# Contents

**50** 





### **SPARK**

**Top Projects** The Riiksmuseum of DIY projects

Objet 3d'art

Function, meet form; form, function

**Manchester Robot Orchestra** Meet the new Ed Sheeran, with extra hard drives

Columns

Streamline life like Jeff Goldblum in Jurassic Park

Letters A PhD researcher needs your help. So help her!

**Kickstarting** Transport for the kids, hackable by the kids

> Hackspace Artisan's Asylum This is what maker heaven looks like

Arduino: the Next Generation New boss, new gear, new software, Forza Arduino!

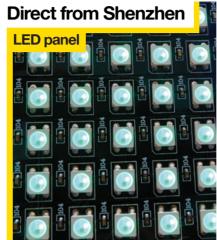
How I Made: Guitar Synth Make sweet music inspired by our favourite Icelander

**Open Space Agency** Seek out new life and new civilisations, with DIY gear

Interview: Noisy Toys On analogue audio and nasal integrity

Improviser's Toolbox Measuring tape Home projects, made-to-measure

HackSpace learns: Glass-blowing We try not to burn ourselves on hot silica. And succeed!



All the colours of the rainbow, in one cheap package



122

Carrots, dogs, and cornflour combine to teach kids about sound



**Top Projects** 



### **FORGE**

**SoM** Tap your own screws Add thread to make bespoke parts for your builds

**SoM** Arduino

Go beyond 7-segments to add a proper display

**SoM** Reciprocating saw When you want to destroy, accept no substitute

**Tutorial** Wearables Match accessories to the world around you

**Tutorial** Z80

Teach an Arduino to make decisions for you

Program your retro computer with assembly 100 Tutorial Machine learning

**104** Tutorial Dry ice ice cream Tasty treats made with solid carbon dioxide

108 Tutorial Standalone Arduino By-pass the board and program the chip directly

110 Tutorial Watch renovation Treat your timepiece to a bit of tender loving care

## **FIELD TEST**

116 Direct from Shenzhen LED Panel Add super happy rainbow colours to everything you touch/make

118 Best of Breed Audio add-on boards for when a buzzer just won't cut the mustard

122 Can I Hack It? How can we improve on a standard mini arcade machine?

Review Adafruit Crickit Add a big bunch of functionality to your Adafruit CPX

126 Review Line-us Draw pretty things with this WiFi-enabled plotter

128 Review Simba-Pro Add Bluetooth to your builds with a tiny input module

**Book Review** Hippo Not the river horse of antiquity, but the brain of modern humans

**Cover Feature** 

**ARDUINO** 

The world's favourite maker board is getting a boost - find out how, when, and what you can do with the new stuff

Tutorial Dry ice ice cream

Science is fun, dangerous, and full of saturated fat flavour

118

Some of the tools and techniques shown in HackSpace Magazine are dangerous unless used with skill, experience and appropriate personal protection equipment. While we attempt to guide the reader, ultimately you are responsible for your own safety and understanding the limits of yourself and your equipment. HackSpace Magazine is intended for an adult audience and some projects may be dangerous for children. Raspberry Pi (Trading) Ltd does not accept responsibility for any injuries, damage to equipment, or costs incurred from projects, tutorials or suggestions in HackSpace Magazine. Laws and regulations covering many of the topics in HackSpace Magazine are different between countries, and are always subject to change, our are responsible for understanding the requirements in your jurisdiction and ensuring that you comply with them. Some manufacturers place limits on the use of their hardware which some projects or suggestions in HackSpace Magazine may go beyond. It is your responsibility to understand the manufacturer's limits.

**Hack**Space