

5 TIPS FOR EPIC AERIAL VIDEO

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PLAYING WITH DRONES

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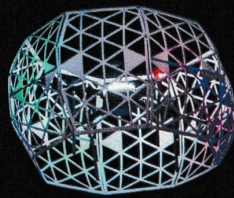
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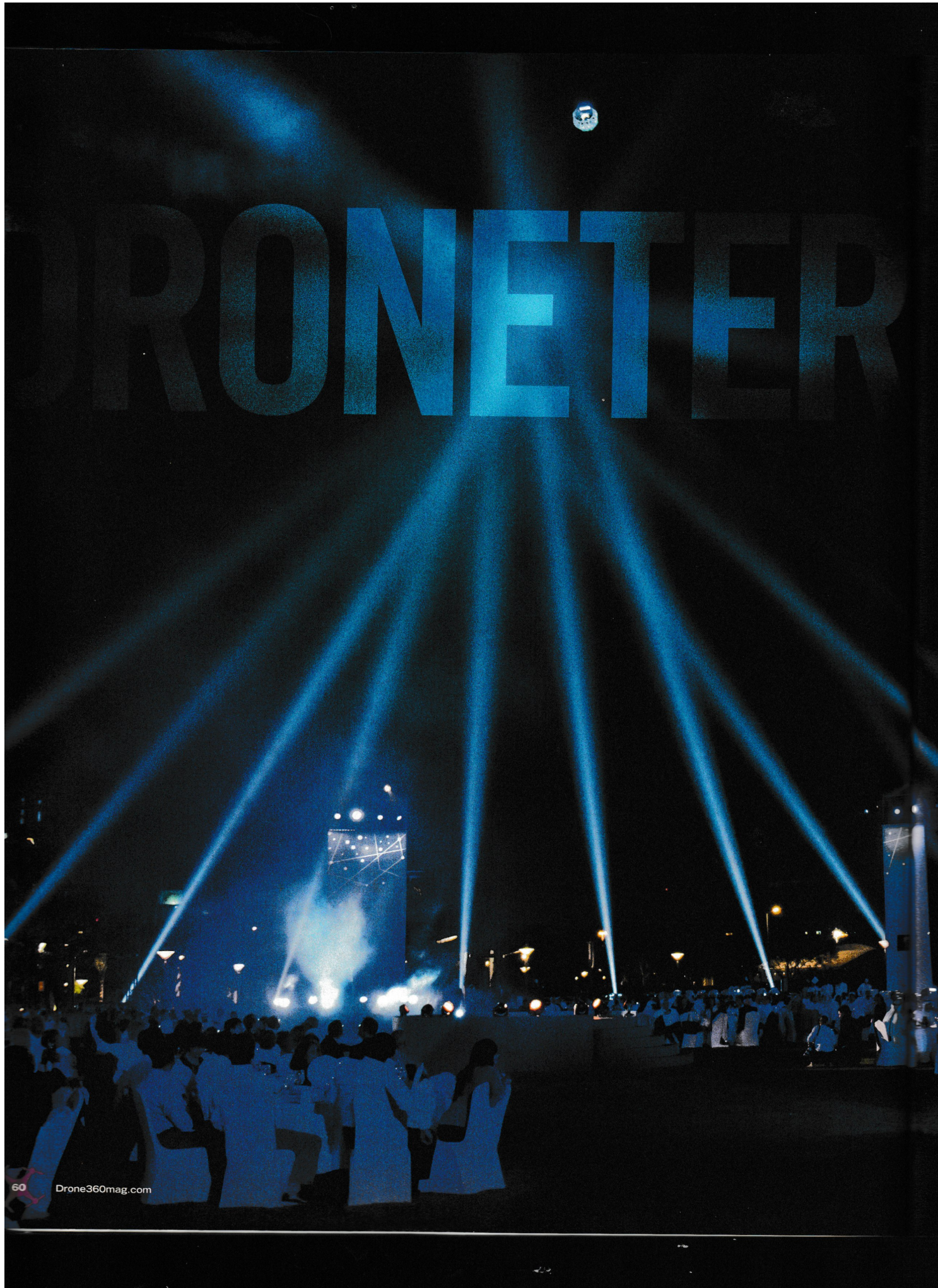
Drones are great for jobs that are dirty, boring,
or dangerous — but who says that they can't also
have their place in the entertainment industry?

By Zara Stone



Show design company News substance
flew five DJI Matrice drones encased
in latticework frames at the 2015
World Economic Forum's Summit
Gala dinner in Abu Dhabi.

NEWSUBSTANCE





Dancers clad in skintight Lycra and sequined flapper costumes back-flip across the stage. The whole production, with its floor-length gowns and sparkling backdrops, is meant to conjure a vision of 1930s Hollywood. Centerstage are two lovers sharing a powerful duet. And all the while, eight multi-colored lampshades hover above the lovers' — and the audience's — heads.

These lights aren't part of some complex theatrical rig: Each flying lampshade conceals a drone, able to dip and dive on cue.

Since April 2016, New York theatergoers have been experiencing the double whammy of Cirque du Soleil's first musical, *Paramour*, combined with the first aerial drone show to get a permanent slot on Broadway. The lampshade drones

have performed over 250 times, with upwards of 4,000 autonomous flights.

This feat can be credited to Bill Keays, Cirque du Soleil's former science and technology advisor. Keays' role was to search for technology that had theatrical potential, and when he discovered these dancing drones at Zurich-based Verity Studios, he knew he'd hit the jackpot.

"Imagine flying objects all over the theatrical place!" he says. "One of the things we could accomplish is breaking through the fourth wall," directly involving the audience in the action. Keays was so taken with Verity's results that he went to work for them full time as a creative project manager. His focus was making sure the drones could handle the rigors of a Broadway show: Think daily performances with last-minute changes.

BREAK A PROP!

Integrating drones into performances of all kinds is a growing industry, as producers and creators alike are experimenting with aerial dimensions. Lady Gaga's Super Bowl performance is the highest-profile example of this so far; her

Broadway dreams aren't just for bright-eyed starlets — world-famous Cirque du Soleil has brought drone technology to the stage in the form of swirling, twirling aerial lampshades.

■ CIRQUE DU SOLEIL THEATRICAL/RICHARD TERMINE

set featured a backdrop of 300 twinkling Shooting Star drones from Intel.

Due to safety and weather concerns, the drone show was pre-recorded. But for the roughly 111 million viewers, the concept of "dronertainment" was firmly established into mainstream consciousness. Intel has also collaborated with Disney Springs, Orlando, to create Starbright Holidays, a seven-week aerial light show featuring 30-foot-high Christmas trees represented by color-changing LEDs accompanied by Disney-fied orchestral music. The drones successfully concluded their run in January 2017 with 90 performances under their propellers.

On a smaller scale, drones have infiltrated popular culture by becoming regulars on reality TV. In 2016, Japanese dance troupe Elevenplay auditioned for *America's Got Talent* with a choreographed drone dance act. Five ghostlike dancers flipped and pirouetted in between



The Japanese dance group Elevenplay is known for their innovative performances that integrate new technologies. Here, illuminated quadcopters mirror the dancers' movements.

YOUTUBE/DAITO MANABE

24 quadcopters mounted with glowing orbs. Their eerie moves got them past the first cut, and the YouTube video of their act has almost 1 million views. Simultaneously in England, a dance act made the semi-finals of *Britain's Got Talent* with a routine that involved breakdancing to Coldplay's "A Sky Full of Stars," coordinated with 13 dipping and diving Parrot Bebops. From Disney to prime time, drones have gained ground in art, music, and theatrical spaces.

"When you move things into the sky, you pull people's attention," explains Patrick O'Mahony, creative director for London-based event design company News substance.

O'Mahony has been incorporating aerial artistry since 2013. He even had the honor of flying five lattice-clad DJI Matrice drones over heads of state at the 2015 World Economic Forum's Summit Gala dinner in Abu Dhabi (an audience that included UAE economy minister Sultan bin Saeed Al Mansoori). Each 1-meter-tall drone was the aerial partner of an on-the-ground dancer.

"I'm interested in the drones as [a] creative vehicle," O'Mahony says. "I'm not as interested in how many — more what we do with them."

To guarantee more design flexibility, News substance now custom builds their drones in-house. While these drones can be airborne for 15 to 20 minutes, O'Mahony suggests a 10-minute maximum show, ideally less.

"Three minutes is the magic number of wowing an audience and leaving them wanting more," he says. He's cautious not to overuse aerial displays in events, and regularly refuses work that doesn't fit his vision. "We don't want this to be a one-hit wonder. What we're looking to do is create stories in the sky."

THE SOUND OF UNMANNED MUSIC

Then there are the drones that innovate in the musical sphere. In 2014, KMel Robotics, a tiny Philadelphia startup, built a drone orchestra with five hexacopters that physically created music, zipping from drums to string guitar to water glasses. They tapped out "The Star-Spangled Banner" and Richard Strauss' "Thus Spake Zarathustra," most commonly known as the theme to the movie *2001: A Space Odyssey*. The resulting music was surprisingly good, making Qualcomm's 2015

acquisition of the company no surprise, but sadly ending KMel's musical forays.

Luckily, musician John Cale (yes, Cale as in The Velvet Underground), took up the drone baton, teaming up with architect Liam Young to create a live musical drone performance on a grand scale. Entitled *LOOP>>60Hz: Transmissions from the Drone Orchestra*, the sellout event was held at the Barbican Centre concert hall in London as part of its Digital Revolution programming.

Cale scored the music, which included both selected works from his past repertoire and new compositions performed by a live orchestra. Young choreographed costumed drones to fly around the hall in time to Cale's score. The drones were equipped with loudspeakers and microphones to pipe sound around the venue and to include their whirring into the performance.

But the pair didn't want the drones to be seen as interchangeable "electronic components," says Young. In order to humanize them, each drone was given a name, an outfit, and a unique personality.

"The emphasis of the show was to talk about drones in a different way,

"DRONES ARE STILL WRAPPED IN A BLANKET OF MENACE — PART OF THIS WAS OVERCOMING THE STIGMA."



to bring people in proximity to them," Young says. "Drones are still wrapped in a blanket of menace — part of this was overcoming the stigma."

From a logistical standpoint, show producer Keri Elmsly emphasizes the importance of having a good relationship with a venue: The Barbican approved her risk assessment for *LOOP*>>60Hz, allowing the drones to fly, no nets involved. "That was bravery," she says. Considering the DJI Phantoms involved are just under 3 pounds, with blades capable of shredding skin, the risk is real. But Elmsly, a

longtime champion of emerging technologies, was adamant the performances happen net-free.

"This takes the drone from being an observer to being the observed," she says. "The [goal of the] drone orchestra was to talk about them as cultural objects, and you cannot separate tech from culture."

ENTREPRENEURIAL ENTERTAINERS

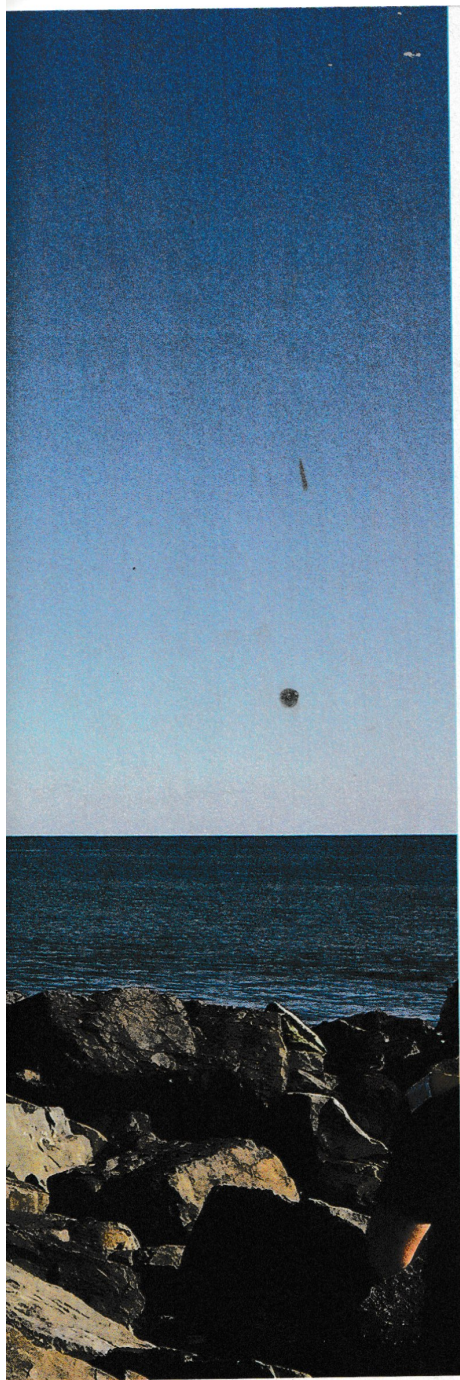
Young and Elmsly, like many of the dronetainers I've interviewed, lay claim to being "first" in this space. These firsts differ so dramatically in their scope,

Colored smoke bombs attached to three DJI Phantom drones created an ethereal and colorful aerial spectacle, especially as the drones coasted above the blue water below.

PAUL TRILLO

it's difficult to award any one company the "first" moniker.

But during my research, I found an unusual 2009 performance that may have sparked the trend. Texas A&M's fall production of Shakespeare's comedy *A Midsummer Night's Dream* used seven R/C aircraft (six E-flight micro helicopter and one AirRobot) to perform as fairies.



The show was a collaboration between the drama and engineering departments, and this combination of technical and artistic skill was a clear precursor to dronetertainment today.

Many artists have started adding drones to their toolkit, including street artist KATSU's spray paint-equipped drone, the Icarus. This drone enables KATSU to create art in hard-to-reach places, and there's something poetic about merging graffiti (a traditional form of civil protest) with a drone, and its reputation for civil terror.



On the more technical side of this spectrum, light painting is yet another emerging form of drone artistry. Here, drones mounted with LEDs paint pictures in the sky. The resulting images are captured through long-exposure camera shots. There are more than 60,000 YouTube videos demonstrating this with varying levels of skill; you can see everything from Santa sledding through the night to amateur sky scribbles. For beginners, a company called ScribbleDrone has created a free app that lets DJI owners design their own light paintings.

In a similar spirit, the short film *Chromaticity* by artist Paul Trillo takes sky painting into the physical realm. His work displays trails of colored smoke from grenades attached to drones.

"I've always loved aerial flight shows, and everyone falls in love when stunt planes fly through the air with colored smoke," Trillo says. "It seemed like a natural fit to apply that idea to a drone. This is both an abstract, visual film as well as a performance."

In the final edit of Paul Trillo's video, he digitally removed the drones themselves, making it appear as though the trails of smoke were carving through the air independently.

PAUL TRILLO (2)

In his piece, co-created with drone company Aerobo, three DJI Phantoms billowing smoke swoop over the Atlantic Ocean, recorded by a fourth drone at a higher vantage point. The drones were erased in post, creating an ethereal look. "Once I started to remove the drones digitally, it suddenly took on a new tone. It felt mysterious, ominous even, something like *Fantasia*," says Trillo. "There's a certain illusion to it, where people question whether it's real or not."

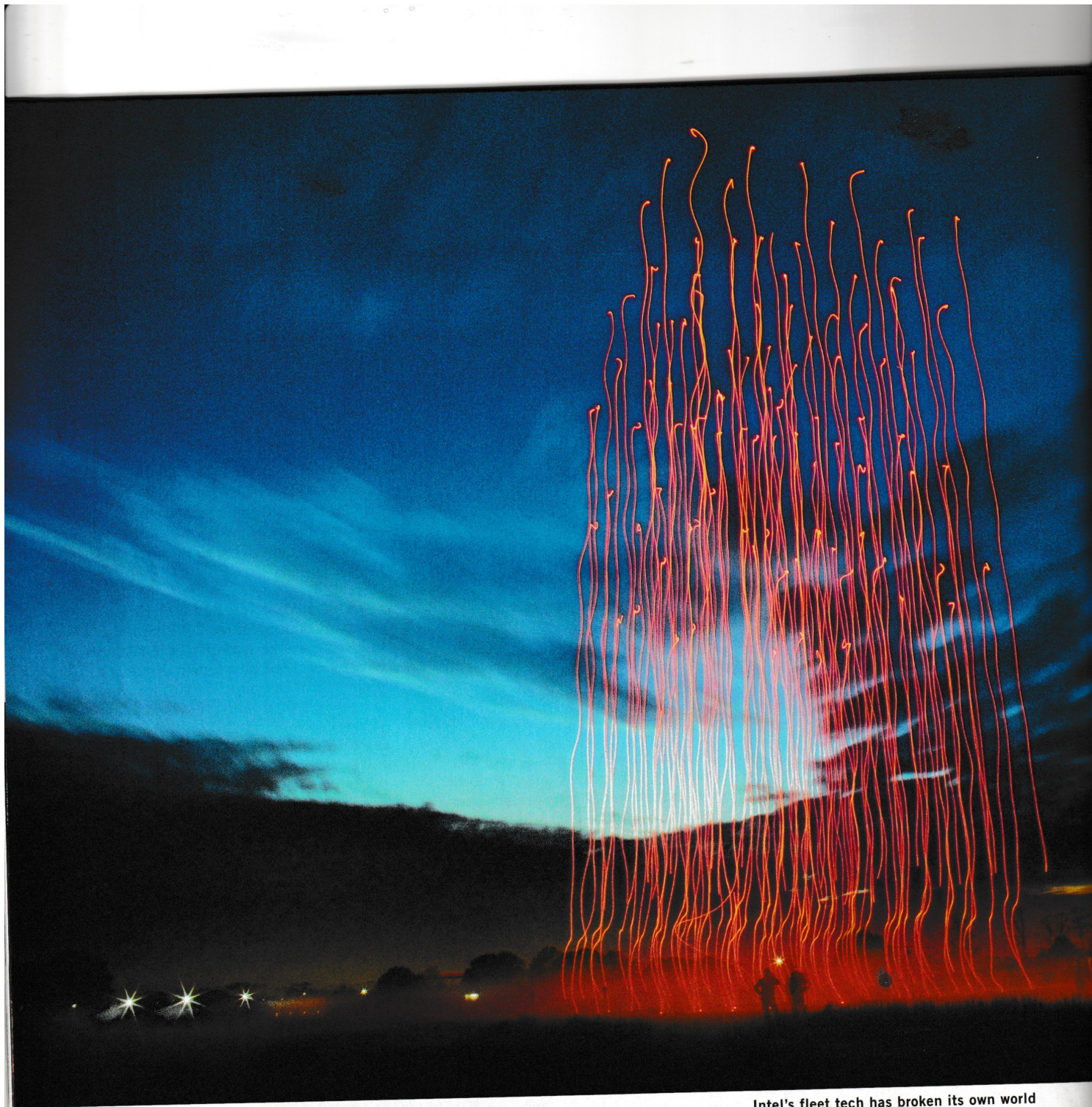
REMEMBER THE RULES

For those feeling inspired, it's important to make sure you're following FAA rules and regulations.

"Any commercial use of drones, including entertainment, must comply with the provisions of Part 107," says FAA spokesperson Les Dorr. "Depending on the venue, the operator may need waivers under Part 107 and/or authorization to operate in controlled airspace."

This is something Natalie Cheung, general manager of drone light shows for Intel, has become intimately familiar with. During her time at Intel, she's landed her team two Guinness World Records for the most UAVs airborne simultaneously (300 in the first attempt, 500 in the second) and project-managed partnerships with Disney and the NFL.

"I BELIEVE
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SENSES."



"The FAA has been listening to what the drone industry has been asking for," she explains. "It's [now] a really easy process."

Cheung is enthusiastic about what a drone-filled future might look like. "When [people] look at the night sky they don't expect it to be dynamic. We can paint something in the sky!" she says. "The fact we can utilize drones to provide art and merge with technology is good for a global audience."

Intel's seven-week run with Disney proved to her that the novelty doesn't

fade with exposure. And with 4 billion color combinations available on the Shooting Star drones, they've got a lot to play with.

Planning the Disney show involved five months of work for her team, with wake-up calls at 2 a.m. for on-site testing. But now that the team is experienced, future collaborations could happen faster. For Disney fangirl Cheung, the work was a dream come true. The show at Disney Springs used the movie *Tangled* for inspiration; she hopes to see her favorite, *The Lion King*, in the night sky someday.

Intel's fleet tech has broken its own world records multiple times (its current record is 500 drones in the air at once), representing some of the most complicated swarming capabilities outside of the military. **INTEL (2)**

But this could be just the tip of the proverbial iceberg for Disney's drone ventures. In 2014, the company filed patents that discuss the potential of using drones to fly projector screens and gigantic marionettes around its parks. Perhaps unwisely, they used *The Nightmare Before Christmas*' creepy Jack Skellington as their proof of concept. Cheung says she's



A fleet of LED-equipped drones lie in wait for their aerial light show. These drones make real-time decisions based on battery life, weather conditions, and individual location to optimize the visual performance.

drones will advance the level of our entertainment by bridging and expanding human's five senses." His work builds on the theory that cognition is affected by objects in our environment.

Kim has designed tracking systems that work with a trio of Parrot AR drones, mapping their position and synchronizing their flight to music. He calls these drones "The Sky Dancers," and hopes to license them to Las Vegas shows. He has meetings scheduled this year, and a tentative performance date for fall 2017.

"The project contributes to the awareness of drone uses in entertainment and it will facilitate the utilization of drones, especially in recreation," he says.

Arthur Holland Michel, codirector of the Center for the Study of the Drone at Bard College and member of the *Drone360* Editorial Advisory Board, takes a more hands-off approach when examining the use of drones in popular culture.

"Two years ago, the things that Intel and Disney are doing would not be possible," he says. "The tech is now at a point where it can be used this way, and it's happened very suddenly."

But Michel warns that these are still "custom experiences," not plug-and-play shows you could perform at birthday parties. Even so, he argues, the falling cost of drone technology democratizes

access for artists — but they need to be cognizant of how they use it.

"The mere use of a drone is no longer that exciting," he says. "Filming something with it does not inherently make it more interesting. But some of the light shows are fairly transformative."

For what it's worth, no one in the industry doubts the fact that dronertainment will continue to expand. Yes, they're all personally invested, but the grassroots growth speaks for itself. At Verity Studios, Keays is busy working on his next batch of drones. "It's pretty well established that these will become a standard tool of the trade," he says.

He posits that in 10 years, companies will be able to get their tech reliable and safe enough for daily shows. Verity Studios' drones use localization technology that keeps them aloft even when damaged, but their technology is proprietary.

To encourage innovation, he's published a white paper outlining best dronertainment practices. Of course, an accident, somewhere, sometime, is inevitable. And then there's the problem of quality — as theatrical companies rush to include drones, the technology is not always utilized well.

"There's a motivation behind firsts," he says. "All shows want to be first, first drone show on Broadway, first drone circus, first drone show on a cruise ship. But as time goes on the audience will expect more and show creators will get more imaginative. There's nowhere to go but up." **360**

"THE MERE USE OF A DRONE IS NO LONGER THAT EXCITING."

unaware of these projects, so we'll just have to keep an eye out.

UP IN LIGHTS

While there's certainly no shortage of ideas in the dronertainment space, it's yet to be seen which ones will be able to really capture the public's attention. It's this uncertainty that fascinates Professor Si Jung Kim, who's made it his focus at University of Nevada's engineering lab.

"I joined in 2014 with two main research topics: drone-tainment and mobile-tainment," he says. "I believe