

DOZENS OF HACKS AND HOW-TOS FOR YOUR GEAR **Premiere Issue!**

# Make:

technology on your time



**181**  
pages of  
**D.I.Y.**  
technology

*How to Make a  
Magnetic Stripe  
Card Reader*

*Backyard  
Monorails  
XM Radio  
Hacks  
iPod Tricks  
Blogging  
Made Simple*

**AERIAL  
PHOTOGRAPHY  
NOW** WITH  
KITES!

**BUILD YOUR OWN KITE RIG  
USING THE PLANS INSIDE!**



50



84

**REAL-LIFE  
REVIEWS  
OF USEFUL  
GADGETS!**



96



106

O'REILLY

# Make:

technology on your time™

## Volume 01

### 7: **Welcome**

Publisher and editor Dale Dougherty presents the philosophy of MAKE in a nutshell: We're all *makers* now.

### 10: **Life Hacks: Yak Shaving**

Time-management techniques for geeks. By Danny O'Brien and Merlin Mann

### 12: **Desktop Rail Gun**

Build a miniature magnetic linear accelerator.  
By Simon Quellen Field

### 13: **Tim O'Reilly**

News from the Future: A report on the labs and garage projects changing the way we live.

### 14: **Made On Earth**

Amazing things your neighbors have made in the backyard: monorails, steam trains, beer keg coolers, and more.

### 22: **Cory Doctorow**

Hacking toy dogs to sniff out toxic waste.

### 23: **Maker: Welcome to the Fab Lab**

A tour of Neil Gershenfeld's fab lab at MIT. By D.C. Denison

### 34: **Glowstick A Go-Go**

Hardware hacker Bunnie Huang explains how he designed and built his pattern-generating LED device.

### 38: **Heirloom Technology**

Revisiting, revamping, and re-using forgotten technology.  
By Tim Anderson

### 44: **The Open Source Hybrid Car**

How to make a car using the same process that led to Linux.  
By Saul Griffith

### 47: **Dorkbot**

In cities around the world, high-voltage hackers meet to show off their robots, gizmos, and movable works of art.  
By David Pescovitz



#### ON THE COVER

Photographer Emily Nathan captures Cris Benton rigging his kite camera before a test run. Make one yourself with his instructions on page 50. The kite shown is a Cody historical reproduction, made by Logo Kites Drachen GmbH of Hamburg, Germany. Available exclusively from Gomberg Kite Productions International. [www.gombergkites.com](http://www.gombergkites.com).

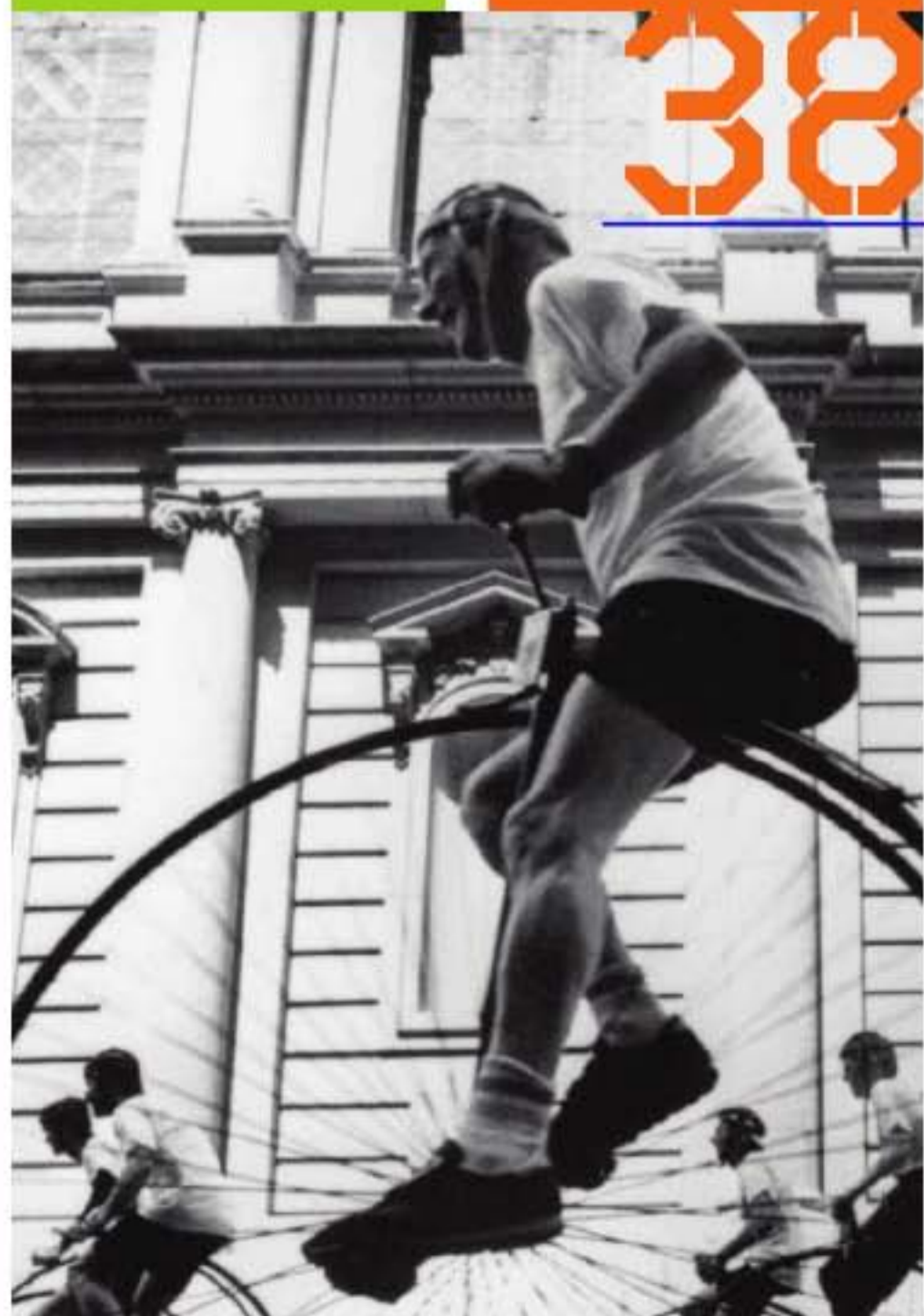


# 22

The feral robot dogs are coming to a Superfund site near you.

The Wright brothers made better bicycle seats than airplanes. It's time to revisit the grooved saddle.

# 38



# Volume 01

## [118:](#) **Bruce Sterling**

Flintknappers are making the tools that people have been making since before they were human.

## [158:](#) **PongMechanik**

Why you might not want to build a real-world game based on a virtual game based on a real-world game. By Howard Wen

## [162:](#) **Primer: Soldering & Desoldering**

Joe Grand's guide to making the perfect joint.

## [170:](#) **MakeShift**

Imagine this: Your car battery is dead, and you're stuck in the woods. Your mission: Get home before you freeze to death. By William Lidwell

## [172:](#) **Howtoons**

Make a simple motor in minutes. By Saul Griffith and Joost Bonsen

## [174:](#) **Toolbox**

Real-life reviews of favorite books, gadgets, gear, and tools.

## [185:](#) **Reader Input**

Comments sent to the editors of MAKE.

## [190:](#) **Challenge**

Got a problem? Ask MAKE's readers to solve it for you.

## [191:](#) **eBay Metrics**

What eBay's sales reports tell us about trends in tinkering.

## [192:](#) **Homebrew: My First Computer**

Remembering the time my dad built an Apple 2 from scratch. By Gareth Palidwor

# 162

Even if you've never picked up a soldering iron, MAKE's primer will have you connecting components in short order.



Why is this man screaming? Because his mechanical pong machine has broken yet again.

# 158

# DIY

two AirPort Express hacks, read eBooks on a Palm, learn four neat iPod tricks, pair your Bluetooth headset to a Macintosh.

## [119:](#) **Home Entertainment**

Open an iPaq to replace the battery, convert your satellite radio Rody for portable use.

## [125:](#) **Imaging**

Recover lost photos from zapped flash memory, build a gooseneck camera mount from a cheap lamp.

## [127:](#) **Mobile**

Get the rundown on high-speed wireless modems, extend your range with

## [143:](#) **Cars**

Enhance your life by making your car look like an official company vehicle.

## [147:](#) **Online**

Ten Gmail hacks, blogging made simple with Ecto, two Excel hacks, speed up your typing with Typelt4Me.

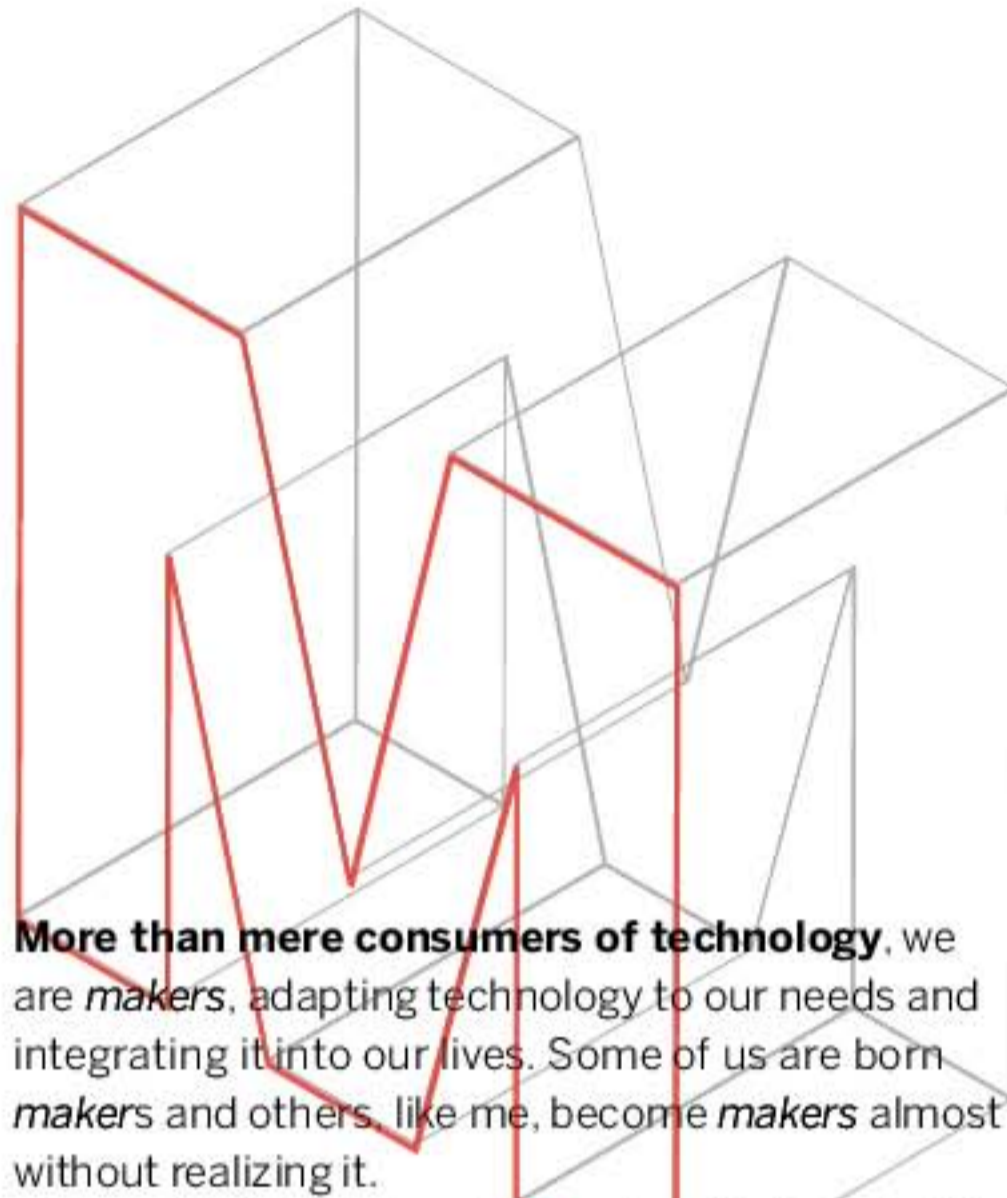
## [155:](#) **Computers**

Make a tote for your mini PC using rubber straps.

# 119



# The Making of **Make:**



**More than mere consumers of technology**, we are *makers*, adapting technology to our needs and integrating it into our lives. Some of us are born *makers* and others, like me, become *makers* almost without realizing it.

Maybe it started when I burned my first music CD, ripping individual songs from packaged CDs and assembling my own playlist. This was unthinkable just five years ago, and now it's how we make our own music — much to the chagrin of the recording music industry.

Maybe it started when I got Wi-Fi working, not just for myself but for my whole family. Suddenly, the computer wasn't locked down to a desk and wired to an outlet. It was free to roam, like a cell-phone, and I began finding new places such as coffee houses that I could call home, or at least home-office.

Maybe it started when I brought my digital camera and laptop on vacation and found that my slideshow was ready before the vacation was even over.

I'm sure that most of us share these experiences, and many others that demonstrate the impact of new technologies in our lives. Think of how many devices each of us interacts with on a regular basis today. And that's only the beginning. Neil Gershenfeld of MIT's Center for Bits and Atoms, who is featured in this issue, writes in his book *When Things Start to Think* that "personal computing has not gone far enough; it lets us shape our digital environment but not our physical environment." In other words, technology that allows us to create complex things will soon become as affordable as the technology we use to create and manage data. We are just beginning

to see the impact of technology in our personal lives. So much is possible.

MAKE is a new magazine dedicated to showing how to make technology work for you. At the core of the magazine are projects that show you how to use technology in interesting and practical ways. A MAKE project is rewarding and fun as an experience, and it produces something you can share with your friends and family. Becoming a *maker* is a lot like learning how to become a better cook — you can follow or improvise upon the work of experts.

In the process of developing MAKE, I have met all kinds of expert *makers* who were excited to contribute their ideas and their favorite projects. There are some I'd call *extreme makers* who bring highly specialized skills and experience working with both new and old technology. They specialize in the unexpected and go beyond what you or I would ever consider practical. We can learn a lot by following what they do, and I'm happy that MAKE provides a showcase for their work.

I hope you enjoy getting to know the experts as well as meeting other *makers* like yourself. We expect that our website will become a place to share your experiences building the projects in the magazine, as well as a home for projects that you develop. I look forward to meeting you there.

Let me know what you think of MAKE and how you use technology to make your own life better. You can contact me at [dale@oreilly.com](mailto:dale@oreilly.com).

---

Dale Dougherty is the editor and publisher of MAKE and the publisher of O'Reilly Network ([www.oreillynet.com](http://www.oreillynet.com)).

It's ironic that in an industry  
so concerned with memory,  
how quickly we forget.

Luckily we have a place to remind us. The Computer History Museum is dedicated to exploring the computing revolution and its impact on the human experience. It is home to the largest collection of computing-related artifacts in the entire world. The collection includes hardware, software, photos, films and video, documents and many one-of-a-kind and rare objects. The Museum's many programs include a popular speaker series featuring luminaries and their personal stories, commemorative celebrations and oral histories that are sure to jog your memory. The Computer History Museum. *Where Computing History Lives*



1401 N Shoreline Blvd Mountain View CA 94043  
tel 650 810 1010

[www.computerhistory.org](http://www.computerhistory.org)

**Make:** EDITOR AND PUBLISHER  
*technology on your time™* **Dale Dougherty**  
[dale@oreilly.com](mailto:dale@oreilly.com)

EDITOR IN CHIEF **Mark Frauenfelder** [mark@boingboing.net](mailto:mark@boingboing.net)  
CREATIVE DIRECTOR **David Albertson** [david@albertsondesign.com](mailto:david@albertsondesign.com)

MANAGING EDITOR **Shawn Connally**  
ART DIRECTOR **Kirk von Rohr**

ASSOCIATE EDITOR **Phillip Torrone**  
DESIGN INTERN **Dennis Pasco**

EDITORIAL ASSISTANT **Arwen O'Reilly**  
ASSOCIATE PUBLISHER, MARKETING **Dan Woods**

COPY CHIEF **Mary Hubben**  
ADVERTISING DIRECTOR **Colette McMullen**  
COPY EDITORS/RESEARCH **Goli Mohammadi, Michael Shapiro**  
707-827-7175  
[colette@oreilly.com](mailto:colette@oreilly.com)

WEBMASTER **Terrie Miller**  
PUBLISHER AT LARGE **John Battelle**

WEB DESIGN **Laura Schmier**  
PUBLISHED BY O'REILLY MEDIA, INC.  
**Tim O'Reilly, CEO**  
**Laura Baldwin, COO**

MAKE TECHNICAL ADVISORY BOARD:  
**Gareth Branwyn, Joe Grand, Saul Griffith, Natalie Jeremijenko**

Copyright © 2005 O'Reilly Media, Inc.  
All rights reserved. Reproduction without permission is prohibited.  
Printed in the USA

Volume 01, February 2005  
MAKE™ is published quarterly by O'Reilly Media, Inc., in the months of February, May, August, and November. O'Reilly Media is located at 1005 Gravenstein Hwy North, Sebastopol, CA 95472, 707-827-7000. SUBSCRIPTIONS: Send all subscription requests to: MAKE, P.O. Box 17046, North Hollywood, CA 91615-7046 or subscribe online at [makezine.com/offer](http://makezine.com/offer) or via phone at 866-289-8847 (U.S. and Canada), all other countries call 818-487-2037. Subscriptions are available for \$34.95 for 1 year (4 quarterly issues) in the U.S. Canada: \$39.95 USD; all other countries: \$49.95 USD.

**Please note:** Technology, the laws, and limitations imposed by manufacturers and content owners, are constantly changing. Thus, some of the projects described may not work, may be inconsistent with current laws or user agreements, or may damage or adversely affect some equipment.

Your safety is your own responsibility, including proper use of equipment and safety gear, and determining whether you have adequate skill and experience. Power tools, electricity and other resources used for these projects are dangerous, unless used properly and with adequate precautions, including safety gear. Some illustrative photos do not depict safety precautions or equipment, in order to show the project steps more clearly. These projects are not intended for use by children.

Use of the instructions and suggestions in MAKE is at your own risk. O'Reilly Media, Inc., disclaims all responsibility for any resulting damage, injury, or expense. It is your responsibility to make sure that your activities comply with applicable laws, including copyright.

#### NEW LEAF PAPER

ENVIRONMENTAL BENEFITS STATEMENT



This magazine is printed on New Leaf Legacy, made with 100% post-consumer waste, elemental chlorine free. By using this environmentally friendly paper, Make Magazine saved the following resources:

trees	water	energy	solid waste	greenhouse gases
77 fully grown	30,233 gallons	41 million BTUs	3,594 pounds	6,955 pounds

Calculated based on research done by Environmental Defense and other members of the Paper Task Force.  
© New Leaf Paper Visit us in cyberspace at [www.newleafpaper.com](http://www.newleafpaper.com) or call 1-888-989-5323