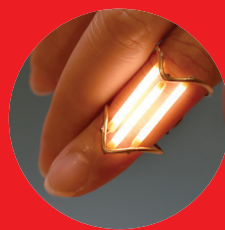


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Make:



**FUTURE
BLING:**
Craft an LED
Filament Ring

TURN IT UP

ELECTRONIC MUSIC

DIY Synths, Circuits
& Instruments



Electro Etching Metal

TRANSPARENT 3D PRINTS

CNC Hold-Down Clamps

WHITTLE A WOODEN CHAIN

Flip-Dot Animation Display

COKE BOTTLE MARIMBA

Makers in Wartime

MAKING
FIREWORKS

RADIO CONTROL

Robots & Props
with OpenTX

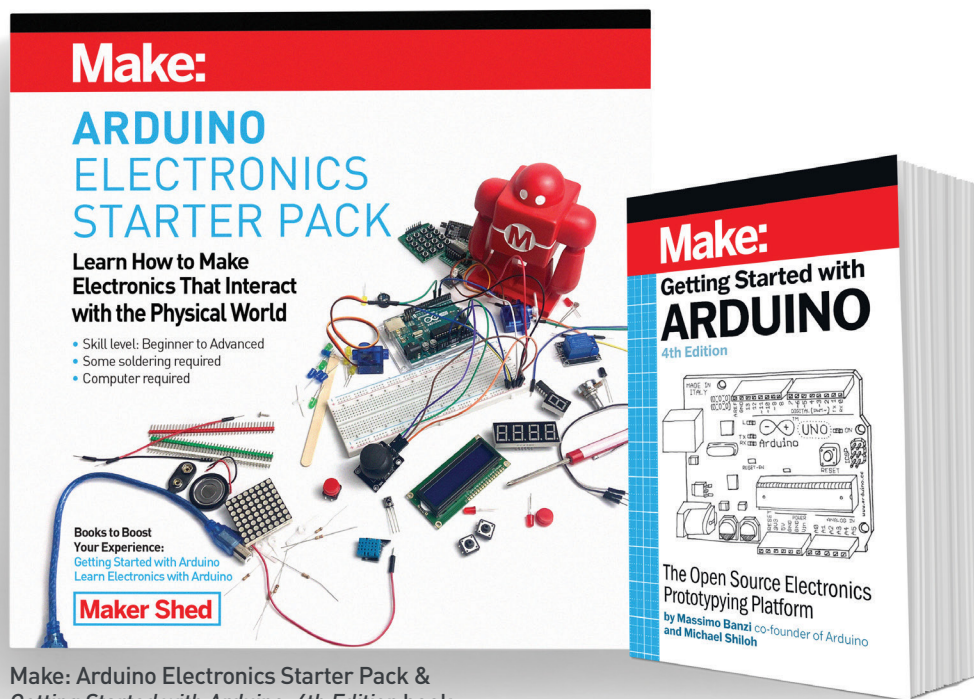
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How this R/C robot
hand came to
life for Netflix's
Wednesday!



UNLEASH YOUR INNER MAKER!

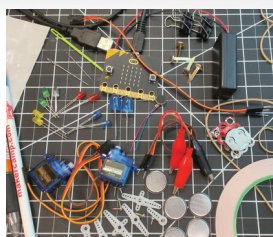
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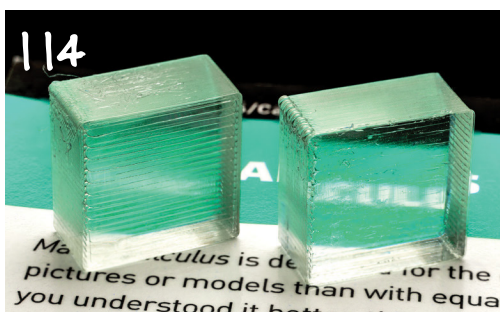
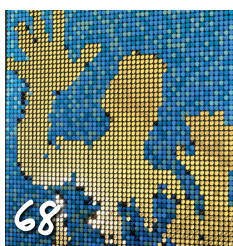
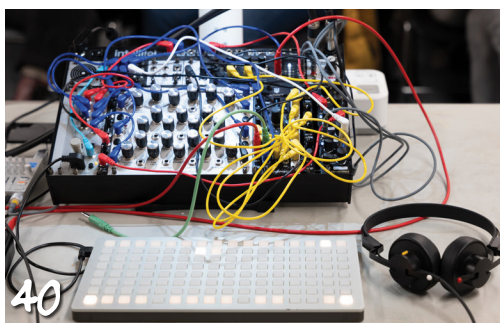
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*What's your favorite
musical artist to listen
to while working in the
shop?*



Sean Nolan
*Whidbey Island, Washington
(Whittled Wonder)*
I love a bit of everything
(shoutout KXA 1520), but
always come back to
Kenny Chesney in my
happy place!



Owen McAteer
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Bonobo. Sets just the right
vibe and energy for me to
focus and create.

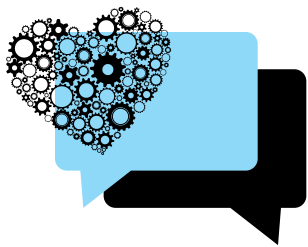


Ben Eadie
*Calgary, Alberta, Canada
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Chillhop is my jam.
Honestly, I do not know
any specific artists. I
generally play "lo-fi"
playlists on YouTube.

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FROM THE EDITOR'S DESK

READER INPUT

WHAT WAS YOUR FIRST ISSUE OF MAKE:?

 **Aaron**
@aeiche@twit.social

@makemagazine The first issue I can find in my collection is #09. I used to buy them from the magazine shop at the airport before taking a flight somewhere. It was nice to have something special and familiar when traveling. I've found myself grabbing an old issue and reading through the articles over the last couple of years. In spite of technology changing rapidly, the magazine holds up incredibly well!



 **John Sheehan** 🌱
@jennasy

@makemagazine I have them all. From issue #1 (autographed by Dale) to the current issue.

Randomly finding that first issue at a bookstore was life changing for me. The is so much inspiration inside every issue.

 **System IV, Building K**
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@makemagazine Just received my first one today, #84, and onto the table of wonders it goes... Will report back after chicken arrives. :)

 **Jason Coon**
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@makemagazine I've been a Make member for a while, and usually prefer the digital copy. My first physical copy is actually the one I was featured in with @wizard & @geekmomprojects! 😊

Brilliant article by @ishotjrl! 😊



What was your first issue of *Make:* magazine? Or your favorite? Let us know at editor@makezine.com or at makezine.com/go/my-first-issue.

OH STOP IT, YOU

You have created the most fantastic issue ever! I read it cover-to-cover several times and investigated most of the generative AI apps. Also, I happen to be getting into SDR.

—Mike Winter, via email

 **David Curran Parody**
@iamreddave

The new issue of @make is great.



PUTTING THE ZINE IN MAKEZINE

Discord user @gus shared this fun project on our Show & Tell channel. Join us on the *Make:* Discord server and show us what you're working on, at makezine.com/go/discord.

 Gus (DC, US) 03/12/2023 3:35 PM

Started a couple zines with cutouts from Make!



MAKE: AMENDS

In "Unleash the Amateurs" (*Make:* Volume 84, page 14), we reported that Hiram Percy Maxim contacted fellow radio amateur Windsor Locks in 1914. In fact Windsor Locks, Connecticut, is the *town* the colleague lived in. Thanks to reader Tim McNerney for spotting the error!

Seeing Both Sides Now

by **Dale Dougherty**, President of Make: Community

There are two sides to making, which seems to satisfy most makers.

One side is playful. Makers are enthusiasts, curious to explore, and willing to try something just for its own sake. Making is play, enjoyed as much for the process as for what it produces. Makers get to choose what projects to do, based on their interests and ideas.

The other side of making is serious, more work than play. It can be purposeful, driven by necessity or external demands. This type of making often puts the maker into a different gear and they feel a sense of accomplishment.

Yet making can be both playful and serious at the same time. A project you begin for fun becomes something you must take seriously to finish. (Just make sure you're still enjoying yourself, or the work becomes drudgery.)

Music is a great example of something fun that can also be taken very seriously. In this issue, Nick Gaydos reports how electronic music's history of experimentation has led to today's resurgence of modular synthesizers — devices you can assemble yourself that generate sound with knobs and switches. Joe Bauer shows you how to make your first synth module, a DIY Avalanche Oscillator. Bill Van Loo recommends software for making music at any level, from playful phone apps to serious digital audio workstations (DAWs). While many musicians produce their music for release, he says, "it's fine to just play for the joy of playing." Jet Kye Chong's soda bottle marimba is like that — fun to play and easy to make, an instrument made from recycled plastic that has a robust sound.

Need more synth circuits? Just for fun, Lee Wilkins hacks an Atari Punk circuit to use different fruits as resistors, and the team from Dogbotic Labs shares an amazing quirk — a simple logic chip that somehow plays notes perfectly in tune! On a more serious mission, Charles Platt shows how to generate an "unpredictable screamer circuit" to deter pesky rats, and probably your closest neighbors.

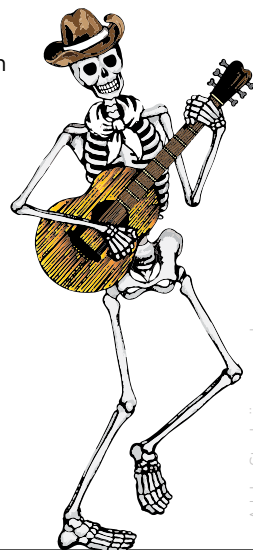
And what's more fun than a monster movie? Ben Eadie and Jesse Velez show how they create lifelike animated props for *Ghostbusters* and *Wednesday* using next-level radio control programs, with Linux running right on the transmitter.

Sometimes the skills we develop on fun projects become valuable in another context. At the outbreak of war in Ukraine in February 2022, I reconnected with Yuri Vlasuk and Svitlana Bovkun, who had produced Maker Faires there. A year later, I asked Yuri to tell us how makers have contributed to the defense of Ukraine.

Nearly everyone in Ukraine is asked to be resourceful and help defend the country, Yuri reports. Welding is a valued skill. 3D printing is used to develop shell casings and tails for grenades. Drone racers from Maker Faire now are piloting consumer drones on the battlefield. Other makers are helping in areas where people lack shelter, heat, power, and food. The Tolocar project is a fleet of mobile makerspaces that can visit those areas to help people solve problems and learn new skills.

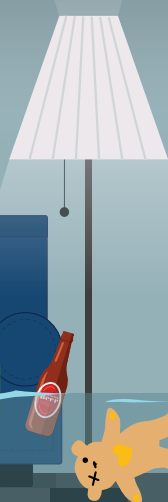
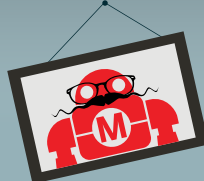
Brad Halsey visited Ukraine during wartime last year. He reports that, seeing their entrepreneurial energy and rapid innovation, he came back wishing America could learn to think creatively and build in the same way.

To those who perhaps unknowingly deprecate makers as hobbyists, I try to explain that making has both sides. I acknowledge that makers are proud hobbyists — and that if these hobbyists are ever called upon, they have capabilities that a society with so many problems might desperately need any day now. 🍷



Adobe Stock-jiew surreal

MacGyver Challenge: Teenage Wasteland!



By Lee D. Zlotoff and Rhett Allain

CAN YOU MACGYVER A FAST FIX FOR A FLOODED FAMILY ROOM?

We are all MacGyvers now! Make: has brought Mac back to help you think — and make — your way out of emergencies. Watch for the next challenge on our blog (makezine.com), Mastodon (@[@makemagazine](https://mastodon.social/@makemagazine)), Twitter (@[@make](https://twitter.com/make)), and Facebook ([makemagazine](https://www.facebook.com/makemagazine)) and enter your solutions for a chance to be featured in these pages and win Make: goodies!

The Scenario

You're 17, and your family just moved into a new house in the suburbs. Your parents have an overnight date in the city, leaving you with clear instructions *not* to have a party while they're away. So, no sooner do they leave than you invite a half dozen friends over for, not a party exactly but, you know ... a *get-together*. Which, astonishingly, involves various inebriants in your finished basement cum family room. Midway through the festivities the local power goes out, driving the party upstairs to the patio outside — unaware that one of your hammered BFFs has left water running in the sink with the drain closed. When you venture back down for more refreshments at 3 a.m. you discover to your horror there's a good 2 inches of water flooding the basement! Now curiously sober, you summon your homies — who abandon you like rats from a sinking ship.

The Challenge

Now on your own, you realize you have exactly 7 hours to get the water out and clean up the mess before your folks return. And the power is still out.

What You've Got

 And it's *all you've got*:

- Normal kitchen stuff. Knives, forks, spoons, cookie sheet pans, but weirdly no bowls or pots. But if it's in a kitchen drawer, you have it. Spatulas, straws, turkey baster.
- There's a nice mixer (again, no power), a toaster oven, air fryer, microwave. The fridge is off — but it has just a bare minimum: a six-pack of soda and a squeeze bottle of ketchup.
- Of course, there's the "junk drawer." You have a battery-powered flashlight, coins, keys, pocketknife, marbles, empty film canisters, AA batteries, rubber bands, paper clips.
- Yes, you have plastic straws and duct tape.
- In the garage, it's just outdoor stuff: garden hose, sprinklers, shovel, hoe, rake. There are no gas-powered devices and no buckets.
- The basement does have a small window to get out to the ground.
- The rest of the house just has normal stuff.

TURN THE PAGE FOR SOLUTIONS!

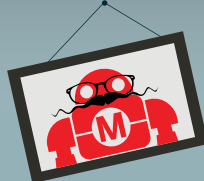


LEE ZLOTOFF is an award-winning writer, producer, and director of film and TV, including *MacGyver* (1985–1992). His new production, *MacGyver: The Musical*, casts a different audience member as Mac at each performance. macgyver.com



RHETT ALLAIN teaches physics at Southeastern Louisiana University. He was technical consultant for the *MacGyver* reboot (2016–2021) and an advisor for *MythBusters*. He blogs about physics fun at rhettallain.com.

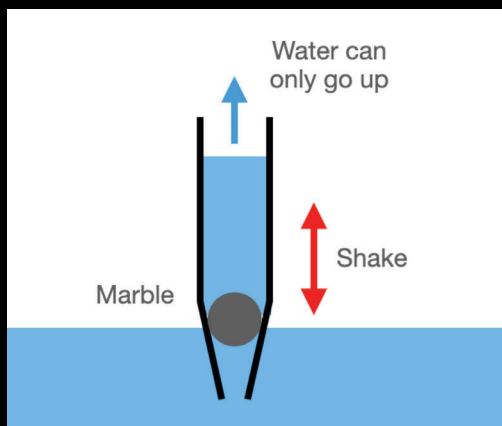
MacGyver Challenge: Teenage Wasteland!



Our Solution

A siphon won't work down in this basement, so of course you need to make a pump to remove the water — but which water pump would be the best in this case? In this situation we can build a *shake pump* aka *jiggle pump*, with a one-way water valve. Take the squeeze bulb off the turkey baster and drop a marble down the tube so that it sits in the narrow part. When water comes into the tube, the marble will get pushed up and let the water flow. However, if water tries to go the other way, the marble will get stuck in the narrow part of the turkey baster, trapping the water.

With the marble in the baster, you just need to connect the hose and run it outside. When you push the baster *down* into the water, it will force water *up*. When you pull the baster up, the water stays in there (because of the one-way valve). Repeat to move the water up and out! Visit youtu.be/RXdiHfsDyqo to watch how it works.



Most Plausible Solution

We are judging Chuck B.'s solution as the most plausible since it is very similar to our method and includes our turkey baster check valve. Chuck's idea includes a bit more detail, with two check valves instead of one (using the ketchup bottle too), and also with an improvised hand pump. And yes, it involves plenty of paper clips, plastic straws, and duct tape. Although this setup might take some time, it would look awesome! (Read all the full solutions at makezine.com/go/teenage-wasteland.)

Most Creative Solution

Craig Robson's idea is to make a Venturi pump using the water faucets in the house along with some hoses and parts of the ketchup bottle. The *Venturi effect* says that when you force a fluid through a restriction, the fluid's speed will increase — which also brings a decrease in pressure. The Venturi pump uses flowing water (from the faucet) going through a restriction (from parts of the bottle) to create suction and pull the water out of the basement.

Honorable Mention

Sometimes the best solution is no solution? David Maynor suggests that instead of removing the water, just come up with a plausible excuse for the flood: "Poke a hole in the water heater and work on your surprised face." 🌀

A LIFE WITH

arm



Written by David J. Groom, Arm Developer Program Ambassador and Community Editor, Make:

Growing up in the UK, the BBC's Computer Literacy Project gave me the once-in-a-century chance to take a front-row seat in the computer revolution. At my school in Essex there was a single BBC Micro Model B in our classroom, which we were only allowed to use occasionally, and usually as a group.

The BBC Micro was the creation of Arm progenitor Acorn Computers, and its innovative "Tube" interface allowed the Acorn team to use it as a test mule while developing their next-generation RISC (Reduced Instruction Set Computer) silicon and associated software. The resultant 6MHz ARM1 (Acorn RISC Machine) chip was then dogfooded as a second processor for the BBC Micro, where it helped enable simulation, accelerate CAD work, and provide a target for a new version of BBC BASIC written in ARM assembly.

One day my father came home with Acorn's latest BBC Master 128, the successor to the venerable Model B, with which I cherished every fleeting moment. Thus began my life with Arm, though I hadn't quite realized it yet.

I recall vividly the first time I truly encountered Arm; Dad took me to a computer show where I saw, on a pedestal, the 32-bit, ARM2-powered Acorn Archimedes. The machine and several others like it were running a 3D spaceship lander (aka *Zarch*) and a real-time rendering of colored spheres to demonstrate the machine's 7x performance advantage over already impressive 68000-based contemporaries like the Amiga.

Not long after, I moved to the USA and the remainder of my formative years were spent surrounded by x86-based PCs, which never caught my passion in the same way as the Acorn

devices, but saw me attending the University of Michigan Honors College to study Computer Science, and securing internships at Microsoft.

It wasn't until 2007 that I rediscovered my path to all things Arm. Falling in love with the Arduino Diecimila as part of a Roomba hacking project enamored me with embedded hardware. Rather than writing code to run on a screen or web server, it allowed me to write code that I could touch. The pinnacle of this was hacking on the Arm Cortex-M4-based Pebble smartwatch at the Pebble Rocks Boulder hackathon, which combined my passion for the unique wearable platform with my hardware obsession. The dev targets we used during the event were PJRC's Teensy boards, another Cortex-based device, meaning my team's win was thanks in part to two Arm-based chips!

With the kickoff of the **Arm Developer Program**, this year is shaping up to be a very exciting time to build on Arm. As an **Arm Ambassador** within the program, I get extensive support and insights directly from Arm experts, while the wider-reaching **Arm Developer Program** offers comprehensive resources for new and experienced developers.

Whether you're just starting out with embedded machine learning, trying to optimize your cloud computing performance and spend, or pushing the realms of mobile graphics or server performance, the Arm ecosystem is the place to be in 2023. Join me for the next **once-in-a-century opportunity to develop the future on Arm**.



Learn more about the
Arm Developer Program at
arm.com/developerprogram



MADE ON EARTH

Backyard builds from around the globe

Found a project that would be perfect for Made on Earth?

Let us know: editor@makezine.com

BALLOONS AS ART AS THERAPY

BALLOONSINBOLD.COM

DJ Morrow is blowing up balloon art, turning a medium mostly associated with children's birthday parties into a canvas fit for fine art galleries.

The 27-year-old Texan had been twisting balloons into various characters as a Houston-based party entertainer for eight years before the Covid-19 pandemic deflated his business. Depressed and anxious about an uncertain future and dwindling finances, he reached for something he knew how to inflate, repurposing black balloons as darkness surrounding a wax hand clutching a light bulb. "It was just that idea of using art as a lifeline when you have nothing else to hold on to," he tells *Make*: of the piece *Reaching*.

It was his next piece, though, that truly convinced him balloons were capable of serious artistic expression. He recreated his favorite painting, *Saturn Devouring His Son* by Francisco Goya, and the stunning sculpture was quickly upvoted to the top of Reddit.

"I decided this is the moment where I need to just unshackle myself," Morrow says. "Stop playing towards people's expectations of what balloon art is, and just be honest and raw."

Since then, his works have only grown in scale and complexity, using a technique called balloon weaving to craft large figures, which contrast the colorful fun of the medium with darker contemplative themes of isolation and anxiety. "The new direction has given me the outlet that I needed to deal with my emotions and to have hope that things can get better — not just for me, but for society at large."

Morrow has been busy inspiring others by teaching at balloon conventions around the country while preparing for his first solo art show this spring. Time, he says, is always the biggest challenge, as balloons lose air after 30 hours, so, "once you start twisting, the clock starts running." —*Greg Gilman*





THREADING AN EYE IN THE SKY

[INSTAGRAM.COM/VICTORIAROSERICHARDS](https://www.instagram.com/victoriaroserichards)

Stitching stunning sunsets and magnificent maps in miniature form, English embroidery artist **Victoria Rose Richards** takes the craft to a new level with the vibrant colors and textures in her works.

Richards, who has autism, began embroidering as a stress-relieving hobby while studying biology at the University of Exeter in her home county of Devon, England. She graduated in 2019 and still plans to someday pursue a career in that field, but she decided to continue sewing after realizing how much joy it brings her. Richards says, "It was something productive I could genuinely enjoy with no strict expectations and deadlines, no failures as such (because every failed project is just part of learning your craft!), and I could bring the pictures in my head to life."

She draws much of her inspiration from the mismatched English landscapes that are filled with ordered agrarian plots and chaotic countrysides, and often uses a top-down perspective to center a bird's-eye view of the land. Now a full-time artist for the foreseeable future, Richards' formal training in ecology and soil biology helps shape her artwork, as does her overall enthusiasm for all things nature.

As an artist whose needlework spans a variety of sizes, from 2-inch canvases to 10-inch hoops, Richards admits that she has some physical challenges making larger pieces. Besides the constant pricking of fingers, she finds that hoop stands and clamps don't suit her personal embroidery methods very well, so she has to hold her pieces up herself while she works. This places a lot of unnecessary stress on her hand and finger muscles, and she worries that too many large projects could result in long-term hand injuries.

Still, that doesn't stop Richards from remaking the English countryside in thread form, and she encourages others to do the same. "Don't be scared to experiment!" she says to those inspired by her works. "You need to go outside your comfort zone and potentially make bad art to make better art later on ... [but] first and foremost your art should make you happy to create." —*Marshall Piro*s

Victoria Rose Richards