum voltage rating on the Configuration Channel pin (used for negotiating power delivery rates), listed at 6V.

Enlarge / This is the datasheet for the ROHM M92T30—a very similar USB-C PD chipset to the M92T36 used by the Switch.

While a wide variety of third-party chargers and cables have been linked to Switch bricking, the most common complaints seem to center on a third-party dock made by Nyko. Like many cheap USB-C chargers, the Nyko dock does not actually have a dedicated PD controller; it instead implements the PD protocol using a general purpose microcontroller—and that microcontroller was sending 9V to the Switch over the CC pin, exceeding the absolute maximum voltage rating by 50%. And as they taught me in Electronics Technician A School in my Navy days, when you let the magic smoke out, the widget stops working.

- This is a shot of the Nyko dock’s motherboard, from Ars’

2017 review. The microcontroller emulating PD protocols is on the lower left.
Sam Machkovech

- This zoomed-in shot shows you the microcontroller Nyko uses to—imperfectly—emulate a dedicated PD controller.
Sam Machkovech

There is one area in which the rumors of Switches getting bricked due to proprietary, non-standard Nintendo design is correct, however. Nintendo wanted the Switch to slide very smoothly in and out of its dock—but the USB-C mechanical design spec doesn't allow for that. So Nintendo's own dock for the Switch is very slightly narrower than the USB-C standard in order to provide the desired smooth slide instead of the usual snug click.

Third parties want to emulate that mechanical feel as closely as possible, but there's no published standard—they basically just take a stab at it and hope for the best. Given that the standard already has pins spaced only 0.5mm apart, even a slight design or manufacturing defect is likely to cause a port to fail.

If the port fails open—meaning pins just don't make electrical contact—there's usually no real harm done. But if they fail short—meaning pins are bridged electrically to pins they have no business connecting to—you may easily overvolt a pin. Remember that 6V absolute maximum rating on the Configuration Channel of the Switch's USB-C PD chip? Well, it's only 0.5mm away from the VBus (main power line), which carries 15V.

Finally, you may brick your Switch if you use USB-C to USB-A adapter cables. There are two variants of the cable; one with a 10K ohm resistor, and one with a 56K ohm resistor. This isn't directly dangerous to the Switch itself, but using a 10K ohm cable with a low-powered USB-A charger may overload it, damaging the charger—and a damaged charger could produce unexpected voltage on an output pin, which might in turn

damage the Switch as well.

https://arstechnica.com/?p=1545471

Now even funerals are livestreamed—and families are grateful

Enlarge / A receiving line of guests next to the casket at a funeral in a funeral home.
Getty Images

reader comments

24 with 20 posters participating

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The call came on January 2. It was early enough in the morning that Natalie Levy probably shouldn't have been awake—she had recently left a high-stress job at a private-equity firm in San Francisco, and was determined to relax a bit—but her dog had woken her up.

It was her sister on the line. "When's the last time you spoke to mom?" Levy remembers her asking. The worry in her voice was palpable. Levy's sister was supposed to meet her mother that day in Ann Arbor, Michigan, where both lived, but the mother didn't show.

Levy felt the panic rising. "Within probably an hour and a

half, I was calling the Ann Arbor police, crying on the phone," Levy recalled. "Something seemed so off." Then, another call from her sister, who had searched her mom's house with neighbors: They had found a receipt for a gun in the kitchen.

The call from her brother-in-law came shortly after midnight. He was crying and barely able to get the words out, Levy recalls. "He said they found her body on the outskirts of Ann Arbor, in a park," she says between quiet sobs and shaky breaths. "It's like you're just living a nightmare. You don't think it's true. They say it takes about four months, with suicide, for it to fully set in."

Within a few hours, Levy was on a plane to Michigan, where she and her family quickly planned the funeral. The suddenness of it all left them with an all-too-common problem: Tracking down the people whose lives her mother had touched, and giving them a chance to mourn with fellow loved ones.

There were friends who couldn't travel and family members who lived too far away to make it in time for the service, which, by Jewish tradition, had to happen as soon as possible. But their chapel had a solution: It livestreamed the funeral, and uploaded a recording of the service to its website shortly after, with a hyperlink prominently displayed in the obituary.

"There was no question we wanted to do the remote [viewing], to make sure that [it was] something that [was] accessible if somebody was sick or if somebody couldn't make it. I think that's really important," said Levy. She says some extended family members her mother had reconnected with late in life were extremely grateful they could participate remotely, as were the half-dozen or so other friends and family members she recalls tuning in live.

“If one person listened then whose life she touched, that’s enough,” Levy says. “Just knowing that people were able to participate … I felt good about that.”

In a culture obsessed with tweeting and Instagramming every moment of life, it’s little surprise that streaming extends to death. Funeral livestreaming services have been around for more than a decade, but the practice has recently exploded in popularity, says Bryant Hightower, president-elect of the National Funeral Directors Association. He estimates that nearly 20 percent of US funeral homes now offer the service—a big number in an industry resistant to change—in response to demand from clients. Tech-savvy entrepreneurs offer livestreaming as a service to hesitant funeral directors.

For Marlene Bass of Boynton Beach, Florida, livestreaming was more of a necessity than a bonus. She and her husband, Stuart, moved to Florida from Detroit over 25 years ago. There, they played their way through many golf clubs in the state, made countless friends, and built a life together. But when he passed away last July, Bass says she knew most of their friends and Florida-based loved ones wouldn’t be able to say goodbye in person.

“When we moved to Florida and we started getting older we talked about what we were going to do,” said Bass. “He wanted to be buried where his father was [in a family plot in Michigan], so we agreed on it and prepaid our funeral expenses,” which included a cross-country plane ticket and accommodations so she could attend the funeral.

She opted to livestream the service. She said she’d used the technology before to tune into weddings when her husband was sick, and thought it made sense to bridge the gap for those who couldn’t make it to the funeral. “I was really happy that they could do that,” Bass said. “Everybody is getting old in my neck of the woods, since we’ve been here so long. A lot of people are going all over when they die. It’s not just me.”

Gary Richards, founder of OneRoom, a company that offers livestreaming services to funeral directors in New Zealand, Australia, Canada, and the US, says he's noticed that many of the families that use his service are recent immigrants from the Philippines, Vietnam, or India, who are looking for a way to connect with family and friends from back home. He's says he's also noticed a considerable number of Americans looking to bridge the east and west coasts.

Chad Techner, co-owner of the Ira Kaufman Chapel in Southfield, Michigan, which handled the Levys' service, says the need for remote viewing services was evident from the moment he joined the family business in 2010.

"In the Jewish funeral world, we try and do things as quickly as reasonably possible and that makes it a little bit more difficult for people to get in," said Techner. "In other customs, it'll be a week or two later, but even then, it's not always easy, feasible, or affordable for people to just fly in for a funeral."

Techner says that when the Kaufman chapel began offering livestreams in 2010, the setup was simple: A single stationary camera in the chapel, connected to a computer with an ethernet cable. Demand quickly grew, particularly from people who wanted to livestream funerals being held elsewhere.

Now, the chapel has livestreamed funerals from temples and synagogues, in people's homes, at a senior living facility, and even graveside. He says that around 85 percent of families at the chapel opt for streaming.

The videos are not solely for the benefit of remote viewers. Levy and her family found that it proved most useful to those that attended. "One of the things that we were told was: You're not going to remember anything," she says. "[Everyone is] saying all these wonderful things, they're telling these stories and you can't process it," the grief and shock is just

too much.

In the months since her mother’s January 7 funeral, Levy says she and other family members have watched and rewatched the recording online. “One of the only things that every day reminds you of how great she was in such an awful time is people’s memories and you sharing those memories with each other.”

Richards, of OneRoom, says that many families he’s worked with have similarly used the recording to mourn after the funeral. Streaming has made it technically easier, he says. “In the old days it was on a DVD or USB, which [would be] created and given to a family member, often elderly, who puts it in a top drawer and it disappears,” says Richards. “We’re basically like a memorial vault or digital cemetery for the family.”

OneRoom typically uses multiple cameras: one facing the lectern and one facing attendees—to give a sense of the room and mood; another viewing option displays a tribute video or slideshow, if one exists.

Richards says that tens of thousands of viewers watch OneRoom streams each month, including thousands rewatching funerals they attended or previously viewed. In each of the past three years, he says, the company has doubled the number of monthly viewers and funeral homes it works with; he thinks this year will be no different.

OneRoom’s livestreams and recordings are private; those invited to view the service have to enter a code to access the stream. Others share more openly. Techner, of the Kaufman chapel in Ann Arbor, says he gives families the option to make their streams private, but most opt not to do so, meaning they can be viewed by anyone who visits the chapel’s website.

The videos—even those taken in unusual locations—are surprisingly good quality when viewed on a computer or phone, and the sound is crisp, a review of dozens of funeral

livestreams archived by the Kaufman chapel from the last year found. But Techner says it wasn't always this way.

When they started doing off-site streams, Techner says technical difficulties were fairly common. The variability of non-hardwired Internet connections would cause streaming issues about 20 percent of the time, which meant remote viewers would often have to wait until the funeral was finished before a quality recording of the service could be uploaded online.

"Now, it's nearly never," he said, citing the increased availability of easy to use (and cheap) mobile hotspots that can provide the high-speed Internet access necessary for seamless live video streaming. "It is definitely much easier and more reliable streaming off-site [today] than it ever has been."

Hightower, of the National Funeral Directors Association, says such challenges are part of why he thinks it has taken so long for livestreaming to take off. He says that nowadays the likelihood that a funeral home offers livestreaming depends on two key factors: size and location. Funeral homes located in urban areas are more likely to work with families who have relatives and loved ones spread out around the country.

Larger firms have more diverse clients and are better equipped to deal with the many small issues of running their own livestreaming operation, he says. "Funeral homes have to buy a music license in order to allow us to play recorded music from artists at funeral services," he explained. But as livestreaming has become more popular, funeral directors have encountered unexpected copyright issues.

If you're livestreaming a funeral, "you're also streaming some of those recorded music pieces that you had to pay a fee for, but in order to broadcast those outside the chapel and to stream them to virtually anywhere in the world you have to pay

an additional streaming license," which may be confusing to many funeral directors, says Hightower. "It's one of those things we've had to learn as we go."

This article first appeared on Wired.com.

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