POPULARMECHANICS.COM
APRIL 2010

★ Get a Perfect Lawn —IN JUST 6 WEEKS

WIN THIS! $6500 MOWER PAGE 24

Popular Mechanics

Science Technology Automotive Home Outdoor

HOW I SURVIVED

. . . WILDERNESS PLANE CRASH

BRIDGE COLLAPSE

AVALANCHE

EIGHT DAYS LOST AT SEA

+ Expert Tactics to Combat Hypothermia, Snakebite, Drowning & Other Perils

MEMO TO WHITE HOUSE:

DON'T KILL NASA

By Astronaut Tom Jones

ALSO IN THIS ISSUE

DIY

TIGHTEN LOOSE CAR-DOOR HINGES

BUILD YOUR DREAM (TREE) HOUSE

HANG FLOATING SHELVES

DETANGLE YOUR COMPUTER CABLES

Pump a little adrenaline into your life with the Impreza WRX. 265-horsepower provides the thrust. Symmetrical All-Wheel Drive provides the grip. Combined, they deliver a 0 to 60 time of just 4.7 seconds,* and a shock to your heart every time you hit the accelerator. **Love. It's what makes a Subaru, a Subaru.**

SUBARU.

WRX: Well-equipped at $24,995†

*CarandDriver.com, January 2010. †MSRP excludes destination and delivery charges, tax, title and registration fees. Dealer sets actual price.

Popular Mechanics
2010
Apr.
PM FEATURES
VOLUME 187 NO. 4

For writer Logan Ward, the first step in building a treehouse ("Family Tree," page 68) was making this scale model out of cardboard. It also amped up his kids' enthusiasm for the new backyard addition.

58 Survival Chronicles
Overcoming disaster is a matter of preparation, perseverance, courage and, sometimes, luck. If calamity strikes, you can boost your odds for success with these lessons drawn from real-life survival stories.
BY JOHN GALVIN

68 Family Tree
These days, kids often opt for video games over the outdoors. But one father found a way to elevate fresh-air fun high above electronics: Build a backyard treehouse.
BY LOGAN WARD

74 Four-Door Faceoff
Midsize sedans are the best-selling cars in America, so auto manufacturers keep pushing more models to market. In a PM road test, we pit the segment's three most popular vehicles against five newcomers in the dogfight for the consumer's dollar.
BY LARRY WEBSTER

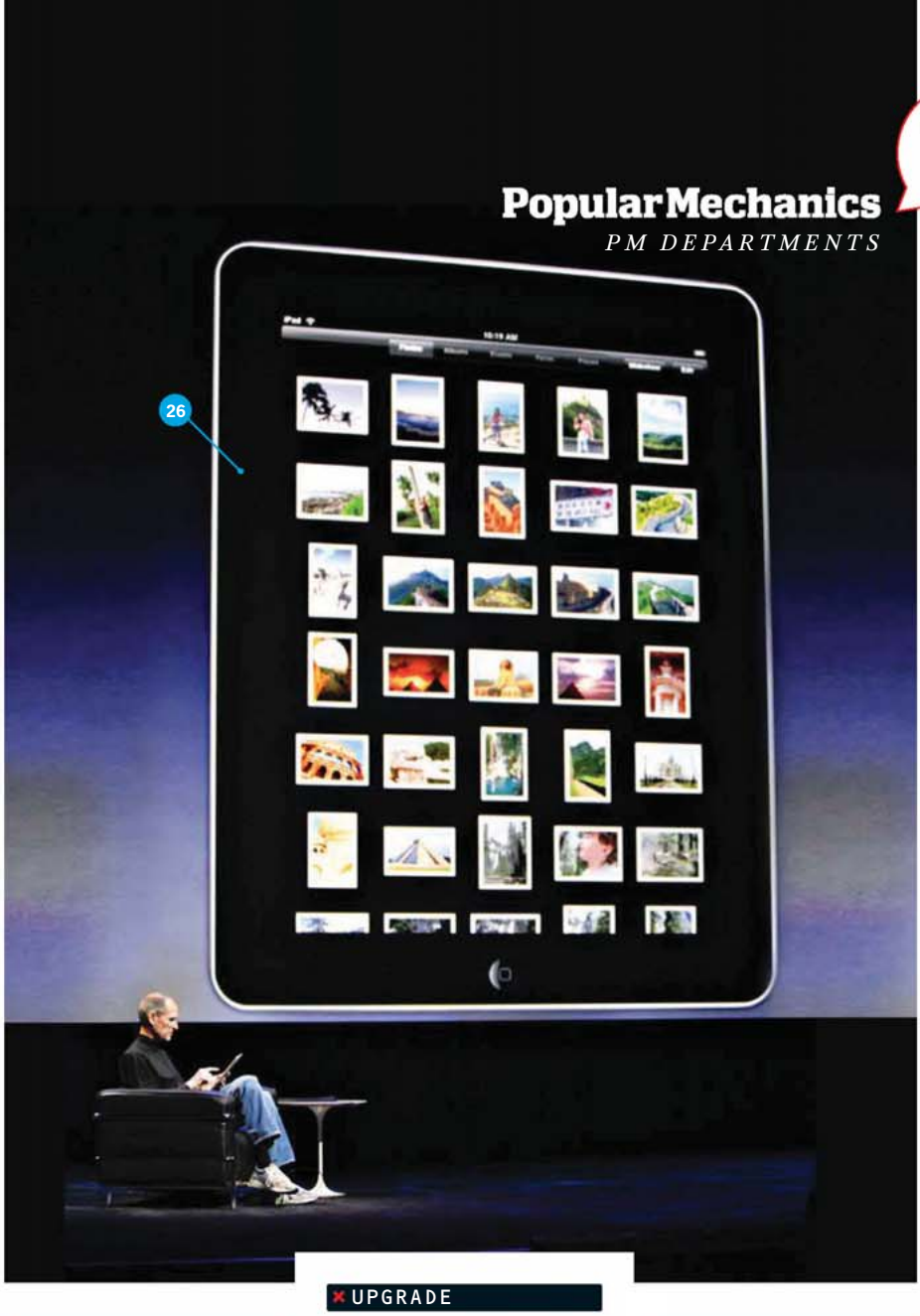
82 Six Weeks to a Perfect Lawn
Turning weedy grass into velvety sod may sound impossible—but not if you follow the PM action plan for growing the perfect lawn.
BY JIM GORMAN

ON THE COVER

Key elements of our cover photo illustration were shot by Joe Pugliese. Prop styling by Still Sets. Final composition with additional elements by PM digital imaging specialist Anthony Verducci.

PHOTOGRAPH BY **J MUCKLE**

NEW TOOLS
CARS
HOME
HOW-TO



diy

pm do-it-yourself

HOME

91 The Chips Fall Where They May
We test six jigsaws on steel for our slice-and-slash challenge.

96 Homeowners Clinic
How to build simple floating shelves. **Plus:** Lower energy bills with foil-faced radiant barriers.

98 How Your House Works: Electric Panel
We translate the circuit-breaker panel to explain the basics of wattage, voltage and all the amperage in between.

AUTO

105 Saturday Mechanic
How to make old car doors shut like new.

110 Car Clinic
Prevent ball-joint failure with this affordable DIY fix. **Plus:** Repair HVAC stuck on defrost.

TECH

117 Fighting Cable Chaos
Transform a mess of unruly wires and plugs into an orderly, color-coded routing system.

122 Digital Clinic
Why Microsoft is waging war against modified Xbox 360s. **Plus:** Leveling fluctuating song volume on iTunes.

TECH WATCH

11 A Deeper Dip
Astronomers discover new stars in the Big Dipper constellation. **Plus:** The latest magnetic field radios save victims trapped underground.

UPGRADE

21 Auto Insurance
The Energizer All-in-One jump-starts your car—no good Samaritan needed. **Plus:** Sizing up the Apple iPad; Bluetooth headsets get Lab Test abuse.

NEW CARS

39 Mainstreamer
The Hyundai Tucson is small, stylish and capable. **Plus:** Driving Audi's lithium-ion supercar; the best from a dynamic Detroit Auto Show.

COLUMNS

52 How It Works: Hurricane Wavemaker
To engineer better buildings, researchers bust walls with waves generated by this high-tech machine.

54 America Grounded
Former shuttle astronaut Thomas D. Jones says NASA's new budget means the demise of American leadership in space.

LISTED ON THE COVER

82 Perfect Lawn
58 How I Survived
74 Car Test
68 Treehouse
24 Win This Mower

IN EVERY ISSUE

How to Reach Us **4** / Letters **6** / This Is My Job **134**

PHOTOGRAPH BY GETTY IMAGES

The 440® 12-Inch Tongue and Groove Plier. It's 20.67 oz. of patented know-how from its laser-hardened teeth to the tips of its CHANNELLOCK BLUE® handles. It's what happens when ingenuity, determination and backbone decide to throw a party in a 1500° hardening furnace. It's a whole foot of American-made, high-carbon steel that won't take no for an answer. **It's time you owned a CHANNELLOCK® tool.**

CHANNELLOCK

WORK HARD. SWEAT BLUE.®

© 2010 CHANNELLOCK, Inc. Meadville, PA 16335 www.channellock.com

Enter to win a 5-piece CHANNELLOCK® Home/Pro Tool Roll
at www.ChannellockSweepstakes.com

Popular Mechanics

JAMES B. MEIGS
Editor-In-Chief

Executive Editor David Dunbar
Design Director Michael Lawton

Deputy Editor Jerry Beilinson
Managing Editor Michael S. Cain

EDITORIAL
Editor, Automotive Larry Webster
Senior Editor, Automotive Mike Allen
Senior Editor, Home Roy Berendsohn
Senior Editor, Science Jennifer Bogo
Senior Editor, Technology Glenn Derene
Associate Editors Joe Pappalardo, Seth Porges, Harry Sawyers
Research Director David Cohen
Assistant Editor Erin McCarthy
Assistant to the Editor-In-Chief Allie Haake
West Coast Editor Ben Stewart

ART
Senior Art Director Peter Herbert
Associate Art Director Stravinski Pierre

PHOTOGRAPHY
Director of Photography Allyson Torrisi
Associate Photo Editor Michele Ervin

PRODUCTION
Assistant Managing Editor Emily Masamitsu
Copy Editor Robin Tribble

IMAGING
Digital Imaging Specialist Anthony Verducci

POPULARMECHANICS.COM
Online Director Angela Diegel
Online Editor Tyghe Trimble

PROJECT ASSISTANT
Alyson Sheppard

INTERNS
DJ Hopson, Jeremy Repanich

Contributing Editors:
Andrew English, Jim Gorman, Chris Grundy, Ben Hewitt, Carl Hoffman, John Pearley Huffman, Alex Hutchinson, Joel Johnson, Tom Jones, David Kiley, S.E. Kramer, Jay Leno, Fred Mackerodt, The MythBusters (Jamie Hyneman, Adam Savage), Joe Oldham, Glenn Harlan Reynolds, Noah Shachtman, Erik Sofge, Kalee Thompson, Joseph Truini, James Vlahos, Logan Ward, Basem Wasef, Barry Winfield, Jeff Wise

Contributing Photographers & Illustrators:
Burcu Avsar, Tim Bower, Brad DeCecco, Dogo, Chad Hunt, Scott Jones, Ed Keating, Axel de Roy, Dan Saelinger, Gabriel Silveira, Sinelab, Art Streiber, Dan Winters

SUBSCRIPTIONS
subscribe.popularmechanics.com

BILL CONGDON
Publisher

Associate Publisher Jane Wladar
General Manager Bruce A. Mitnick
Executive Marketing Director Mike Kresch

Online Advertising Director Matthias Wolf
Marketing Director Barbara Serino
Associate Marketing Manager Johanna Hessling
Group Production Director Karen Otto
Group Production Manager Carole Hartman
Associate Production Manager Karen Nazario

Creative Director Glen Fuenmayor
Marketing Manager Chad Meany
Online Marketing Coordinator Janette Hong
Vice President, Group Consumer Marketing Director Rick Day
Advertising Coordinator Carolyn Yanoff

ADVERTISING SALES OFFICES

NEW YORK
East Coast Sales Manager Ray Rienecker *212/649-2876*
Account Manager Matthew Schwagerl *212/649-2902*
Account Manager Cameron Albergo *212/649-2901*

CHICAGO
Manager Spencer J. Huffman *312/984-5191*
Account Manager Matt Avery *312/251-5355*
Sales Assistant Yvonne Villareal *312/984-5196*

SPECIAL SECTION SALES
Beth Boyle *914/461-3269*

DIRECT RESPONSE ADVERTISING
Angela Hronopoulos *212/649-2930*

LOS ANGELES
Account Manager Brittany Marquis *310/664-2921*
Sales Assistant Cari Nelson *310/664-2922*

DETROIT
Manager Robert Reynolds *248/614-6120*
Sales Assistant Toni Starrs *248/614-6011*
Hearst Magazines Sales, Inc.

DALLAS
Account Manager Patty Rudolph *214/824-9008*
Weikel Media

SAN FRANCISCO
Northwest Manager Andrea Wiener *415/859-5565*
Athena Media Partners

CLASSIFIED ADVERTISING REPRESENTATIVE
Kathleen Gleason *888/473-0788; fax: 708/352-4094*
Klassmark, 52 W. Burlington Ave., La Grange, IL 60525

PUBLISHED BY THE HEARST CORPORATION

Frank A. Bennack, Jr.
Vice Chairman & Chief Executive Officer

George R. Hearst, Jr.
Chairman

HEARST MAGAZINES DIVISION

Cathleen Black
President

Michael Clinton
Executive Vice President, Chief Marketing Officer & Group Publishing Director

John P. Loughlin
Executive Vice President & General Manager

Gilbert C. Maurer
Publishing Consultant

Mark F. Miller
Publishing Consultant

how to reach us

E-Mail *popularmechanics@hearst.com*. **Mail** Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. **Fax** 646-280-1081. Please include your name, address and a daytime phone number. Letters may be edited. **Subscription Questions** For customer service, change of address and subscription orders, log on to ***service.popularmechanics.com***, or write to **Customer Service Department, Popular Mechanics, P.O. Box 7186, Red Oak, IA 51591.** **Back Issues** Write to **Hearst Single Copy Sales, P.O. Box 7763, Red Oak, IA 51591-0763.** **Reprints** E-mail ***PMreprints@hearst.com***.

EDITORIAL BOARD OF ADVISERS

POPULAR MECHANICS is grateful to these scientists, innovators and leaders, who help ensure we cover the most important stories in the most authoritative way.

BUZZ ALDRIN
Apollo 11 astronaut; colonel, U.S. Air Force (Ret.)
SHAWN CARLSON
Executive director of the Society for Amateur Scientists; MacArthur Fellow
DAVID E. COLE
Chairman, Center for Automotive Research
SAUL GRIFFITH
Chief scientist, Other Lab; MacArthur Fellow
THOMAS D. JONES
Space shuttle astronaut; author of *Sky Walking*
GAVIN A. SCHMIDT
Climate modeler, NASA Goddard Institute for Space Studies
AMY B. SMITH
MIT instructor; leader in appropriate technology movement
DANIEL H. WILSON
Roboticist; author of *The Mad Scientist Hall of Fame*
WM. A. WULF
President, National Academy of Engineering

WHAT THEY'RE DOING

DR. KEN KAMLER

Surgeon and author of *Surviving the Extremes,* Ken Kamler used functional MRI scans at a medical and healthcare technology conference in October to show what neural brain activity might look like before, during and after surviving a Mt. Everest climbing disaster. Kamler will join an expedition to study shipwrecks and ruins from ancient Rome and World War II in the Mediterranean waters off Malta this fall.

Please Recycle This Magazine
Remove Inserts or Samples Before Recycling

©2010 The Gillette Company

HELP ELIMINATE ODOR: DON'T JUST COVER IT UP

10x MORE ODOR PROTECTION COVERAGE
*WHEN USED TOGETHER**

INTRODUCING Gillette's LINE OF ODOR SHIELD PRODUCTS.

Odor Shield Anti-Perspirant and Body Wash help eliminate body odor instead of just covering it up. ***Odor Shield technology*** targets and neutralizes body odor at the source. And when used together, you get ***10x more odor protection coverage****. So you can perform under pressure.

TARGETS
SHIELD ZEROES IN ON ODOR

NEUTRALIZES
ODOR COUNTERACTED AT THE SOURCE

PROTECTS
HELPS ELIMINATE BODY ODOR

Gillette
The Best a Man Can Get™

*Total body coverage vs. just using anti-perspirant alone.

Robotic Affection

I truly enjoyed Erik Sofge's February story, "Can Robots Be Trusted?" The author, however, seemed a little surprised by the idea that people would react positively to a robot's fluttering eyes and other social features. I would point out that sociology, anthropology and psychology all reveal that humans do this quite regularly with animals—people consider them friends and attribute anthropomorphic qualities to them. So if humans fall in love with animals, why not fall in love with robots?

JERRY ROSONKE
MANSFIELD, SD

I enjoyed your story on robots and agree we should be concerned about machines that give the outward appearance of feeling and thought, but do not actually feel or think. Morality derives from the assumption of mutuality of experience: If I hurt another person, he feels pain as I would; if I am kind to him, he feels pleasure as I would. Is it wise to create insensate objects toward which we will direct our affections when these objects have no experience of empathy?

The creation of consciousness is so difficult that some artificial-intelligence researchers seem to take the attitude, "If I can create a machine that appears to love me, does it matter whether it actually does?" We must consider the implications of robots without true consciousness, and prepare to adjust our culture and moral codes accordingly.

JIM CLEAVELAND
LOS ANGELES, CA

ISSUE
02/10

Readers responded to a story on robots and the debate over clean coal.

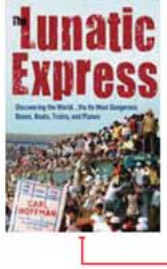
*Popular Mechanics comes to a pocket near you with an **iPhone app that delivers every new issue of the mag** for $1.99 an issue/$7.99 for 12 issues. It's easy to read, easy to carry and chock-full of our usual technical goodness. Learn more at Zinio.com or go to Apple's App Store to download Zinio's magazine app.*

Coal Fired

I agree with your hypothesis from "The Myth of Clean Coal." It's simply an oxymoron; by its very nature coal is dirty. The government also creates monstrous waste by requiring ethanol addition to gasoline and by subsidizing other alternatives that make no financial sense. The vocal and irrational drive to do these things has a negative economic impact. More of us need to object to these impositions. Thanks for the attention to such matters.

ROBERT GALLOWAY
CHARLESTON, WV

IN BOOKSTORES THIS MONTH:



The Lunatic Express: Discovering the World ... Via Its Most Dangerous Buses, Boats, Trains, and Planes, by PM contributing editor Carl Hoffman. On a 50,000-mile global trek, Hoffman chronicles the perils of travel by the most hazardous methods of transportation—through the Amazon on washed-out roads, across the waterways of Bangladesh on overcrowded ferries and through Mongolia's Gobi Desert in 20-ton propane trucks.

what do you think?

Write to Us Include your full name, address and phone number, even if you correspond by e-mail. Send e-mail to ***popularmechanics@hearst.com***. All letters are subject to editing for length, style and format.
Subscribe Please go to ***subscribe.popularmechanics.com***.

PHOTOGRAPH BY FILIP KWIATKOWSKI

THERE ARE 1000 REASONS WHY THE SERIES 1000 CAN'T BE BEAT. HERE ARE FOUR:

THE SERIES 1000 LAWN TRACTOR

A TOP RATED PRODUCT

1. Maneuverability. The Series 1000's best-in-class 12-inch turning radius gets you into – and out of – any tight spot. **2. Perfect Cut.** Aerospace engineers designed the Series 1000's deck and blades to cut precisely and disburse clippings evenly for unsurpassed quality of cut. **3. High Performance.** The Series 1000 comes with a professional-grade powerful engine. **4. Premium Quality.** The Series 1000 is made with the industry's thickest welded steel frame and leading warranty. All so you can keep that investment called home looking its best for years to come.

See your local Cub Cadet dealer for zero interest or low monthly payments.*

STARTING PRICE OF $1,499**

Cub Cadet

YOU CAN'T GET ANY BETTER.™

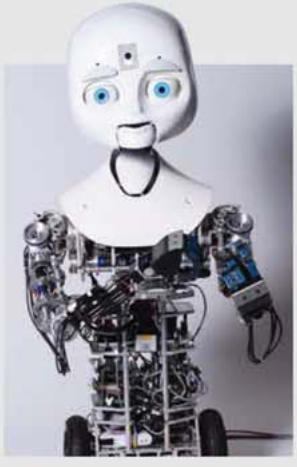
RESIDENTIAL | COMPACT TRACTORS | UTILITY VEHICLES | COMMERCIAL EQUIPMENT

cubcadet.com/PM

MINIMUM MONTHLY PAYMENTS REQUIRED. VALID ON PURCHASES OF $1000 OR MORE MADE BETWEEN 2/1/10 – 6/30/10 WHEN YOU USE YOUR CUB CADET CREDIT CARD. A PROMOTION FEE OF UP TO $125, A TRANSACTION FINANCE CHARGE, WILL BE CHARGED. A promotion fee of up to $125 that is a transaction FINANCE CHARGE will be added to the purchase balance. Valid on purchases of $1000 or more made between 2/1/10 – 6/30/10 on a Cub Cadet Credit Card account. On promo purchase balance, monthly payments equal to 2.50% of initial purchase balance required, but no monthly Finance Charges will be assessed if (1) promo purchase balance paid in full in 12 months, (2) all minimum monthly payments on account paid when due, and (3) account balance does not exceed credit limit. Otherwise, promo may be terminated & monthly Finance Charges assessed from purchase date. On promotions requiring a minimum payment, payments over the minimum will usually be applied to those promo balances before non-promo and other balances. If you have a non-promo balance, this may reduce the benefit from the promo. If you want to change this allocation, please call Customer Service. Standard terms apply to non-promo purchases and optional charges. Promo purchases on existing accounts may not receive full benefit of promo terms, including reduced APR if applicable, if account is subject to delinquency pricing. As of 1/29/2010 **APR: 23.99%** & on all accounts in default, **29.99%**. Minimum Monthly Finance Charge $2.00. Subject to approval by GE Money Bank. ** Product Price — Actual retail prices are set by dealer and may vary. Taxes, freight, setup and handling charges may be additional and may vary. Models subject to limited availability. See your Cub Cadet local dealer for warranty details.

× APRIL

Robot Revolution



ROBOTS IN OUR LIVES They're not just the bad guys in science-fiction movies. Robots already help the world run—from autonomous agricultural machines that help feed us, to UAVs that keep enemies at bay in Afghanistan and Iraq, to Roombas that can clean the floors we don't have time to vacuum ourselves, to underwater rovers that help plane-crash forensics teams make flying safer. PM's experts report on cutting-edge robotics from around the world.

DEUS EX MACHINA Will we know the moment that we've achieved artificial intelligence? Is there really an uncanny valley making lifelike robots untenable? What will a beer taste like after the singularity? When it comes to the theory and future of robotics, we talk to the biggest thinkers and innovators in the field to paint a broad view of emerging ethical and theoretical issues.

FIRST ROBOTICS In an effort to inspire a generation to become scientists, researchers and technology leaders, Dean Kamen created FIRST Robotics, a competition where high school students design and build robots that duke it out in what is, essentially, a varsity sports event. PM covers FIRST throughout the season.

popularmechanics.com/science

REVOLUTIONARY PRODUCTS. SUPERIOR RESULTS.

Meet the revolutionary Cub Cadet zero-turn with steering wheel control. The new Z-Force S zero-turn rider gives you an easy-to-use steering wheel for control of all four wheels and stability on hills.

WWW.CUBCADET.COM

Cub Cadet
YOU CAN'T GET ANY BETTER™

CALLING ALL ELECTRONICS ENTHUSIASTS!

Join Popular Mechanics' New Online Tech Community at
www.popularmechanics.com/myMod

You're in control on myMod:

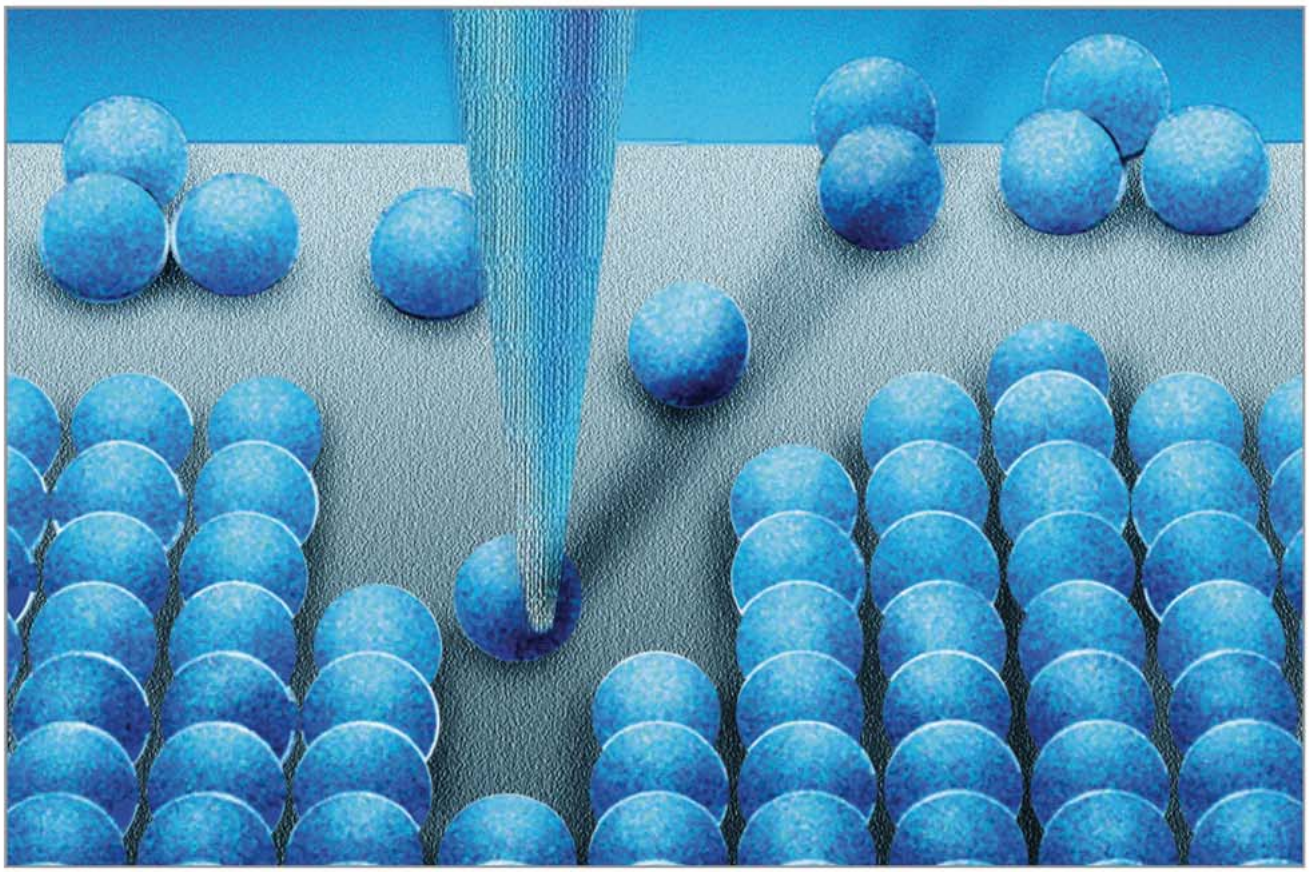
- Share photos of your mod
- Submit a photo of your mod and if it's chosen by PM's Tech Editors as "Mod of the Month" you will win a Digi-Key prepaid Visa gift card valued at $150!
- Swap stories, tips and more with other modders
- Learn to "Speak Geek"

Sponsored by
Digi-Key CORPORATION
QUALITY COMPONENTS, SUPERIOR SERVICE

No purchase necessary to enter or win. The Popular Mechanics myMod Contest. Sponsored by Hearst Communications, Inc. Begins February 1, 2010 at 12:01 AM EST and ends July 31, 2010 at 11:59 PM EST. Open to legal residents of the 50 United States and D.C. who have reached the age of majority in their state of residence at time of entry. Void where prohibited. Contest is subject to complete official rules available at www.popularmechanics.com/mymod

1&1 INTERNET–YOUR AFFORDABLE WEBSITE SOLUTION
As the world's largest web host, 1&1 is dedicated to security, innovation and value when it comes to your website. From basic domain packages to feature-packed web hosting plans and powerful dedicated servers, 1&1 offers a complete range of website solutions for every need, every skill level and every budget. Prices start at $8.99/year.
Visit www.1and1.com for more information

CAMEL SNUS
©2010 R.J. REYNOLDS TOBACCO CO.
BREAK FREE
BE THERE.
DO THAT.
WARNING:
THIS PRODUCT MAY CAUSE MOUTH CANCER



Quantum Mechanics Made Clear

In its relatively short history, quantum mechanics has radically changed our perspective on reality and has come to play a critical role in today's most important technologies. Now, discover astonishing insights into this remarkable field with **Quantum Mechanics: The Physics of the Microscopic World**.

Award-winning Professor Benjamin Schumacher—a founder of quantum information theory and a fellow of the American Physical Society—introduces you to the complex phenomena of quantum mechanics in a way that is both enlightening and easily accessible. Generously illustrated with diagrams, demonstrations, and experiments, these 24 fascinating lectures are a great way to master the secrets of this extraordinary discipline.

This course is one of The Great Courses®, a noncredit, recorded college lecture series from The Teaching Company®. Award-winning professors of a wide array of subjects in the sciences and the liberal arts have made more than 300 college-level courses that are available now on our website.

Quantum Mechanics: The Physics of the Microscopic World

Taught by Professor Benjamin Schumacher, Kenyon College

Lecture Titles

1. The Quantum Enigma
2. The View from 1900
3. Two Revolutionaries—Planck and Einstein
4. Particles of Light, Waves of Matter
5. Standing Waves and Stable Atoms
6. Uncertainty
7. Complementarity and the Great Debate
8. Paradoxes of Interference
9. States, Amplitudes, and Probabilities
10. Particles That Spin
11. Quantum Twins
12. The Gregarious Particles
13. Antisymmetric and Antisocial
14. The Most Important Minus Sign in the World
15. Entanglement
16. Bell and Beyond
17. All the Myriad Ways
18. Much Ado about Nothing
19. Quantum Cloning
20. Quantum Cryptography
21. Bits, Qubits, and Ebits
22. Quantum Computers
23. Many Worlds or One?
24. The Great Smoky Dragon

Order Today!
Offer Expires Tuesday, May 18, 2010

ACT NOW!

Quantum Mechanics: The Physics of the Microscopic World
Course No. 1240
24 lectures (30 minutes/lecture)

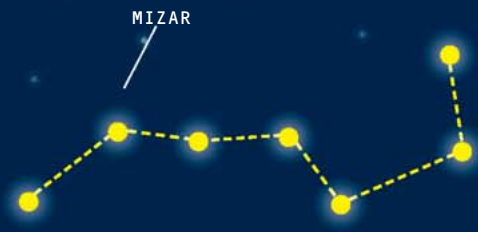
DVDs ~~$254.95~~ **NOW $69.95**
+ $10 Shipping, Processing, and Lifetime Satisfaction Guarantee

Priority Code: 42492

1-800-TEACH-12
www.TEACH12.com/3prm

THE TEACHING COMPANY®
The Joy of Lifelong Learning Every Day™
GREAT PROFESSORS, GREAT COURSES, GREAT VALUE GUARANTEED.™

TechWatch



Big Dipper Keeps Getting Bigger

Human beings have been staring at the constellation Ursa Major, which contains the star group commonly called the Big Dipper, for thousands of years, but it still holds a few secrets for astronomers. With the naked eye, ancient sky watchers in Arabia could see that one of the Dipper's seven stars, Mizar, has a companion called Alcor. Over the centuries, improving telescopes revealed more stars in the cluster. Late last year, two independent teams of astronomers detected a sixth star near Mizar in the middle of the constellation's handle, bringing the total number of stars in the Big Dipper to 12. — *JOE PAPPALARDO*

MIZAR STAR COUNT

2 STARS ***Antiquity***
Ancient sky watchers use the detection of Mizar and Alcor as an eye test. In 2008, an ophthalmologist's paper finds that these results correlate to the modern Snellen visual accuracy tests.

3 STARS ***1617***
Benedetto Castelli finds the binary star Mizar B with a telescope owned by his mentor, Galileo Galilei.

4 STARS ***1890***
Astronomers studying shifts in the wavelength of starlight find that Mizar A is also a binary star.

5 STARS ***1908***
Another binary star is found orbiting Mizar B, making the cluster the first-known quintuple star system.

6 STARS ***2009***
Planet hunters find a star, Alcor B, using a telescope with a mirror that flexes to compensate for the effects of Earth's atmosphere.

Battle of the Blockbusters

Movies vs Video Games

THE PROCEEDS FROM *AVATAR*, THE BIGGEST MOVIE OF ALL TIME, ARE SIMILAR TO THOSE FROM *MODERN WARFARE 2*, THE BIGGEST VIDEO GAME OF ALL TIME, SHOWING THE GLOBAL POWER OF THE VIDEO-GAME MARKET.

Global Sales 5 Days
$274 MILLION
$550 MILLION

Global Sales 1 Month
$1.2 BILLION
$1.0 BILLION

What Boils Below Yellowstone

A seismic study begun over a decade ago has finally settled a long-standing debate about the source of Yellowstone's geothermal heat, and suggests there's much more magma lurking in the subterranean supervolcano than previously thought. Geophysicists funded by the National Science Foundation used data from 200 seismic sensors that measured the waves from 800 earthquakes between 1999 and 2005 to trace the magma. Since seismic waves travel more slowly through hot rock than cold, the researchers were able to outline the shape of a magma pit, located 400 miles below the surface, that curls about 150 miles northwest of the park. The finding contradicts claims that a shallow pool of churning rock fuels Yellowstone's volcanism, and means any future eruption will be more severe. — *ALEX HUTCHINSON*

NEW RUSH FOR RED GOLD

Panning in the streams of Alaska, scientists with the United States Geological Survey have identified a potential source of europium, a rare element that manufacturers use to provide vivid red color in television screens, computer monitors and LEDs. Working the Taylor Mountains area, the government researchers found grains of dark monazite, a mineral that has unusually high concentrations of the element. The discovery could augment europium mining in southeast California, which has recently been overshadowed by Chinese production.

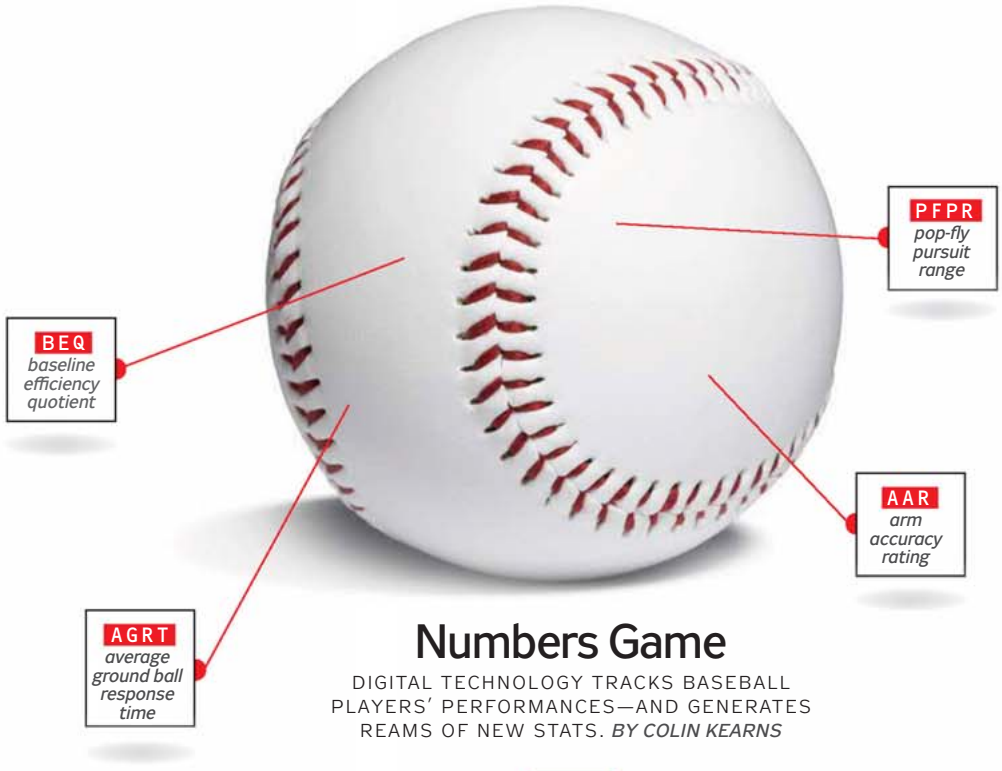
BATTERIES FROM PAPER

Scientists at Stanford University recently developed a method to store energy in ordinary paper by coating it with ink infused with carbon nanotubes and silver nanowires. These nanomaterials are great conductors because their one-dimensional structures move electricity efficiently. The result: lightweight, flexible batteries and capacitors. — *A.H.*

PHOTOGRAPH BY GETTY IMAGES (YELLOWSTONE)

Race for WIMPs

A quest to redefine the nature of the universe is underway in a mine shaft in Soudan, Minn., where physicists with the Cryogenic Dark Matter Search have been looking since 2003 for particles produced by the big bang. Some theories suggest that dark matter makes up as much as 90 percent of the matter in the universe, but they have never been proven because the weakly interacting massive particles, or WIMPs, believed to be dark matter are nearly impossible to detect. Last year, crystalline detectors deep inside the mine, shielded from cosmic rays by half a mile of rock, registered two "events" that might have been WIMPs. But because there's a 25 percent chance that the signals were background noise, the team is adding more sensitive detectors in 2010—hoping to beat the Large Hadron Collider near Geneva, Switzerland, to a definitive dark matter discovery.
— A.H.



Numbers Game

DIGITAL TECHNOLOGY TRACKS BASEBALL PLAYERS' PERFORMANCES—AND GENERATES REAMS OF NEW STATS. *BY COLIN KEARNS*

The two most observant scouts for the San Francisco Giants watch every home game from their reserved seats—high up on the first and third baselines. They measure how far and fast the center fielder travels to snag a shallow looper and record the exact distance of every hit ball, fair or foul. And, since they are completely electronic, these scouts never need to get up for the seventh-inning stretch. Last season, San Francisco's AT&T Park was the testing ground for a prototype of Field f/x, a camera and software system developed by Bay Area company Sportvision. Using images from the system's twin 5-megapixel cameras, Field f/x's software automatically tags the location of the ball and each player 15 times per second. This information can later be analyzed to shed light on aspects of a player's performance that have been largely subjective, such as arm strength and efficiency in running bases. "This technology opens up the possibility of quantifying even more statistics that people never would have known," says Bill Schlough, the Giants' chief information officer. The numbers won't be found on the backs of baseball cards—the Giants treat the new stats as trade secrets. They want to use them to guide trades, individualize coaching and optimize game-day player matchups. The company says the stats could be used on TV broadcasts and fantasy-league websites.

OLD SPORT, NEW METRICS

Measurable statistics like batting average or on-base percentage make it easy to grade the offensive skills of players. Now, with Field f/x, talent scouts are applying quantitative analysis to the harder-to-track areas of a player's ability.

Base Runners
Field f/x charts the base paths to reveal which players run the most efficient routes. After a runner steals a base, Field f/x can determine if he could have left later in the pitcher's windup.

Catcher
Cameras measure the strength and accuracy of the catcher's throwing arm, from home plate to the base being stolen.

Outfielders
If a center fielder makes a diving catch, analysis can determine why he dove—was it a slow reaction to a routine shot or did the batter hit the ball outside the player's fielding range, forcing him to make a speedy play? Such metrics can influence training.

Infielders
One of the greatest advantages of Field f/x is its ability to track the response time of infielders. Scouts can detect which shortstops react quickest to grounders, attaching data to a player's fielding range.

PHOTOGRAPH BY GETTY IMAGES

Radar-Enabled **ADAPTIVE CRUISE CONTROL** and **Collision Warning** with **Brake Support*** **28 MPG**** 390-Watt, 12-speaker **SONY® AUDIO SYSTEM***

All-Wheel Drive* **MyKey™** Radar-Enabled **Blind Spot Information System (BLIS®)** with Cross-Traffic Alert*

Sound Screen™ Acoustic Laminated Glass* and 10 other new sound management technologies **New SR1 rear suspension**

EASY FUEL capless fuel filler **SYNC®* HANDS-FREE COMMUNICATIONS** with traffic, directions, and information†

Lumbar-Massaging Multicontour Heated And Cooled front seats with Active Motion™* Intelligent Access with **PUSH-BUTTON START***

YOU SAY OBSESSIVE LIKE IT'S A BAD THING.

Actually, obsessive behavior led us to some very good things. Like radar technology that monitors and alerts you when the sensors detect vehicles in front of you, behind you and in your blind spots.* And hands-free, voice-activated SYNC®* that gives traffic reports, directions and can actually read your text messages out loud. In fact, the 2010 Ford Taurus was presented the first-ever Edmunds.com Technology Breakthrough Award at the International Consumer Electronics Show. We speak car. We speak innovation.

INTRODUCING THE NEW
TAURUS

Ford

Drive one.
fordvehicles.com

*Available features. **EPA-estimated 18 city/28 hwy mpg, FWD. †Optional. Driving while distracted can result in loss of vehicle control. Only use mobile phones and other devices, even with voice commands, when it is safe to do so.

Big Booms for Safer Roads

MARINE CORPS ENGINEERS IN AFGHANISTAN HAVE A NEW BEAST OF A VEHICLE TO DEFEAT EXPLOSIVE BOOBY TRAPS.

BY JOE PAPPALARDO

The civilian mechanics at Anniston Army Depot in Alabama usually only fix vehicles for the Army, not design them for the Marine Corps. But as Marines push into contested areas of Afghanistan, their engineers face a persistent threat from roadside bombs. The mechanics at Anniston saw they could build a safe ride for these military engineers by adding off-the-shelf equipment to an M1A1 Abrams battle tank. The result, called the Assault Breacher Vehicle (ABV), maximizes the depot staff's experience at fixing the M1A1 and their ability to mount heavy engineering equipment, including a 12-foot plough, onto its hull. The Army donated excess tank parts from its inventory to create the ABV.

After about two years of trials and training, the Marine Corps delivered the first ABVs late last year to southern Afghanistan, where they quickly saw action clearing improvised explosive devices (IEDs) from the roads leading to the Taliban stronghold of Now Zad in Helmand province.

The Breacher crew's preferred method of clearing the roads involves shooting an MK155 linear charge—a nylon rope beaded with 1750 pounds of explosive C4—so that it lies across the unpaved roadway, and then detonating the line to create a safe path more than 300 feet long and 50 feet wide. The system was designed in the 1960s to defeat pressure-fused mines, but is finding a new use in clearing IED-infested roads. Intercepted enemy radio transmissions, quoted in a Marine Corps release, indicate that the enemy fled Now Zad as the explosive strings erupted, saying, "Get out, the big boom is coming!"

BORN TO BEAT BOMBS

Crew	→ *Two Marine Corps engineers*
Armament	→ *.50-cal. machine gun*
Armor	→ *Reactive plates explode to mitigate damage from rocket-propelled grenades or hull-penetrating explosive devices.*
Mine Plough	→ *A 5000-pound, sharp-toothed plough digs up to 7 inches into the ground at 10 mph to dislodge explosives.*

HOW MK155 LINEAR CHARGES WORK

1. A rocket trailing a nylon string of C4 explosives is launched at a 45-degree angle from the vehicle.
2. The rocket burns out after 6 seconds, and the charges fall to the ground in a straight line. The C4's fuse shear pin is broken at the end of the flight.
3. After a 5-second countdown, 1750 pounds of C4 detonate to destroy enemy explosive devices with overpressure.

© 2010 Masco Corporation of Indiana

Sometimes your hands could use a hand.

TOUCH$_2$O® TECHNOLOGY. TOUCH IT ON, TOUCH IT OFF.

Touch anywhere on the spout or handle with your wrist or forearm to start and stop the flow of water. Another way that Delta® is more than just a faucet. For a demo, visit *www.deltafaucet.com/touchfaucet*

DELTA

see what Delta can do™

The Smartest Bike Wheel in the World

Smart bicycle wheels have regenerative braking, which can charge a battery when the rider brakes, providing power to an electric motor. But a brilliant bike wheel, like the one created by MIT researchers, can also report data about the world it rides through. The Copenhagen Wheel, named for its initial testing ground, communicates wirelessly with an iPhone mounted on the handlebars to measure speed, distance and pollution. And if a thief tries to steal it, the wheel locks and sends a text message to its owner. *—A.H.*

HOW IT WORKS

1. *A radio converts the electronic signals of a rescuer's voice into magnetic waves.*
2. *Magnetic waves pass easily through hundreds of yards of solid material.*
3. *The receiver of a trapped miner converts the magnetic waves into electrical signals, which he hears as a voice, and he responds with his position.*

A Voice in the Darkness

A NEW MAGNETIC COMMUNICATOR ALLOWS FIRST RESPONDERS TO CONTACT VICTIMS OF UNDERGROUND DISASTERS. *BY DAVID HAMBLING*

When first responders arrive at a mine disaster or a building collapse, communicating with victims or other rescuers is usually impossible because radio waves can be blocked by metal, earth and stone. Even sites with low-frequency emergency radio systems suffer from slow data transfer that restricts use to simple text messages. But a novel system being developed by Ferro Solutions of Woburn, Mass., transmits voice signals with magnetic waves that travel through solid matter more easily than do radio signals.

Typical radios send signals on electromagnetic waves that oscillate at specific frequencies. Engineers at Ferro developed a portable communicator that translates these undulating waves into signals carried by magnetic fields with resonant frequencies that compatible radios can pick up through hundreds of yards of obstructions. The digital voice signal first passes through a transducer made of a composite that melds piezoelectric material (which generates a voltage when it deforms) with a magnetostrictive metal (which changes shape when it's exposed to a magnetic field). The transducer converts the radio signals into magnetic ones; another reverses this process when the signals reach the other radio.

OTHER APPLICATIONS

Military
This year, Ferro Solutions will demonstrate a radio system U.S. troops can use to clear cave complexes or bunkers. During rescue operations at mass casualty events, such as the Haitian earthquake, military engineers equipped with these radios could stay in contact as they dig to save victims.

Oceans
Divers could speak via a magnetic communicator without interference from rough seas, underwater terrain and dead zones caused by temperature gradients.

Personal Electronics
A magnetic resonance system could allow contact-free recharging—for example, a cellphone battery could be boosted from anywhere in a room.

ILLUSTRATION BY **CHRISTIAN MARRA**

QUALITY

WEB HOSTING AT THE BEST PRICE!

"I have been hosting my website with 1&1 for several years now and have had great customer service and exceptional server reliability."

Isaac Chenevey, www.agilisfitness.com

6 MONTHS
50% OFF
ON THE 1&1 BUSINESS PACKAGE*

	1&1	Network Solutions	Go Daddy
Hosting Package	**Business**	**Small**	**Unlimited**
FREE Domains (.com, .net, .org, .info, .biz)	3 (for the life of your package)	1 (first year only)	–
Monthly Transfer Volume	Unlimited	3,000 GB	Unlimited
Mailbox Size	2,000 MB	1,000 MB	1,000 MB
Private Domain Registration	FREE	$9.00/year	–
Search Engine Submission	✓	✓	Extra charge applies
Money Back Guarantee	90 days	30 days	–
Special Offer	6 MONTHS 50% OFF	–	–
Price Per Month	~~$9.99~~ $4.99 for 6 months*	$9.96	$14.24
First Year Hosting Total (with discount)	$89.91/year	$128.52/year	$170.88/year

As the world's largest web host, with over 20 years of experience and state-of-the-art data centers worldwide, 1&1 is dedicated to security, innovation and value when it comes to your website.

99.9% Uptime!

90-Day Money Back Guarantee!

24/7 Toll Free Support

More special offers are available online. For details, visit www.1and1.com

*Offer valid as of March 1, 2010. 12 month minimum contract term applies. Setup fee and other terms and conditions may apply. Visit www.1and1.com for full promotional offer details. Program and pricing specifications and availability subject to change without notice. 1&1 and the 1&1 logo are trademarks of 1&1 Internet AG, all other trademarks are the property of their respective owners. © 2010 1&1 Internet, Inc. All rights reserved.

MEMBER OF united internet

Call **1-877-GO-1AND1**

Visit us now **www.1and1.com**

1&1®

The Men Who Saw It Coming

SCIENTISTS PREDICTED THE EARTHQUAKE THAT RAVAGED HAITI. COULD ANYTHING HAVE BEEN DONE TO PREPARE?

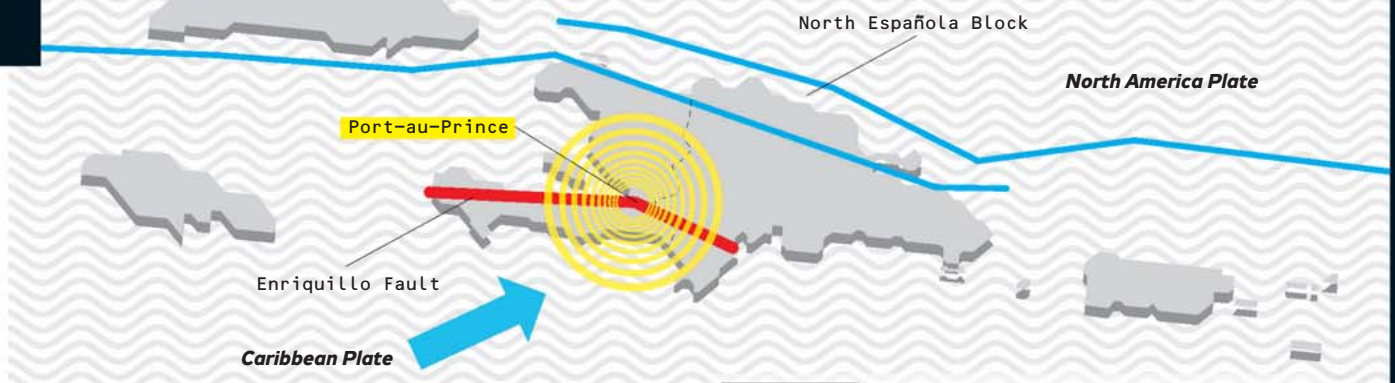
BY CASSIE RODENBERG

The 7.0 magnitude earthquake that hammered Haiti in 2010 was so intense—and the nation so poor—that it is hard to imagine anything could have been done to prevent the tragedy. But geophysicist Eric Calais from Purdue University in Indiana warned the Caribbean nation of the risk, and says that the information could have been used to better prepare the island for an emergency response. At a conference in the neighboring Dominican Republic in 2008, Calais and his team presented a paper that calculated that the Enriquillo fault, which produced the January quake, had the potential to generate a lethal tremor. That paper was the latest in a series of warnings his team issued since 2005. "We've told the Haitian government exactly where the fault is, and that it could produce a 7.2 magnitude event or larger," Calais says. "Unfortunately our number is fairly close to what happened."

Earthquakes can't be prevented, but even impoverished nations can prepare for them. For the most part, Haiti failed to take action. "You can identify the few buildings that are critical—that have to stand up in the face of a large earthquake, like hospitals and schools, from which rescue operations can be organized. This hasn't been done," Calais says. "One of the first buildings in Port-au-Prince that collapsed was a hospital. That is unacceptable."

Haiti is not alone in its lack of preparations for calamity. Other local and national governments ignore earthquake warnings by allowing substandard construction and failing to craft emergency plans—possibly dooming their populations to similarly heartbreaking aftermaths.

THE PLATES Haiti sits on the boundary between the North American and Caribbean tectonic plates. The movement of seismologists' sensors shows that the Caribbean plate moves about a quarter inch per year in relation to the static North America plate. The north Española block, between the plates, is marked by mountains and a fault line (not shown); another fault lies south of it.



THE FAULTS Stress from the passing continental plates builds along fracture lines, like the Enriquillo fault that runs through southern Haiti. Quakes result when the pressure is suddenly released.

FIVE HIGH-RISK FAULTS

1. New Madrid, United States: Scientists predict that the New Madrid fault zone, located over five Midwestern and Southern states, has a 90 percent chance of producing a major quake within the next 50 years. Millions of people in the region live in homes that wouldn't likely survive an earthquake.

2. Quito, Ecuador: Quito sits on an active seismic zone. But as its population rises, so do fears that the city is not prepared for earthquakes, and in particular concern that schools won't survive tremors.

3. Istanbul, Turkey: Nearly 20,000 people died in Turkey's 1999 Kocaeli quake, but preparations are still lacking. A main fault line lies less than 13 miles from Istanbul, representing an extreme risk.

4. Delhi, India: The city of over 12 million is located in the foothills of the Himalayas, where earthquakes are caused by the slow collision of continental plates. Delhi's hospitals and other public infrastructure are inadequate for the population, a fact that bodes poorly for emergency response.

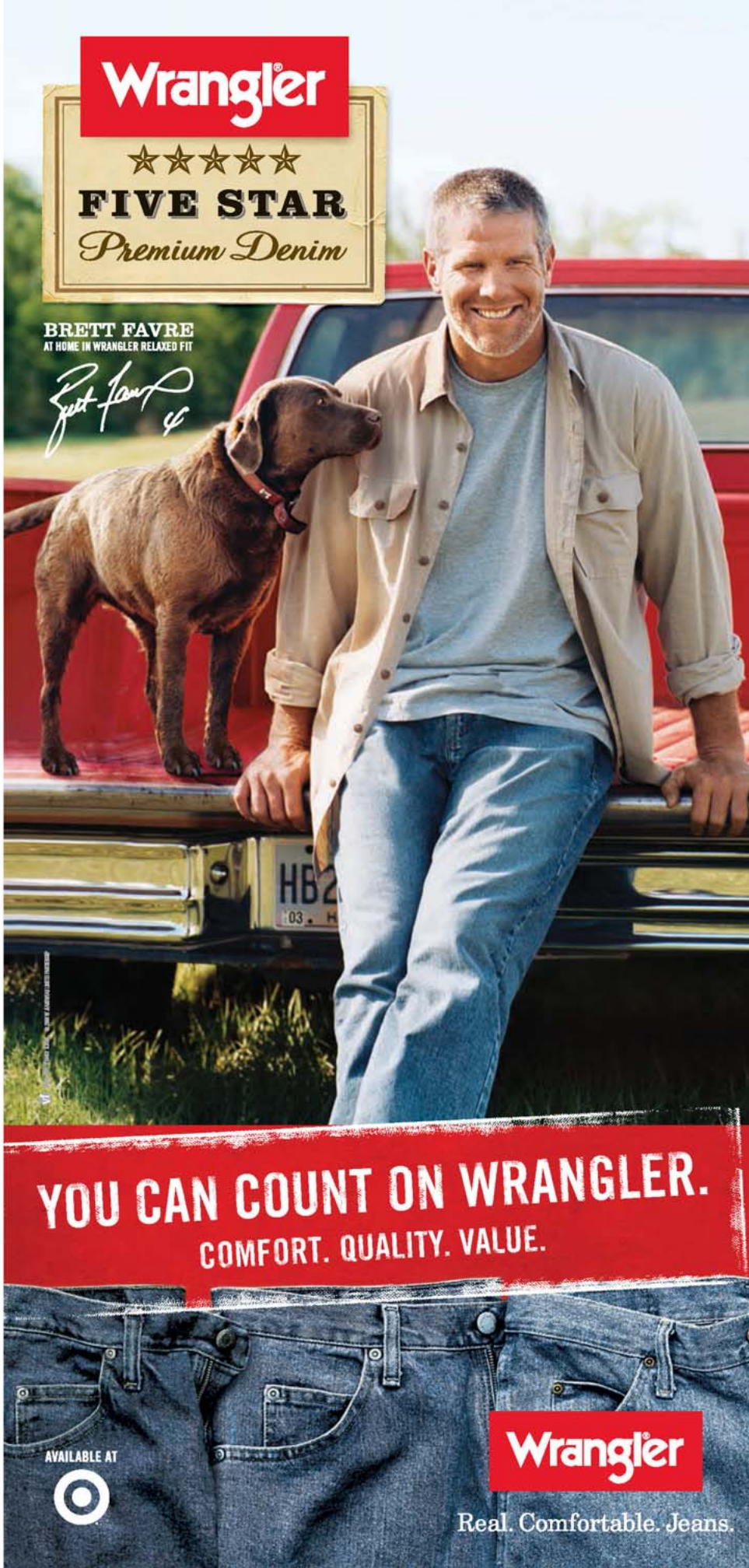
5. Kathmandu, Nepal: The population of Kathmandu has been increasing steadily for decades, but the attendant construction was not regulated and building codes are rarely enforced. Nepal's disaster management agencies are understaffed and not geared for rescue.

ILLUSTRATION BY **SUPERFUTURE**

The 2009 test launch of NASA's Ares 1 may be its only flight.

Grim Victory for Rocket Rebels

Ending months of speculation, President Barack Obama in February released his plan for NASA's future—a plan without a return to the moon. The budget kills all spending on the Constellation program, a Bush administration plan to build a craft called the Ares I to deliver supplies and staff to the International Space Station. According to the axed plan, a second heavy-launch system called Ares V would be used for longer trips to the moon, asteroids or Mars. NASA critic Ross Tierney should have been overjoyed to hear the news of Constellation's demise. Tierney teamed with moonlighting NASA engineers to create an alternative they called Jupiter Direct. ***(PM covered the debate in February 2009.)*** The rival design reuses space shuttle parts to save development time and costs. Tierney's hopes that the administration would embrace the Direct plan were bolstered when he was invited to a meeting at NASA to present the scheme to agency officials. But when the administration released its budget—two weeks after the January meeting—Direct was also seemingly rejected. The budget slates $3.1 billion of research funds to investigate a new heavy-lift rocket, so unless Congress or a big contractor adopts the Direct plan's design, it will be as dead as the Ares vehicles it was meant to replace. — *DAVE NOLAND*



ADVERTISEMENT

2010

Top Tech Tools

These high-tech, useful technology products will make your 2010 better and easier! Looking for hot new products that will help you live better in 2010 whether you're at home or on the road? These three great products from *ShopWithEase.com* fill the bill.

Recharge your battery from the safety and comfort of your car

PORTA-JUMP® EMERGENCY JUMP STARTER

There isn't a worse sound in the world than the clicking sound made by your ignition when you try to start your car and your battery is dead! You're stuck waiting for a tow truck or trying to find someone with jumper cables. It's worse if your wife and family get stuck somewhere on a dark, stormy night. Porta-Jump solves the problem once and for all. Just plug it into your 12Volt Socket and Porta-Jump starts up your car in just a moment! No tow truck, no jumper cables, and you never leave the comfort and safety of your car! Better still, Porta-Jump is rechargeable so it's always ready when you need it. Small enough to fit in your glove box or storage compartment, but powerful enough to start even the biggest pick-up trucks — you'll want to have one in every car. *Just $22.99.*

WHAT-A-LIGHT® PORTABLE RECHARGEABLE FLUORESCENT LAMP

What-A-Light! Portable Rechargeable Fluorescent Lamp with built-in rechargeable battery delivers incredible illumination without the need for a dedicated power source, so you don't have to be tethered to the grid to find your way in the dark. Compact and lightweight, it fits easily into closets, pantries, workshops, garages, kitchens or anywhere you need to shed some light. Its charge-and-go convenience makes it easy to take on camping trips, boat trips, car trips and more — offering added safety and peace of mind. What-A-Light! comes complete with a hanging kit so it's easy to hang exactly where you need it. Mount it, hang it, stand it — What-A-Light! is so versatile. This light should be an essential part of any emergency preparedness plan, too. It includes an 18W/20W fluorescent bulb and adapter that plugs into any AC charger in your house. Get yours today! *Only $34.95.*

AUTOCHRON® PROGRAMMABLE WALL SWITCH TIMER

AutoChron is a real breakthrough! It's the first timer that lets you automatically control overhead lights, outdoor lights, ceiling fans and other electronics that don't plug into a wall. Just slip AutoChron over any wall switch — it installs in seconds with just one screw. An easy-to-read, digital display makes programming AutoChron a snap. AutoChron can turn lights on and off at different times each day for up to 7 days, or even different times the same day. Put one in each room and you can easily create a random pattern of lights turning on and off that will make your home more secure while you're away. Plus, you'll never come home to a dark house again. AutoChron also saves energy costs and is perfect for RVs. And speaking of savings — you'd spend thousands on an electrician to do what AutoChron does for *just $39.95.*

ShopWithEase.com

800-336-1968

Upgrade

Auto Insurance

Murphy's Law as it applies to cars: The times you most need a good Samaritan to jump-start your vehicle are the times you are least likely to find one. Which is why more drivers are opting to carry a portable, battery-powered jump-starter. The ***Energizer All-in-One ($150)*** is one of the most versatile and user-friendly versions we've seen. It's loaded with both a power inverter (for charging gadgets and accessories) and a 250-psi air compressor (capable of fully inflating a tire in 10 minutes). You won't need to pore over a manual by streetlight to find the right clips and knobs—the ergonomic, color-coded design is instantly understandable. Think of the All-in-One as a $150 insurance plan against everyday automobile adversity. — *SETH PORGES*

STUDIO D

PHOTOGRAPH BY **MARKO METZINGER**

Abusive Lab Test

BLUETOOTH HEADSETS

Bluetooth headsets claim to use advanced algorithms and noise-canceling techniques to pull a speaker's voice out from the sounds of a highway, a noisy room or a windy sidewalk. We put three to the test, and then saw how well they handled one of the most likely potential causes of headset death: being left in washing-machine-bound pockets. *BY SETH PORGES*

the tests →

SPEAKING OVER NOISE

How well could others hear us over car-, party- and wind-caused dins?

JABRA: A third-place finish. When we spoke in music-filled rooms, our friends on the other end could only pick up the occasional word.
JAWBONE: In a noisy room, listeners got the gist of what we were saying, if not each individual word.
PLANTRONICS: The winner (by a hair) is still a long way from perfect—although listeners on the other end could hear enough to grasp what we were saying, background blasts of sound still destroyed our ability to have a normal conversation.
WINNER: Plantronics

WASHING MACHINE

Oops! Looks like we left our headsets in our pants pocket through a full cycle in a detergent-filled washer. Post-wash, we let them air-dry overnight before turning them on.

JABRA: A soapy cycle was no match for this headset—given a chance to dry, the Jabra was soon ready to take calls again.
JAWBONE: The Jawbone emerged from the wash cleaner and seemingly no worse for the wear.
PLANTRONICS: Yep, it survived the wash.
WINNER: Three-way tie

DRYER

Sometimes you don't catch your just-washed headset before it makes it into the dryer. After the wash, we put the headsets through a heated dryer cycle.

JABRA: The dryer seemed to spell death for the Jabra—until it lit up as usual a day later.
JAWBONE: Ready to go right out of the dryer, and with no noticeable damage or degradation in sound quality.
PLANTRONICS: No lights, no power, no luck. The dryer transformed the Plantronics into a useless piece of plastic.
WINNER: Jawbone

the sets ←

Jabra Extreme: $80

Jawbone Prime: $130

Plantronics Discovery 975: $130

BOTTOM LINE

The Plantronics provided the best audio performance, but if you're accident-prone or particularly forgetful, the durably built Jawbone and Jabra have the best shot of surviving a trip to the laundromat.

PHOTOGRAPHS BY **J MUCKLE**

YOU IGNORE THE SIGNS.
YOU DON'T WANT TO SOUND LIKE A HYPOCRITE.
YOU DON'T WANT TO ALIENATE YOUR CHILD.
SO YOU

ENABLE

If you think your child is trying drugs or alcohol, the last thing you want to do is enable them. Tap into your natural ability as a parent, and contact us for help.

drugfree.org

The Partnership for a Drug-Free America®

YOU ARE THE PARENT.
YOU ARE STRONG.
YOU ARE NOT ALONE.
WE CAN HELP. SO YOU ARE

ABLE

If you think your child is trying drugs or alcohol, the last thing you want to do is enable them. Tap into your natural ability as a parent, and contact us for help.

drugfree.org

The Partnership for a Drug-Free America®

Click to Test Drive

Real people should not attempt. Always wear your seatbelt.

extreme freebie!

CUB CADET Z-FORCE S 60 LP

$6499

726-CC LIQUID-PROPANE-FUELED ENGINE

ZERO-TURN, TWIN HYDRO GEAR TRANSMISSIONS

60-INCH DECK ENGAGED WITH PUSH-BUTTON PTO

WIN THIS RIDING MOWER!

Riding mowers are typically about tradeoffs. Sure, zero-turn models can carve pinpoint turns, but because their front wheels pivot freely—like a shopping cart—they can be difficult to steer. The **Cub Cadet Z-Force S zero-turn mower** gives you control of all four wheels, making the machine easier to direct, while the three overlapping blades cut a 60-inch swath through overgrown grass. Further obliterating the learning curve: The mower is controlled by a familiar steering wheel instead of lap bars. And then there's the air-friendly propane engine—a 726-cc Kawasaki that, according to the company, exhausts 97 percent fewer particulates than a comparable gas engine. We're giving one of these machines away. Enter at *popular mechanics.com/cubcadetsweeps*.

— ROY BERENDSOHN

RANDOM DRAW SWEEPSTAKES RULES

No purchase necessary to enter or win. Cub Cadet Z-Force S Giveaway. Sponsored by Hearst Communications, Inc. Beginning March 2, 2010, at 12:01 AM (ET) through April 15, 2010, at 11:59 PM (ET), go to *www.popularmechanics.com/cubcadetsweeps* and complete and submit the entry form pursuant to the online instructions. Odds of winning will depend upon the total number of eligible entries received. Must be a legal resident of the 50 United States, the District of Columbia or Canada who has reached the age of majority in his or her state or province of residence at time of entry. Void in Puerto Rico, the province of Quebec, and where prohibited by law. Sweepstakes subject to complete official rules available at ***www.popularmechanics.com/cubcadetsweeps***.

TIMEPIECES INTERNATIONAL

DOUBLE DISCOUNT

82%OFF

LIST PRICE ~~$1,095~~

WAS $249

NOW JUST **$199**

YOU SAVE $896

8 EXQUISITE DIAMONDS

5 YEAR UNLIMITED MOVEMENT WARRANTY

30 DAY MONEY BACK GUARANTEE

PRECISION AND LUXURY AT ITS BEST

NOW WITH DIAMONDS AS STANDARD

The Klaus Kobec Couture Sports. A luxury timepiece with a high precision Swiss movement and diamond dial, is now available direct from the manufacturer at the astonishingly low price of just $199 - a saving of $896 on the retail price of $1,095. All the features and styling you would expect from a designer watch including a magnificent presentation case, but at a fraction of the price you would expect to pay. We just make beautiful watches, beautifully simple to buy.

Includes Soft Lined Wood Finished Presentation Case

- High precision Swiss movement • 8 Genuine diamonds on the dial • Stainless steel case
- Stainless steel and gold plated bracelet • Stainless steel butterfly clasp to the bracelet
- Chronograph featuring hours, minutes and day dials (mens only) • Calendar
- Water resistant to 3atms (98ft) • Supplied to you in a magnificent presentation case.

VISA · American Express · MasterCard · DISCOVER

CALL OUR CREDIT CARD HOTLINE ON **1-877 550 9876**

Please quote code PM104TTD or go to www.timepiecesusa.com/pm104

Timepieces International Inc, 3580 NW 56th Street, Fort Lauderdale, Florida, 33309

Screen Test

APPLE IPAD

➔ Considering all the hype and speculation that preceded the launch of the Apple iPad, it's easy to be let down by its shortcomings: No webcam? No Flash support? No SD card slot, no multitasking? Another deal with AT&T?

But to focus on the quibbles ignores the larger significance of the machine. The iPad succeeds mightily at carving out a niche in personal computing where there was none before—a light-duty media and reading device with all-day usability (Apple claims 10-hour battery life) that is far more portable than a laptop (1.5 pounds, 0.5 inches thick), yet more capable than a smartphone.

Remarkably for Apple, the iPad's hardware design is somewhat conservative—essentially a large-format iPod Touch. Yet the 9.7-inch 1024 x 768 pixel, multitouch screen makes reading e-books, watching movies and viewing photos a far more satisfying experience on the iPad than on its smaller cousin.

The iPad may not seem so revolutionary for long, however. Unlike the iPhone, which was two generations ahead of other smartphones when it was launched, the iPad is simply the first big player in what is bound to be a crowded category by the end of the year. The multitouch user interface on the iPad is slick, but there are other touch-friendly operating systems out there (Android, Windows 7), and Apple's not the only company with tablet dreams.

Hot-Spotter

➔ Mobile hotspots work by taking an over-the-air cellular signal and pumping it out as a Wi-Fi connection that any PC can use to get online. But are separate devices really necessary? After all, smartphones have broadband access too, so why can't they serve as hotspots? The Palm Pre Plus ($150 with two-year contract) can do exactly that, connecting up to five devices at a time, just like a stand-alone mobile hotspot. And look out, Verizon customers—it's the network's first phone that runs on Palm's webOS platform.

EDITOR'S CHOICE

Ceiling Sound

➔ Installing in-wall speakers usually requires snaking wires, cutting drywall and mounting brackets. The ***Klipsch Light-Speaker ($600 for two speakers and a base station)*** is a high-tech, labor-saving solution. The LED lighting fixtures (which fit into a normal ceiling-lighting can) come with a 20-watt speaker built right in. The speaker units are completely contained: They require no wiring, receiving their signal from the base station over a 2.4-GHz radio-frequency connection. Volume and lighting are controlled via a small remote that can handle two zones.

Counter Viewer

A glorified alarm clock? Sorta. An app-capable tablet? Kinda. A kitchen-ready digital recipe viewer? Perhaps. A touchscreen picture frame? At times. Enter the curious case of the ***Sony Dash ($200)***—a 7-inch, Wi-Fi-enabled touchscreen device designed to stream information (such as news, weather and recipes) and handle lightweight apps and games. Sure, there's little this thing can do that can't be done on countless other gadgets, but between the bedside table, kitchen counter and living room coffee table, we're going to bet that not even Sony knows all the uses people will come up with for it.

Finer Grinder

Between grinding down welds, knocking rust off salvaged ironwork and shearing off bolt shafts, the 6-inch angle grinder sees its share of grit. The engineers at Fein discovered that when the tool's power switch is exposed to this damaging detritus, it can eventually seize up and cease to function. For the ***Fein WSG 14-150T ($250)***, they solved the problem with an unusual switch that activates via a pinch to the tool's opposite sides.

Orange Is As Good As Gold!

ASTRONOMY MADE SIMPLE FOR 50 YEARS...

The distinctive orange tubes of the Celestron telescope have come to signify quality throughout the amateur astronomy world. Our original C8 model set the standard. Today we offer the NexStar SE Series which feature the latest technologies and design innovations making this telescope a joy to use. For more information visit us at: www.celestron.com/se.

CELESTRON

CELEBRATING 50 YEARS 1960 2010

www.celestron.com

TECH TODAY:

WHOLE-HOUSE AUDIO AS SIMPLE AS SCREWING IN A LIGHT BULB

A hidden multi-room music system usually requires snaking wires and cutting holes in drywall—but not anymore. The Klipsch® LightSpeaker®, which combines a long-lasting LED bulb and wireless speaker in one screw-in unit, adds brilliant light and ambient music to any room in your house in mere minutes. There's no wiring or retrofitting. All you need is a light bulb socket!

A LightSpeaker System pays for itself in five years through savings on installation, separate audio components and daily usage of efficient LED lighting. Plus, you can take it with you if you move!

- Connect up to 2 music sources
- Supports 2 zones and up to 8 LightSpeakers

2010 INNOVATIONS

HOUSE TOPS AWARD

PM EDITOR'S CHOICE AWARDS 10

Visit **klipsch.com/lightspeaker/pm** for details.

GREAT PRODUCTS FROM THE 2010 CES SHOW

C.CRANE
RADIO & LIGHT

NEW! GeoBulb®-3
5-Year 24/7 Warranty

- Only Uses 7 Watts!
- Good Replacement for Incandescent and CFLs
- 50-60 Watt Equivalent
- 120 Volt • No Mercury or Lead
- Cool White, Soft White, and Warm White

CC WiFi Internet Radio

- Find Wonderful Stations You Never New Existed and Your Local Favorites
- 16,500+ Stations
- No Static — No Fade
- Now with Pandora, Aupeo!, Live365

ccrane.com • 800-522-8863 • GeoBulb.com

ON THE CUTTING EDGE

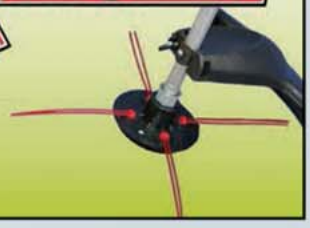
You have been fighting with your string trimmer head for too long. PivoTrim® is a revolutionary, patented pivoting line system for all gas trimmers that absorbs line shock and reduces wear and tear on your line.

No more rewinding spools and fewer line breaks mean less hassle and a better trim! Plus, PivoTrim® offers quick and easy line changes and uses standard .095 trimmer line.

Available at
THE HOME DEPOT
And other fine retailers.

www.pivotrim.com
800-431-4177

PIVOTRIM™



100% Satisfaction Guaranteed!

LASER IT!
Cut it. Engrave it. Mark it.

Laser Engraving, Cutting and Marking Systems from Epilog Laser

From creating and personalizing 3D models, to engraving photos on keychains, to marking high-tech gadgets, our laser systems create the products you see here and more!

Laser Systems Starting at $7,995

Visit epiloglaser.com/popmech.htm for more information and to receive your brochure kit with engraved and cut samples!

EPILOG LASER
1.888.437.4564
sales@epiloglaser.com
MADEINUSA

"THE STAFF AT LUMBER LIQUIDATORS ARE ALWAYS FRIENDLY AND TO THE POINT. THEY'RE NOT A HIGH PRESSURE SALES TEAM AS THEY LET THE PRODUCT SELL ITSELF."

DALE G., BEAVERTON, OREGON

"I liked the quality of Bellawood so much, I installed it in my own home." ~ Bob Vila

Bellawood PREFINISHED HARDWOOD FLOORS® Certified 50 Year Warranty

Bellawood Brazilian Cherry

Over 185 stores nationwide! For a FREE catalog or a store near you call 800-256-7885 or go to lumberliquidators.com.

HARDWOOD FLOORS FOR LESS!

LUMBER LIQUIDATOR$

www.lumberliquidators.com

1-800-HARDWOOD

10/14/09

2010

SMART HOME

THE KEYS TO LOWERING CONSUMPTION LIE IN A HOUSE'S SYSTEMS. THESE 11 NEW TECHNOLOGIES, SELECTED AS POPULAR MECHANICS GREEN DESIGN AWARD WINNERS, CREATE MORE EFFICIENT BUILDINGS AND MORE EDUCATED INHABITANTS. BY HARRY SAWYERS

THE TIGHTWAD TOILET

Toilet technology is a little like limbo—how low can you flow? The bar now sits at 1.28 gallons per flush. But Niagara's Stealth toilet sips only 0.8 gallons per flush thanks to a dual trap system that uses an air-transfer valve to pressurize the trapway, requiring less water to get something that early, primitive low-flow toilets lacked: "nice, complete rim cleaning," says Niagara's Paul Kwiat. Pressurized air replaces water in the trap as the tank fills. As the fixture flushes, the air travels up into the tank to displace the water in a tiny torrent to the bowl.

PHOTOGRAPH BY **NICK FERRARI**

2010

SMART HOME

POPULAR MECHANICS GREEN DESIGN AWARDS

← GET IN ON THE GRAYWATER

Most graywater draining from a sink or shower can be reused, with a little scrubbing, as garden irrigation. Few systems accomplish this task as simply as the one from US HydroTech, which pumps graywater through layers of filtration media to clear the water of soap and debris without chemical treatments. Developer Ed Bertain claims the system can handle up to 69.3 gallons per person, per day. Combine it with a collection tank, which can also be set up to catch rainwater.

↑ THE REEL DEAL

Dual gears store energy the way a flywheel does in the blades of Fiskars' new Momentum mower, which devours debris that would jam a typical reel. The blades also stay sharper—revolving and stationary blades often collide on each turn, but these work like scissors, passing each other at 0.003 inches. Clever blade-spool design lets the mower flush-cut edges typically trampled beneath the wheels.

↓ SYCAMORE SYRINGE

The Deep Drip 1-inch-diameter stake delivers water and fertilizer where they're needed: to tree roots, via a perforated hollow spike hammered 2 feet into the soil surface. A study by Cal State–Fresno's Center for Irrigation Technology found the stake to be more effective than surface water at saturating the root zone while reducing runoff and soil erosion.

↑ GREENER CLEANER

Made using nontoxic ingredients in a secret Manhattan lab, Green Depot's home-brewed cleaners reduce ecological impact as well as elbow grease. The recipe for the window cleaner eschews ammonia and alcohol in favor of "completely biodegradable surfactants," and the tub and tile cleaner works its fume-free magic through the power of a low-pH organic salt.

PHOTOGRAPHS BY KARL JUENGEL/STUDIO D; ILLUSTRATION BY ANDREW RAE

Presented by

Popular Mechanics

eBay

30 DAYS of green

Can you change the world in 30 days? You can start by giving new life to existing products. Buying lightly loved—but new to you—products is great for the planet, because they don't require new energy and resources to produce. That's why eBay and Hearst Magazines have teamed up to bring our 74 million readers **30 Days of Green**, which showcases dozens of ways to green your life. From now until Earth Day, for every reader who takes the eBay Green Team Challenge, eBay will protect one acre of forest in collaboration with Team Earth, and you'll be entered to win. Together, we can create an environment for change.

Visit ebay.com/greenteam to get inspired, take The Challenge and be entered to WIN $10,000 to spend on eBay or hundreds of other great prizes to help you make greener shopping choices!

COSMOPOLITAN COUNTRY LIVING THE DAILY GREEN ESQUIRE FOOD NETWORK MAGAZINE GOOD HOUSEKEEPING HARPER'S BAZAAR HOUSE BEAUTIFUL MARIE CLAIRE O, THE OPRAH MAGAZINE POPULAR MECHANICS REDBOOK SEVENTEEN SMARTMONEY TOWN&COUNTRY VERANDA

2010

SMART HOME

POPULAR MECHANICS GREEN DESIGN AWARDS

SUPER CAULK

This spray-foam latex seals gaps too big for caulk to fill. Installers use a gun rigged to a mixing machine to blast Energy Complete into framing transitions, such as where plates and joists meet. And while caulk loses its hold under pressure changes, latex permits a bit of building movement—enabling it to withstand the big bad wolf of blower-door tests. Plus, it installs faster than "a guy with just a little tube," Owens Corning's Karel Czanderna says.

COOL, DARK ROOF

New Solaris shingles from CertainTeed match the 40 percent reflection rate of a light-colored roof, but look like a dark one. The difference is in the titanium dioxide. The reflective coating encases each granule; spot-coating, the norm, leaves a white sheen. "We've been selling roofs on curb appeal for 20 years, and people heard us—nobody wants white," the company's Lucas Hamilton says.

PETRIFIED OSB

"Oriented-strand board is just such a gorgeous product," TorZo's Chris Coduto says, "but if you want to rout an edge in it for a countertop, it tends to splinter." TorZo's solution is to place the structural panels in a heated vacuum, "polymerizing" the material so that it's firmer than a tropical hardwood. The result, named Orient, comes in four hues and can be shaped into OSB countertops, cabinet fronts, wainscoting or flooring. Installers fasten it with a two-part Corian adhesive (or just wood glue), then seal it with a clear coat. This process takes a basic building product and redefines its purpose.

LED UPGRADE

Power-tool flashlights, not always the crown jewel of the combo kit, can get an efficiency boost with Milwaukee's Upgrade to LED. Switching the bulbs triples the run time on most 9.6-volt to 28-volt tools, and the 50,000-hour LED has 250 times the incandescent's life span.

WONDER WINDOW

Solera's opaque exterior panels contain nanogel polymers, weightless beads filled with air, that form a lattice through which no heat flows. As a skyscraper's curtain wall or a privacy wall in a house, the panes' R-17 to R-20 insulation—on par with a wall's—"dramatically reduces the heating and cooling load of a glass building," Solera's Avi Bar says.

SALVAGE SCAVENGERS

The main challenge of using second-hand building materials? Navigating the salvage yards to find what you need. Kansas City's PlanetReuse acts as your scrap agent, sourcing anything from ex-ocean-boardwalk lumber to brick from an abandoned factory. The matchmakers pair materials requests with new online listings in an operation so streamlined that the firm can often price salvaged items for less than an equivalent new material. Good thing—they don't mill it like they used to.

PHOTOGRAPHS BY KARL JUENGEL/STUDIO D; NICK FERRARI (SUPER CAULK); MARKO METZINGER/STUDIO D (COOL, DARK ROOF); ILLUSTRATION BY ANDREW RAE

PROMOTION

Buying pre-owned sunglasses saves 74% of the CO_2 needed to make new ones. And makes you look cool, which is good in all environments.

Selecting a refurbished smart phone saves the energy equivalent of driving 186 miles. And increases your ability to afford season tickets.

The greenest product is the one that already exists.

Here's what men can do for mankind.

ebay.com/greenteam

Calculations powered by Cooler, Inc.

Choosing a classic, previously loved watch saves the energy equivalent of 39 days of refrigerator use. And it keeps better time than a refrigerator, too.

ebay

TWISTS ON SOLAR

CLEVER WAYS TO CATCH THE SUN EMERGE AT THE SOLAR DECATHLON, A BIANNUAL CONTEST IN WHICH COLLEGE STUDENTS DESIGN AND BUILD A SOLAR-POWERED HOME. THREE DETAILS FROM THE 2009 HOMES GET EXTRA CREDIT FOR CREATIVITY.

UNIVERSITY OF LOUISIANA AT LAFAYETTE

SOLAR LOUVERS

The Ragin' Cajuns' BeauSoleil home has a transitional breezeway, or dogtrot, capped by a complex skylight. Polycarbonate panels sandwich the skylight, which houses flat-plate solar thermal collectors and aluminum fins that function like stationary louvers on exterior shutters. Fins shade the porch from the sun as solar thermal collectors threaded through the metal provide domestic hot water.

PENN STATE UNIVERSITY

REFLECTIVE GREEN ROOFING

On top of Penn State's Natural Fusion home, cylindrical photovoltaics combine with a green roof. The tube-shaped "panels," made by Solyndra, take advantage of reflective roofing by collecting solar energy from 360 degrees. Green roofs reduce a building's rainwater runoff and lighten its cooling loads, but the Nittany Lions realized that plants could also bounce sunlight back into the panels—fusing technology and nature to create a new building-design technique.

UNIVERSITY OF MINNESOTA

SMART SHADE

The photovoltaic-clad roof gable on the Golden Gophers' Icon house extends to shelter its eastern porch beneath a translucent solar array. Silicon film on both sides of the bifacial panels captures sunlight from above and reflected light from below. An example of the design category known as building-integrated photovoltaics (BIPVs), this capitalizes on the pleasant, efficient shading effects of a porch awning by putting it to work generating power.

ON THE WEB > For a full list of Popular Mechanics Green Design Award winners, visit ***popularmechanics.com/greenliving.***

If every *Popular Mechanics* reader* gave a smart phone a new life, it would be like saving over 8,000 acres of forest!

And when you take the eBay Green Team Challenge, eBay will bring your impact to life by protecting an acre of forest.

Here's how to take The Challenge and WIN.

1. Visit **ebay.com/greenteam**.

2. Today through Earth Day, take the eBay Green Team Challenge to live greener by using what exists in the world today.

3. Vote on where you want eBay, together with Team Earth, to protect your acre of forest.

As a thank-you, you will automatically be **entered to WIN $10,000** to start shopping for your greener life on eBay, or one of hundreds of other great prizes.

eBay green team

TeamEarth

NO PURCHASE NECESSARY TO ENTER OR WIN. PURCHASE WILL NOT INCREASE YOUR CHANCES OF WINNING. Void in P.R. and where prohibited. Sweepstakes begins at 12:00:00 am Pacific Time (PT) on March 1, 2010, and ends 11:59:59 pm PT on April 22, 2010 (the "Promotion Period"). Open to legal residents of the fifty (50) United States and D.C., 18 years of age or older, who are confirmed registered members of www.ebay.com at time of entry ("Eligible Participant"). Prizes: Grand Prize (1): $10,000 (awarded as a PayPal deposit). Approximate Retail Value (ARV): $10,000; First Prize (500): $25 eBay Gift Card. ARV: $25/ea. Total ARV of all prizes: $22,500. Odds of winning depend upon the number of eligible entries received. Entry must be received by 11:59:59 pm PT on April 22, 2010. In order to be eligible. There is a limit of one (1) entry per eBay User ID for the Promotion Period. For Official Rules and details, go to www.ebay.com/greenteam. Sponsor: eBay Inc., 2145 Hamilton Avenue, San Jose, CA 95125.

©2010 eBay Inc. and Hearst Communications, Inc. All rights reserved. *Popular Mechanics* and 30 Days of Green are trademarks of Hearst Communications, Inc. eBay and the eBay logo are registered trademarks of eBay Inc. Team Earth is a registered trademark of Conservation International.

Calculations powered by Cooler, Inc.

*8.8 million *Popular Mechanics* readers, MRI Fall 2009

New Cars

2010 Hyundai Tucson

BASE PRICE: $19,790

Mainstreamer

It's no longer a surprise when a new Hyundai is fully competitive with other vehicles in its class. Hyundai certainly builds solid vehicles, and the all-new Tucson rolls in the crowded and competitive crossover pack. Riding on a 103.9-inch wheelbase and stretching 173.2 inches long overall, the new Tucson fits right in with other players such as the Honda CR-V. Every Tucson gets a 176-hp 2.4-liter Four, and most will be paired to a six-speed automatic. The engine is relatively smooth and delivers its power seamlessly. The rear-seat legroom is generous for the class. It's comfortable and refined, but a little unexciting—in sum, it's normal. Hey, we've been spoiled by some really brilliant Hyundais lately, including the Genesis Coupe. *—JOHN PEARLEY HUFFMAN*

INSIDE:

HYUNDAI TUCSON

AUDI e-TRON CONCEPT

MERCEDES-BENZ E350 4MATIC WAGON

MERCEDES-BENZ B-CLASS F-CELL PROTOTYPE

KAWASAKI Z1000

TOYOTA SIENNA

PLUS:

PH TEST DRIVEN

DETROIT AUTO SHOW SPECIAL

pm test driven

1.

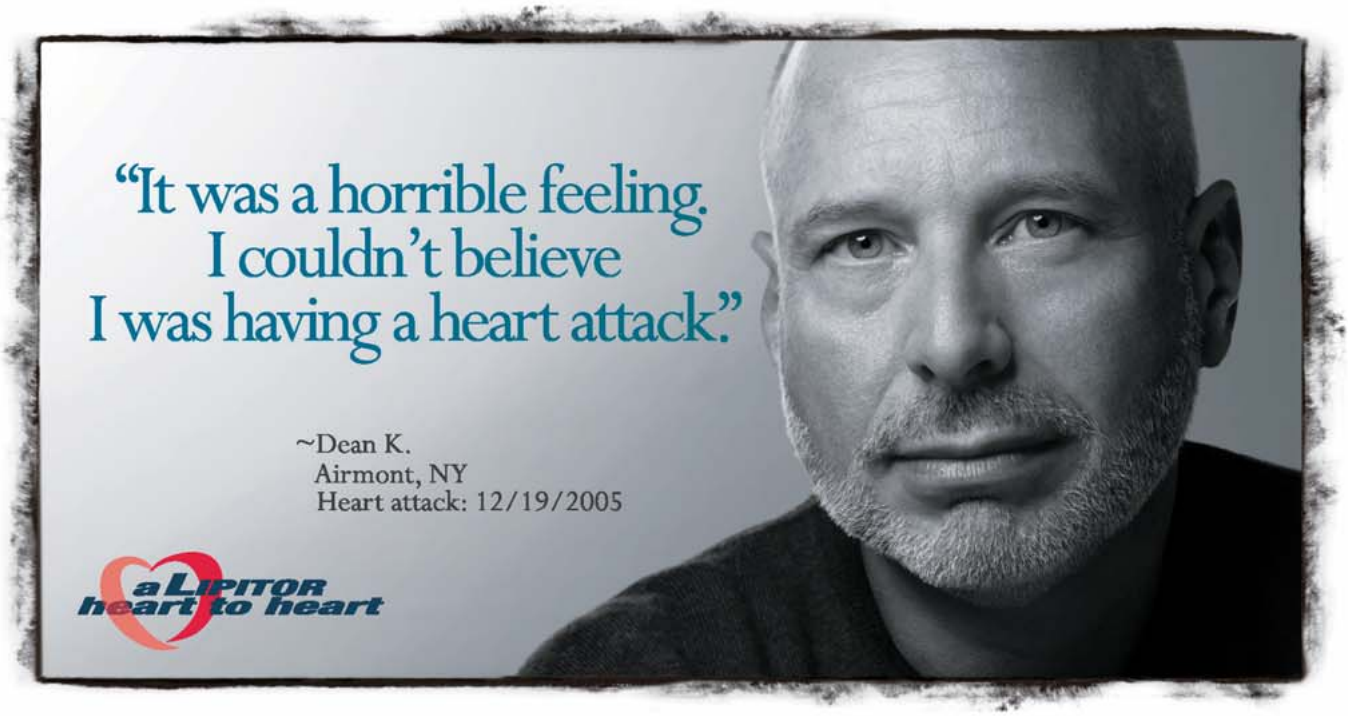
Conceptual Brilliance

The basic engineering concept of the Audi e-Tron goes back at least 112 years to young Ferdinand Porsche's first design, the 1898 System Lohner-Porsche that put electric motors in each of the four wheel hubs. And that's essentially how the e-Tron is built. Audi trimmed down an R8 chassis for this concept, swapping out the V8 engine for 100 lithium-ion cells stacked just behind the cockpit. Press the start button and the information screen rises in front of the driver. No sound. No indication that the car is ready to move. No nothing. But snick the shift wand into "gear" and lightly touch the accelerator, and the e-Tron really moves—the four motors combine to produce 313 hp. At speed you hear a pronounced whoosh and whir as those motors spool up. It turns out the audio-effects engineers in every Hollywood sci-fi movie were right about the sound electric cars would make in the future. Expect to see a production version by 2012. *— J.P.H.*

2.

WINTER WAGON

The fourth-generation 4Matic all-wheel-drive system arrived just in time for the winter months, and we traveled to snowy Hochgurgl atop the Austrian Alps to test Mercedes-Benz's foul-weather-friendly $55,500 wagon. The limited-slip center differential varies the fore and aft torque split between 30 and 70 percent. In snow and slush, the E-Class accelerates effortlessly without drama, thanks in part to the Continental winter tires. On the private Timmelsjoch Pass—a gently undulating series of high-speed turns surrounded by steep snowbanks—we pushed the E350's abilities. The Benz tracked benignly, upset only by the most dramatic ruts and grooves. With the right-side wheels on snow and the left on pavement, the 4Matic pulled away easily, diverting torque to the side with greater traction. *— BASEM WASEF*



"I should've done more to take care of myself. Now I'm exercising, watching my diet, and I trust my heart to Lipitor." Talk to your doctor about your risk and about Lipitor.

- **Adding Lipitor may help, when diet and exercise are not enough. Unlike some other cholesterol-lowering medications, Lipitor is FDA-approved to reduce the risk of heart attack and stroke in patients with several common risk factors, including family history of early heart disease, high blood pressure, low good cholesterol, age and smoking.**
- **Lipitor has been extensively studied with over 17 years of research. And Lipitor is backed by 400 ongoing or completed clinical studies.**

IMPORTANT SAFETY INFORMATION:
LIPITOR is not for everyone. It is not for those with liver problems. And it is not for women who are nursing, pregnant or may become pregnant.

If you take LIPITOR, tell your doctor if you feel any new muscle pain or weakness. This could be a sign of rare but serious muscle side effects. Tell your doctor about all medications you take. This may help avoid serious drug interactions. Your doctor should do blood tests to check your liver function before and during treatment and may adjust your dose.

Common side effects are diarrhea, upset stomach, muscle and joint pain, and changes in some blood tests.

INDICATION:
LIPITOR is a prescription medicine that is used along with a low-fat diet. It lowers the LDL ("bad" cholesterol) and triglycerides in your blood. It can raise your HDL ("good" cholesterol) as well. LIPITOR can lower the risk for heart attack, stroke, certain types of heart surgery, and chest pain in patients who have heart disease or risk factors for heart disease such as age, smoking, high blood pressure, low HDL, or family history of early heart disease.

LIPITOR can lower the risk for heart attack or stroke in patients with diabetes and risk factors such as diabetic eye or kidney problems, smoking, or high blood pressure.

Please see additional important information on next page.

LIPITOR®
atorvastatin calcium
tablets

Have a heart to heart with your doctor about your risk. And about Lipitor.
Call 1-888-LIPITOR (1-888-547-4867) or visit www.lipitor.com/dean

You are encouraged to report negative side effects of prescription drugs to the FDA.
Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

© 2009 Pfizer Inc. All rights reserved. LPU01267IA

IMPORTANT FACTS

LIPITOR atorvastatin calcium tablets (LIP-ih-tore)

LOWERING YOUR HIGH CHOLESTEROL

High cholesterol is more than just a number, it's a risk factor that should not be ignored. If your doctor said you have high cholesterol, you may be at an increased risk for heart attack and stroke. But the good news is, you can take steps to lower your cholesterol.

With the help of your doctor and a cholesterol-lowering medicine like LIPITOR, along with diet and exercise, you could be on your way to lowering your cholesterol.

Ready to start eating right and exercising more? Talk to your doctor and visit the American Heart Association at www.americanheart.org.

WHO IS LIPITOR FOR?

Who can take LIPITOR:

- People who cannot lower their cholesterol enough with diet and exercise
- Adults and children over 10

Who should NOT take LIPITOR:

- Women who are pregnant, may be pregnant, or may become pregnant. LIPITOR may harm your unborn baby. If you become pregnant, stop LIPITOR and call your doctor right away.
- Women who are breast-feeding. LIPITOR can pass into your breast milk and may harm your baby.
- People with liver problems
- People allergic to anything in LIPITOR

BEFORE YOU START LIPITOR

Tell your doctor:

- About all medications you take, including prescriptions, over-the-counter medications, vitamins, and herbal supplements
- If you have muscle aches or weakness
- If you drink more than 2 alcoholic drinks a day
- If you have diabetes or kidney problems
- If you have a thyroid problem

ABOUT LIPITOR

LIPITOR is a prescription medicine. Along with diet and exercise, it lowers "bad" cholesterol in your blood. It can also raise "good" cholesterol (HDL-C).

LIPITOR can lower the risk of heart attack, stroke, certain types of heart surgery, and chest pain in patients who have heart disease or risk factors for heart disease such as:

- age, smoking, high blood pressure, low HDL-C, family history of early heart disease

LIPITOR can lower the risk of heart attack or stroke in patients with diabetes and risk factors such as diabetic eye or kidney problems, smoking, or high blood pressure.

POSSIBLE SIDE EFFECTS OF LIPITOR

Serious side effects in a small number of people:

- **Muscle problems** that can lead to kidney problems, including kidney failure. Your chance for muscle problems is higher if you take certain other medicines with LIPITOR.
- **Liver problems.** Your doctor may do blood tests to check your liver before you start LIPITOR and while you are taking it.

Call your doctor right away if you have:

- Unexplained muscle weakness or pain, especially if you have a fever or feel very tired
- Allergic reactions including swelling of the face, lips, tongue, and/or throat that may cause difficulty in breathing or swallowing which may require treatment right away
- Nausea, vomiting, or stomach pain
- Brown or dark-colored urine
- Feeling more tired than usual
- Your skin and the whites of your eyes turn yellow
- Allergic skin reactions

Common side effects of LIPITOR are:

- Diarrhea
- Upset stomach
- Muscle and joint pain
- Changes in some blood tests

HOW TO TAKE LIPITOR

Do:

- Take LIPITOR as prescribed by your doctor.
- Try to eat heart-healthy foods while you take LIPITOR.
- Take LIPITOR at any time of day, with or without food.
- If you miss a dose, take it as soon as you remember. But if it has been more than 12 hours since your missed dose, wait. Take the next dose at your regular time.

Don't:

- Do not change or stop your dose before talking to your doctor.
- Do not start new medicines before talking to your doctor.
- Do not give your LIPITOR to other people. It may harm them even if your problems are the same.
- Do not break the tablet.

NEED MORE INFORMATION?

- Ask your doctor or health care provider.
- Talk to your pharmacist.
- Go to **www.lipitor.com** or call **1-888-LIPITOR**.

Uninsured? Need help paying for Pfizer medicines? Pfizer has programs that can help. Call **1-866-706-2400** or visit **www.PfizerHelpfulAnswers.com.**

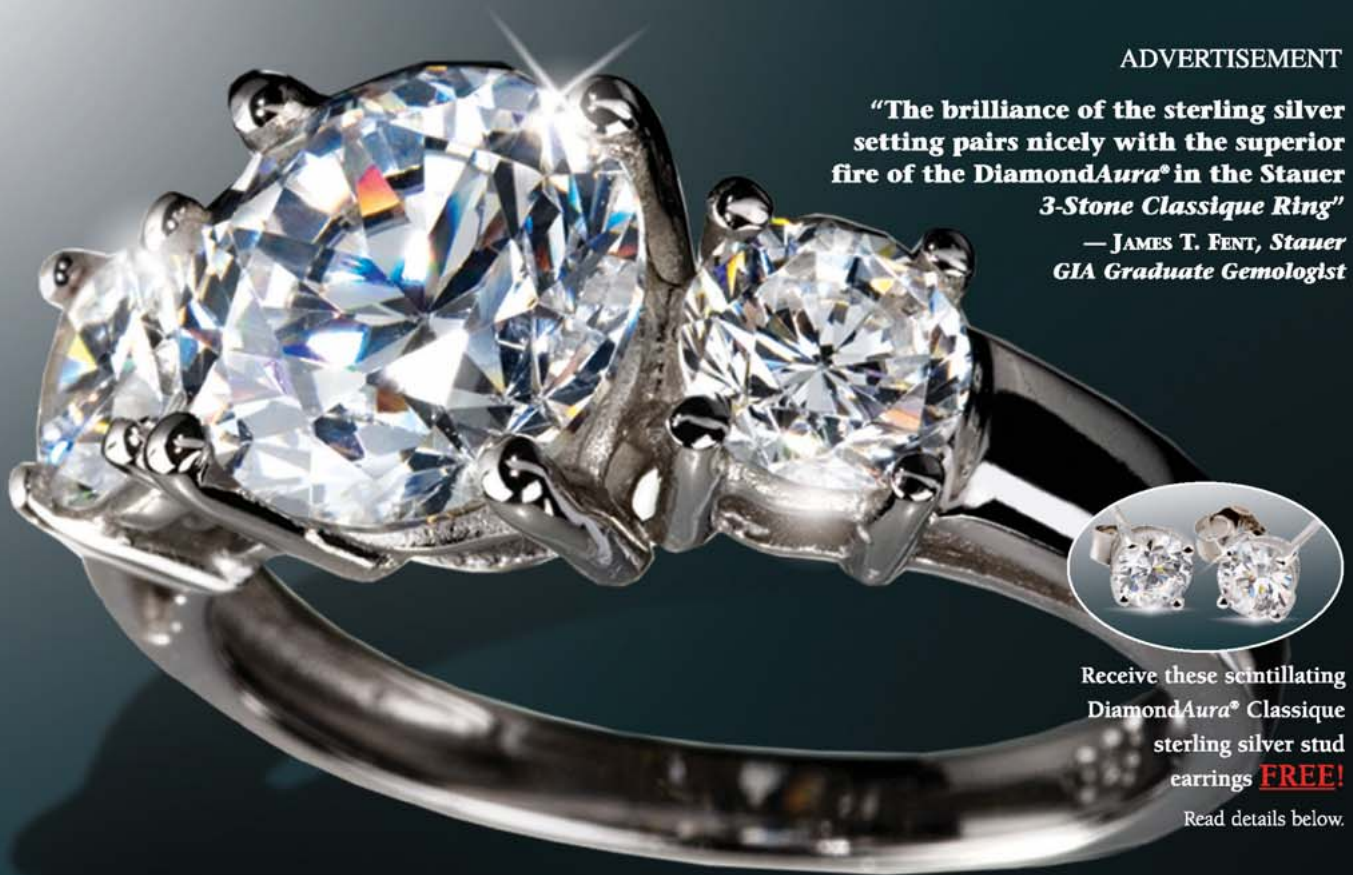
Pfizer helpful answers®

Manufactured by Pfizer Ireland Pharmaceuticals, Dublin, Ireland
© 2009 Pfizer Ireland Pharmaceuticals All rights reserved.
Printed in the USA.

Distributed by Parke-Davis, Division of Pfizer Inc.
New York, NY 10017 USA
June 2009

Rx only

ADVERTISEMENT



"The brilliance of the sterling silver setting pairs nicely with the superior fire of the Diamond*Aura*® in the Stauer *3-Stone Classique Ring*"
— James T. Fent, *Stauer GIA Graduate Gemologist*

Receive these scintillating Diamond*Aura*® Classique sterling silver stud earrings **FREE!**
Read details below.

The Fifth C?

Cut, Color, Carat, Clarity...Chemistry?

Is it possible that the mind of a scientist can create more beauty and romance than Mother Nature? The laboratories at Diamond*Aura*® were created with one mission in mind: ***Create brilliant cut jewelry that allows everyone to experience more clarity, more scintillation and larger carat weights than they have ever experienced.*** So, we've taken 2 ½ carats of our lab-created Diamond*Aura*® and set them in the most classic setting—the result is our most stunning, fiery, faceted design yet! In purely scientific measurement terms, the refractory index of the Diamond*Aura* is very high, and the color dispersion is ***actually superior*** to mined diamonds.

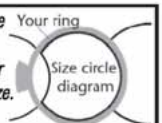
Perfection from the laboratory. We named our brilliant cut stones Diamond*Aura*, because, "they dazzle just like natural diamonds but without the outrageous cost." We will not bore you with the incredible details of the scientific process, but will only say that it involves the use of rare minerals heated to an incredibly high temperature of nearly 5000°F. This can only be accomplished inside some very modern and expensive laboratory equipment. After several additional steps, scientists finally created a clear marvel that looks even better than the vast majority of mined diamonds. According to the book *Jewelry and Gems–the Buying Guide*, the technique used in Diamond*Aura* offers, ***"The best diamond simulation to date, and even some jewelers have mistaken these stones for mined diamonds."***

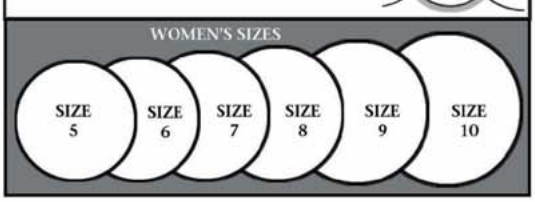
Compare For Yourself at 2 ½ carats		
	Mined Flawless Diamond	Diamond*Aura* Compares to:
Hardness	Cuts Glass	Cuts Glass
Cut (58 facets)	Brilliant	Brilliant
Color	"D" Colorless	"D" Colorless
Clarity	"IF"	Clear
Dispersion/Fire	0.044	0.066
2 ½ c.t.w. ring	$60,000+	$145

The 4 C's. Our Diamond*Aura* 3-Stone Classique Ring retains every jeweler's specification: color, clarity, cut, and carat weight. The transparent color and clarity of Diamond*Aura* emulate the most perfect diamonds—D Flawless, and both are so hard they will cut glass. The brilliant cut maximizes the fire and radiance of the stone so that the light disperses into an exquisite rainbow of colors.

Rock solid guarantee. This .925 sterling silver ring is prong-set with a 1 ½ carat Diamond*Aura* round brilliant in the center, showcased between two Diamond*Aura* round brilliants of ½ carats each. Adding to your 4 C's, we will include the Diamond*Aura* stud earrings for FREE! Try the Diamond*Aura* 3-Stone Classique Ring for 30 days. If for any reason you are not satisfied with your purchase, simply return it to us for a full refund of the purchase price and keep the stud earrings as our gift.

Place one of your own rings on top of one of the circle diagrams. Your ring size is the circle that matches the inside diameter of your ring. If your ring falls between sizes, order the next larger size.





Not Available in Stores

Diamond*Aura*® 3-Stone Classique Ring
(2 ½ c.t.w) • **$145** + S&H

FREE *stud earrings with purchase of Classique Ring*—**a $59.95 value!**

Available in ring sizes 5-10

Call to order toll-free, 24 hours a day, 7 days a week.

1-888-201-7095

Promotional Code DAR726-02
Please mention this code when you call.

Stauer
Heritage of Art & Science

14101 Southcross Drive W.,
Dept. DAR726-02,
Burnsville, Minnesota 55337
www.stauer.com

1.
FUTURE FUELER

The industry might be focused on EVs, but Mercedes-Benz remains bullish on hydrogen. The fuel-cell stack in the new B-Class is more powerful and compact than the previous one, with 136 hp and a range of 250 miles. Crucially, it can handle temperatures as low as minus 13 F, too. Behind the wheel, it feels solid, with relatively lively acceleration and impressive sound deadening. You can hear the compressor sound off as it diverts air toward the stack, but it's barely audible. Mercedes plans to lease 200 fuel-cell vehicles worldwide in the second half of 2010. — *B.W.*

HYUNDAI TUCSON | AUDI e-TRON CONCEPT | MERCEDES-BENZ E350 4MATIC WAGON | MERCEDES-BENZ B-CLASS F-CELL PROTOTYPE | KAWASAKI Z1000 | TOYOTA SIENNA | DETROIT AUTO SHOW SPECIAL

++

pm test driven

2.
Bad Boy

Armed with cold-weather gear and a full tank of gas, we attacked some of central California's most challenging stretches to see if Kawasaki's new 136-hp Z1000's overseas-streetfighter flavor hits a sweet spot on our soil. Dew-dampened leaves littered the roughly paved coil of road. And without the luxury of adjusting the suspension, the Z1000 initially felt too tightly wound. Turn-in was abrupt, and the chassis felt unsettled midcorner, leading us to tread cautiously on these unfamiliar twisties. Fine-tuning the suspension, however, tamed much of the bike's edginess, enabling us to push the $10,499 Z1000 hard over some of SoCal's best mountain roads. At higher speeds and on less technical stretches, the chassis felt well-suited to the engine. Short gear ratios offered enthusiastic pull at midrange, but the burst of power in the upper register packs a serious punch. A brilliant intake howl never hurts the experience, either. — *B.W.*

3.
All in the Family

Much of the new Sienna's substance—major stampings like the floor pan and the basic suspension design, and components like the V6 engine—carries over from the second-generation Sienna that was introduced as a 2004 model. There's no real downside to that, since that van has a well-earned reputation for toughness and comfort. The uncannily smooth 266-hp 3.5-liter V6 is now paired to a six-speed automatic. But penny pinchers will appreciate the base $24,260 four-cylinder, which helps this van hit 22 mpg on the highway. At the other end of the range, the new Sienna Limited offers second-row lounge seating with rising ottomans for leg support when the two seats are reclined. Toyota should have struck a co-branding deal with La-Z-Boy. Yes, it's that comfy. — *J.P.H.*

Recommended by

WHAT IF YOU COULD KEEP YOUR ENGINE AS CLOSE AS POSSIBLE TO FACTORY CLEAN?

TRY NEW PENNZOIL ULTRA™: NOTHING KEEPS YOUR ENGINE CLOSER TO FACTORY CLEAN.*

Your engine is in its most perfect state the day it leaves the factory. That's why we created new Pennzoil Ultra™ full synthetic motor oil. Piston at left shows the current industry standard for clean. Piston at right underwent the same test using Pennzoil Ultra.™ We think the results are pretty clear. No wonder it's recommended by Ferrari. Go to pennzoil.com **Not just oil, Pennzoil.®**

*Based on Sequence VG sludge test using SAE 5W-30. **Pistons from standard V6 engine in ASTM Sequence IIIG test. ©2010 SOPUS Products. All rights reserved.

2010 Toyota Tundra Crewmax 4x2

Horsepower: 310

MPG: 20 - EPA est hwy

A Consumers Digest Best Buy: no

Powertrain Warranty: 60,000 miles/5 years*

Stolen Vehicle Assistance: not available

Automatic Crash Response: not available

*Whichever comes first. See dealer for limited warranty details. **Visit onstar.com for details and system limitations.

2010 GMC Sierra XFE 4x2

Horsepower: 315

MPG: 22 - EPA est hwy

A Consumers Digest Best Buy: yes

Powertrain Warranty: 100,000 miles/5 years*

Stolen Vehicle Assistance: OnStar®/1 year standard**

Automatic Crash Response: OnStar/1 year standard

GMC **MAY THE BEST TRUCK WIN.**

visit GMC.com

Defiant optimism filled the air at Detroit's Auto Show, a marked difference from last year, when pundits wondered if GM and Chrysler would even survive. Post-bankruptcy, GM showed renewed vigor with several alluring concepts. Chrysler was more subdued, but it displayed a Ferrari, a not-so-subtle reminder of its Fiat partnership. Small and alternative-powered concepts and production cars dominated the show in preparation for tougher fuel-economy regulations. Clearly, the transition has coaxed renewed creativity. Here are our favorites. For more, check out *www.popularmechanics.com*. — LARRY WEBSTER

Most automakers went big with small cars ...

1 TOYOTA FT-CH CONCEPT

On the strength of its glowing image, the Prius will soon join Scion and Lexus as another Toyota brand. Naturally, Prius will spawn a lineup of dedicated hybrids, and the FT-CH hatchback could be the first. It's billed as an entry-level model, with Prius-topping fuel economy but less interior space.

2 2011 HONDA CR-Z

The CR-Z Hybrid is a 21st-century CRX with a powertrain similar to the Insight's. A 13-hp electric motor resides between the four-cylinder engine and either a six-speed manual or CVT transmission. This front driver is under 14 feet long—we hope it's a frisky handler. With 122 total hp, it won't be especially quick, and its fuel-economy figures—36 city, 38 highway, with the CVT—are oddly lower than the heavier Insight's.

3 VW NCC HYBRID CONCEPT

The next-generation Jetta is due later this year and will likely include a model very similar to this concept. The powertrain utilizes a 27-hp electric motor sandwiched between a small turbocharged engine and a seven-speed dual-clutch gearbox. VW claims this hybrid can scoot to 60 mph in 8.1 seconds yet still return 45 mpg.

4 HYUNDAI BLUE-WILL CONCEPT

The Blue-Will shows Hyundai's future styling and points to an upcoming plug-in hybrid. It packs efficiency-enhancing tech like roof-mounted solar panels and a thermal generator that turns exhaust heat into electricity. A 134-hp electric motor turns the front wheels and a 152-hp gas engine fires when needed. With lithium-polymer batteries, it can travel 40 miles on a single charge, Hyundai says.

5 2012 FORD FOCUS

Ford's onslaught of enticing small cars, which starts soon with the Fiesta, will continue with next year's larger Focus. It looks simply fantastic—tasteful but still a head turner. A 2.0-liter direct-injection four-banger provides 155 hp. Options include a dual-clutch six-speed gearbox and a full roster of luxury features. Most of all, Ford promises driving dynamics that rival top sport sedans.

Intense interest greeted the new Ford Focus, the most promising domestic small car since the first version debuted in 1999. Initially, this five-door and a sedan will be the only available body styles.

6 CHEVROLET AVEO RS CONCEPT

The Chevy Aveo desperately needs a reboot, and this hooligan RS show car could be just the ticket. Under the hood, a turbocharged direct-injection 1.4-liter four-cylinder belts out 138 hp—plenty for this pint-size five-door. Better still, under the 19-inch wheels, the fender flares and brake ducts lies the next Aveo's basic shape. So even if the RS remains a showpiece, Chevy's cheapest car will soon come with some swagger.

But Cadillac revealed the full-size-and-proud-of-it XTS.

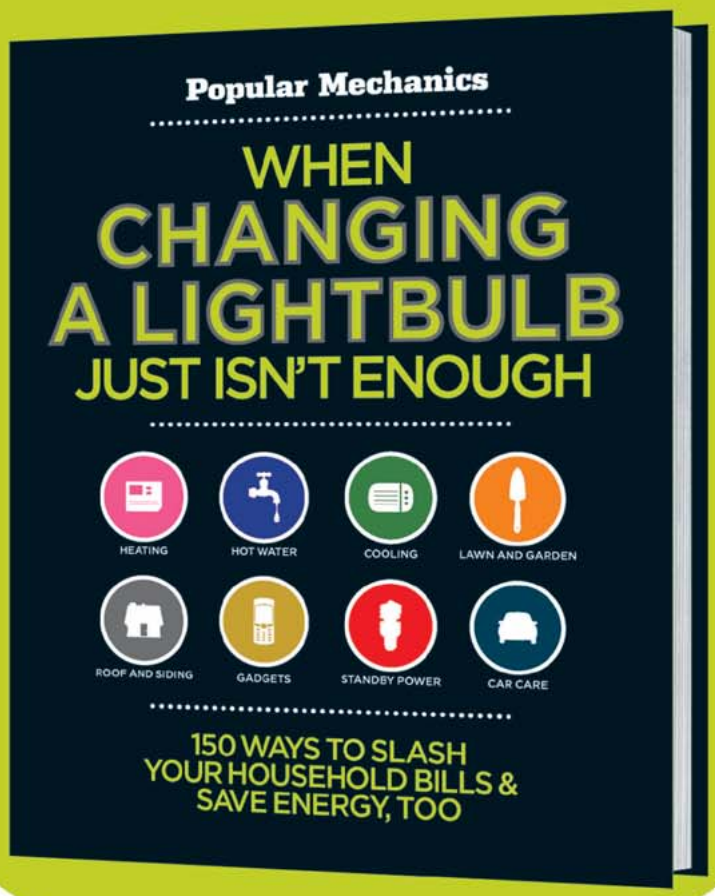
7 CADILLAC XTS PLATINUM CONCEPT

If this 17-foot-long, strikingly handsome full-size sedan bucked the show's small-car trend, at least it packed an efficient plug-in hybrid system with a V6 engine and 350 total hp. Four-wheel drive, adjustable suspension and touch-based interior controls are also part of the package. The XTS previews the upcoming DTS and STS replacement. And it's another notch in Cadillac's—and GM's—styling renaissance.

The most highly recommended bed in America isn't a Sealy,® Simmons,® or Serta®...

TEMPUR-PEDIC®

© 2010 Tempur-Pedic Management, Inc.



Save Money *and* Reduce Your Carbon Footprint

Sure, you know that it makes sense to be Earth-friendly. But did you realize that eco-smart is also *financially* smart? Small changes can make a big impact. Find out how to make a sound investment in greener living.

$14.95 (Can. $19.50) in hardcover
Available wherever books are sold, or call 1-800-338-3778 to order, or go to **bn.com/pmlightbulb**.

Have a question about our books?
We'd love to hear from you.
Email us at booklover@hearst.com.

HEARST BOOKS
A Division of Sterling Publishing Co., Inc.

TEMPUR-PEDIC

ask me™

Ask me about my TEMPUR-PEDIC®

Take the first step! Call for your FREE DVD & Information Kit

1-888-359-8492 or visit www.tempurpedic.com

to find a retail location near you!

TEMPUR-PEDIC

The most highly recommended bed in America.™

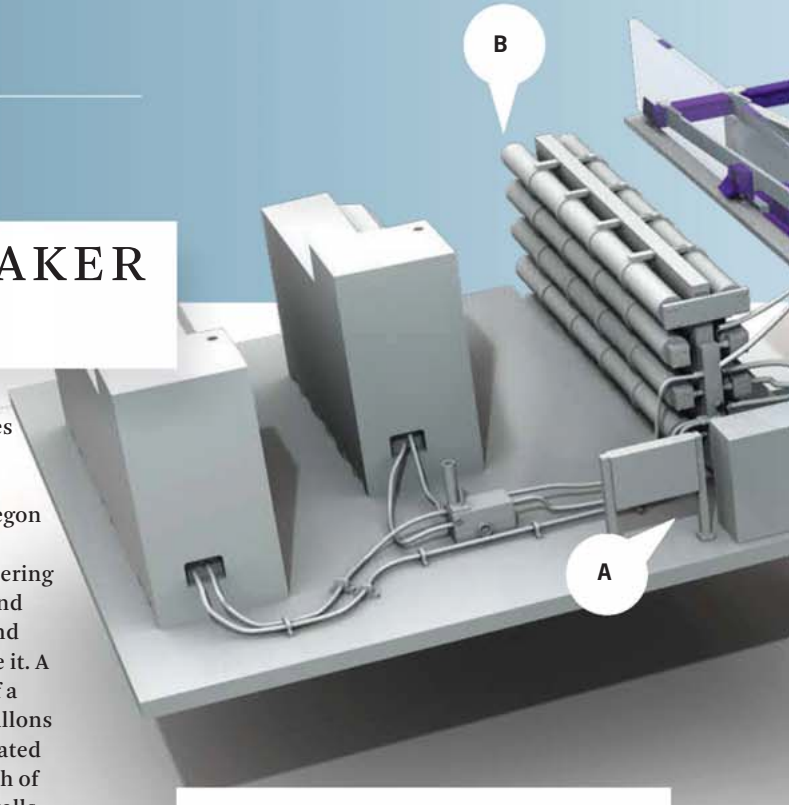
Anatomy of an Artificial Tsunami

Scientists generate waves in a 342-foot-long, 15-foot-deep flume filled with 300,000 gallons of fresh water. The bottom of the tank is flat, then slopes up and ends in a plateau. The profile, varied by experiment, simulates the effect of a beach, making waves break when they hit shallower depths. The machine allows scientists to study regular waves, which consist of a series of troughs and crests, and tsunamis, which are generated as solitary waves; here's how a tsunami is created.

HURRICANE WAVEMAKER

> BY ERIN MCCARTHY
> ILLUSTRATION BY SINELAB

More than half of the U.S. population lives within 50 miles of the coast, where it is vulnerable to hurricanes, tsunamis and other severe weather. Researchers at Oregon State University's O.H. Hinsdale Wave Research Laboratory believe that engineering solutions could prevent the loss of life and property along America's seaboards—and they're using a giant wavemaker to prove it. A hydraulically driven piston at one end of a 342-foot-long tank filled with 300,000 gallons of water is used to replicate waves generated by nature. The waves roll down the length of the tank and crash into nearly life-size walls and levees. "You can't scale down a telephone pole hitting an object and expect it to behave as it would in real life," says Dan Cox, who directs the lab. Ultimately, the data could be used to design new types of buildings, levees and other structures. "A research lab like this is trying to create an accurate wave that replicates what you'd see in nature," says John Bushey of MTS Systems, which designed the wavemaker. "Those waves are a lot more complicated than what you see in a typical amusement park wave pool." **PM**

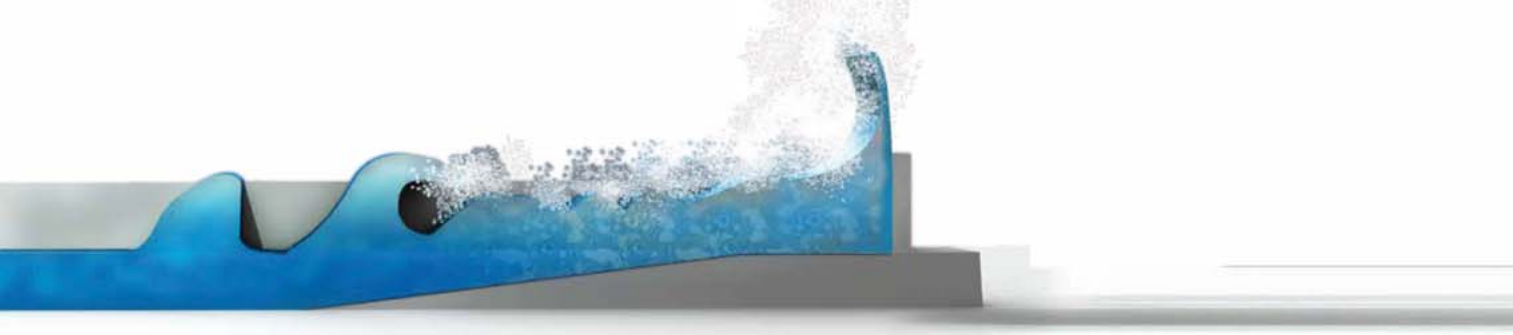


B. Hydraulics

Once researchers have indicated to the computer what type of waves they want, the machine's two servo valves kick into action. To generate random waves, one servo valve regulates flow into and out of two piston-type cylinders—one that extends and one that retracts—which move the waveboard back and forth; a third cylinder acts as a counterbalance to the pressure on the board from the water in the flume. Researchers use both valves—with a total capacity of 750 gallons per minute—to create the energy needed to generate a tsunami.

A. Servo Computers

Scientists control the wave machine with a servo computer, which they use to adjust the amplitude and frequency of the waveboard's movement. This allows them to generate not just sine waves, but the nonlinear waves seen in nature. The computer is connected to two servo valves on the wave machine, which regulate how much hydraulic fluid flows into or out of the pistons that move the waveboard. For regular

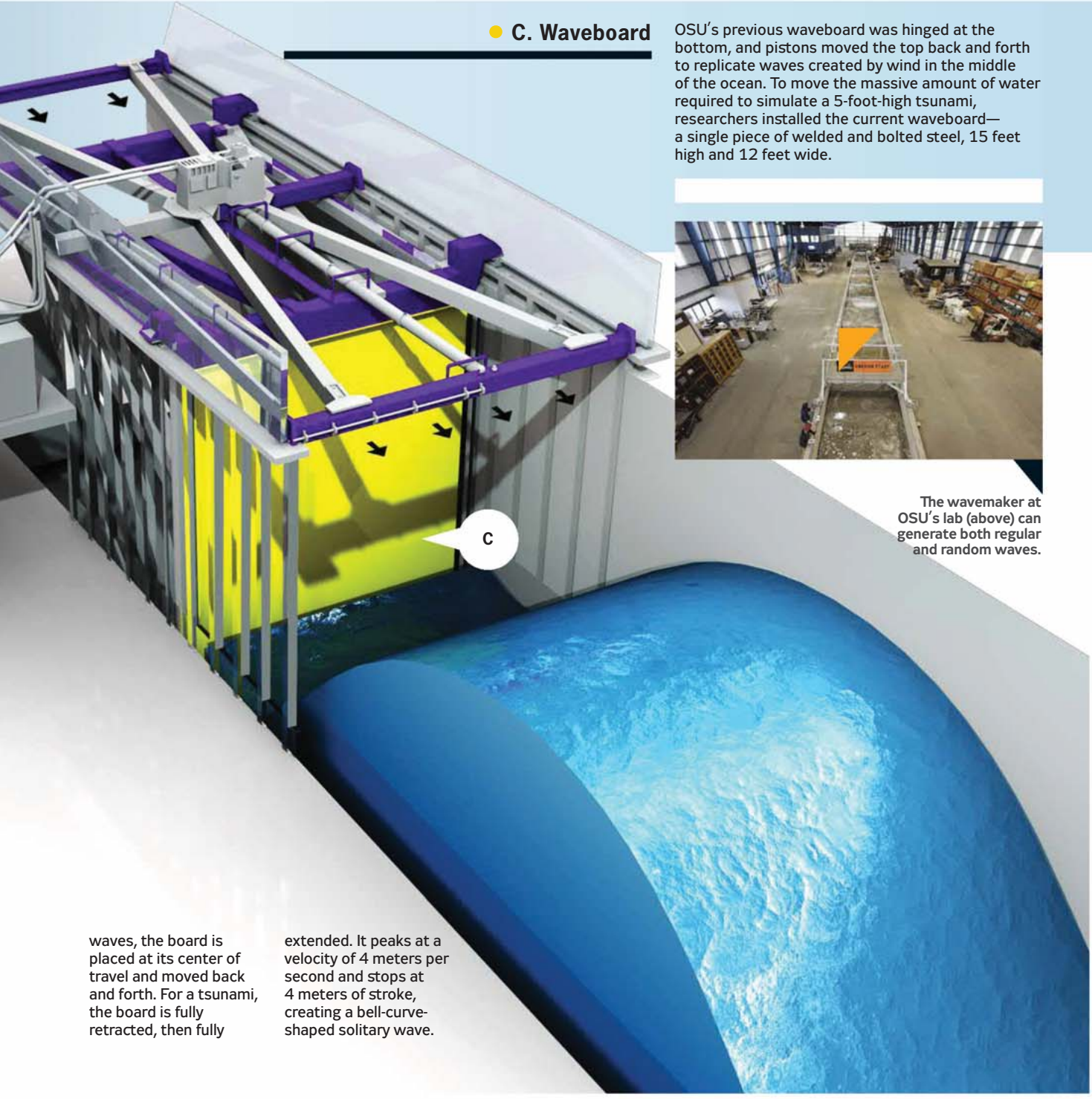


A steel waveboard extends forward at 13 feet per second, generating a 4.5-foot-tall, bell-curve-shaped wave that moves down the flat-bottomed flume—meant to replicate the deep ocean—at 15 feet per second. When the mini-tsunami encounters a ramp on the flume floor, the wave leans forward and grows to a height of 5 feet. In water depth roughly equal to its height—at a plateau in the tank that acts like a sandbar—the wave breaks, generating a wall of water sometimes known as a hydraulic bore. The bore hits test structures with 8000 pounds of force and can generate a 20-foot-high splash. The wave's journey down the flume lasts 10 seconds.

C. Waveboard

OSU's previous waveboard was hinged at the bottom, and pistons moved the top back and forth to replicate waves created by wind in the middle of the ocean. To move the massive amount of water required to simulate a 5-foot-high tsunami, researchers installed the current waveboard—a single piece of welded and bolted steel, 15 feet high and 12 feet wide.

The wavemaker at OSU's lab (above) can generate both regular and random waves.



waves, the board is placed at its center of travel and moved back and forth. For a tsunami, the board is fully retracted, then fully extended. It peaks at a velocity of 4 meters per second and stops at 4 meters of stroke, creating a bell-curve-shaped solitary wave.

AMERICA GROUNDED

> BY TOM JONES

PM'S RESIDENT ASTRONAUT SAYS DRASTIC BUDGET CUTS LEAVE NASA ON A PATH TO NOWHERE.

Tom Jones (foreground), International Space Station, 2001.

President Obama released his fiscal year 2011 budget on Feb. 1, and his policy for NASA's human spaceflight program puts the nation on a course to second-class status in space. Instead of setting our national sights on the moon, nearby asteroids or more distant destinations such as Mars, the president is declaring that human spaceflight is unimportant to U.S. interests.

He's not saying so directly. But his budget actions speak loudly. He has canceled NASA's next-generation Constellation program, including the Orion spacecraft and the two rockets that were designed to return American explorers to deep space (see "Mission: Moon," March 2007).

A little history: In the past 20 years, under three different administrations, NASA has lost more than 25 percent of its buying power. Despite those cuts, the agency managed to operate the shuttle and build the International Space Station (ISS). But it lacked a long-term goal in space. That lack of direction and the failure to replace the vulnerable shuttle led in part to the *Columbia* accident in 2003 that killed seven of my colleagues.

Now, seven years later, the budget shows that the president has already

PROMOTION

The power to help save trees is in your hands—literally.

We could save 1 tree with every 500 magazines we recycle*—yet only 20% of magazines get recycled from home! Give magazines—and the planet—new life by recycling.

Recycle for Rewards!

Inspired by our friends at eBay—who are committed to encouraging reuse and other green shopping choices—Hearst has joined RecycleBank to reward all magazine recyclers. The first 100,000 who pledge to do so between April 1 and May 15, 2010, will receive 15 RecycleBank Points, redeemable for rewards at hundreds of retailers! And if you join the eBay Green Team, you'll get an additional 50 RecycleBank Points.

- **Visit www.recyclebank.com/30daysofgreen**
- **Enter reward code "RECYCLEYOURMAGS" for 15 RecycleBank Points**
- **Receive 50 RecycleBank Points when you join the eBay Green Team through RecycleBank**

About RecycleBank

RecycleBank motivates you to take positive green actions, rewards you with Points redeemable at local and national partners, and invites you to be part of a community that is making a difference.

***Source: Conservatree**

RecycleBank®

HEARST *magazines*

ebay green team

Limit one transaction per member. Not to be combined with other offers.

forgotten the lessons of *Columbia*. Without a goal worthy of the serious risks of human spaceflight, we will be putting our astronauts in danger to do nothing more than crew a research outpost. Even though I helped build the space station, it is not an ultimate destination. The ISS is merely a steppingstone to more ambitious exploration.

It is true that President Obama inherited a Constellation program—a return to the moon and deep space—that the Bush administration had underfunded by more than 35 percent since its inception in 2004. Because of that lack of support, Constellation is badly behind schedule. Those delays also raised costs for the development of the Ares I booster. Yet in October NASA successfully flew an early version of Ares I. While not a long-term successor to the shuttle, this rocket, with adequate funding, could be in service to the ISS by 2015, restoring our own access to space.

The new budget seems merely an attempt to disguise the demise of U.S. leadership in space. The president does away with the Orion spacecraft and its Ares I and Ares V rocket boosters. The abrupt cancellation of the Constellation program means the U.S. no longer wishes to send its explorers to the frontiers of knowledge and the heights of space-faring skill. We are deliberately choosing to have no better space capability than Russia, China or India.

During the peak of the shuttle program in the 1990s, we launched six or seven shuttles and about 40 astronauts per year into orbit for scientific and defense purposes. Starting next year, and for the foreseeable future, just four Americans will make it into space annually—as passengers on foreign rockets. Is this a bold new course for the nation?

After the shuttle orbiters retire, by early 2011, American astronauts will rent seats on Russian rockets headed to the space station. We won't field an alternative spacecraft for five years or more. Instead, the president will farm out the nation's access to low Earth orbit to commercial firms. None of the industry rockets NASA has ordered to deliver cargo to the ISS has yet flown, and betting our nation's sole access to space on industry's ability to replicate 50 years of NASA experience on the fly is unwise. The agency should field its new crewed spacecraft as quickly as possible, then move to commercial firms once they have a proven record of reliable cargo services.

While NASA hopes its commercial effort will produce a ship that can service the ISS, the end of Constellation defers indefinitely the building of a heavy-lift rocket. Without such a Saturn V–class launcher, Americans will never get out of low Earth orbit (where we have been marooned for nearly 40 years). Instead, the Ares V heavy lifter has been replaced with "research and development" on building such a vehicle—someday. With no ability to launch humans past the ISS, we will watch, helpless to follow, as China pursues its determination to be the next nation to send its explorers into deep space.

The president's rejection of a clear goal to send humans into deep space by a date certain eliminates a future in space for the brightest of our young scientists and engineers. The space-talent pool began emptying this winter, as promising innovators turned to careers in other industries. What student would pursue a career in space science or astronautics with the knowledge that the country deems leadership in space unimportant?

The president appointed his Augustine Committee last May to review the nation's human spaceflight plans. Of their recommendations, he accepted the move to put our human access to space on a commercial footing, with great uncertainty as to safety, schedule and cost. If this effort fails, the nation has no backup plan.

But the president rejected the most important of the Augustine observations—that a great nation must fund an exploration program worthy of its vision. In fact, the committee recommended an extra $3 billion per year to renew NASA's human exploration efforts. The president's team, however, chose to add only a billion dollars annually, missing a chance to remedy past underfunding and take the U.S. forward in space. Although the administration borrowed $787 billion last year for stimulus spending, finding $3 billion this year to stimulate our high-tech economy and talent pool proved impossible.

THE ABRUPT CANCELLATION OF THE CONSTELLATION PROGRAM MEANS THE U.S. NO LONGER WISHES TO SEND ITS EXPLORERS TO THE FRONTIERS OF KNOWLEDGE ... WE ARE DELIBERATELY CHOOSING TO HAVE NO BETTER SPACE CAPABILITY THAN RUSSIA, CHINA OR INDIA.

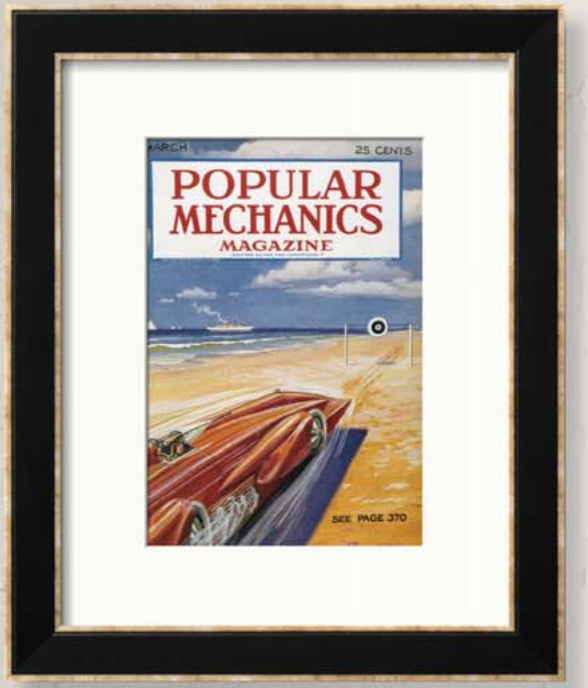
By proposing a budget for NASA that barely exceeds inflation, and failing to renew a commitment to send the U.S. beyond low Earth orbit, the administration is turning away from the dominance in space technology America has enjoyed since Apollo. This nation once put its confident footprints on the moon. Following the president's misguided course, we will trudge in retreat from the frontiers and promise of space. **PM**

Tom Jones, a member of the PM Editorial Board of Advisers, is a scientist, speaker and four-time NASA shuttle astronaut. His latest book, with co-author Ellen Stofan, is Planetology: Unlocking the Secrets of the Solar System.

POPULAR VINTAGE COVERS

Unique images from the HEARST Collection

© 1913 Hearst Communications, Inc. All rights reserved



© 1929 Hearst Communications, Inc. All rights reserved

Special Offer for First Time Customers. GET 20% OFF ENTIRE SITE!

- The world's largest selection of art and décor items
- Professional custom-framing and canvas transfer available
- Fast delivery, shipped to your door ready to hang

Get 20% off the entire site, visit:
www.allposters.com/popularmechanics

AllPosters.com

Survival Chronicles

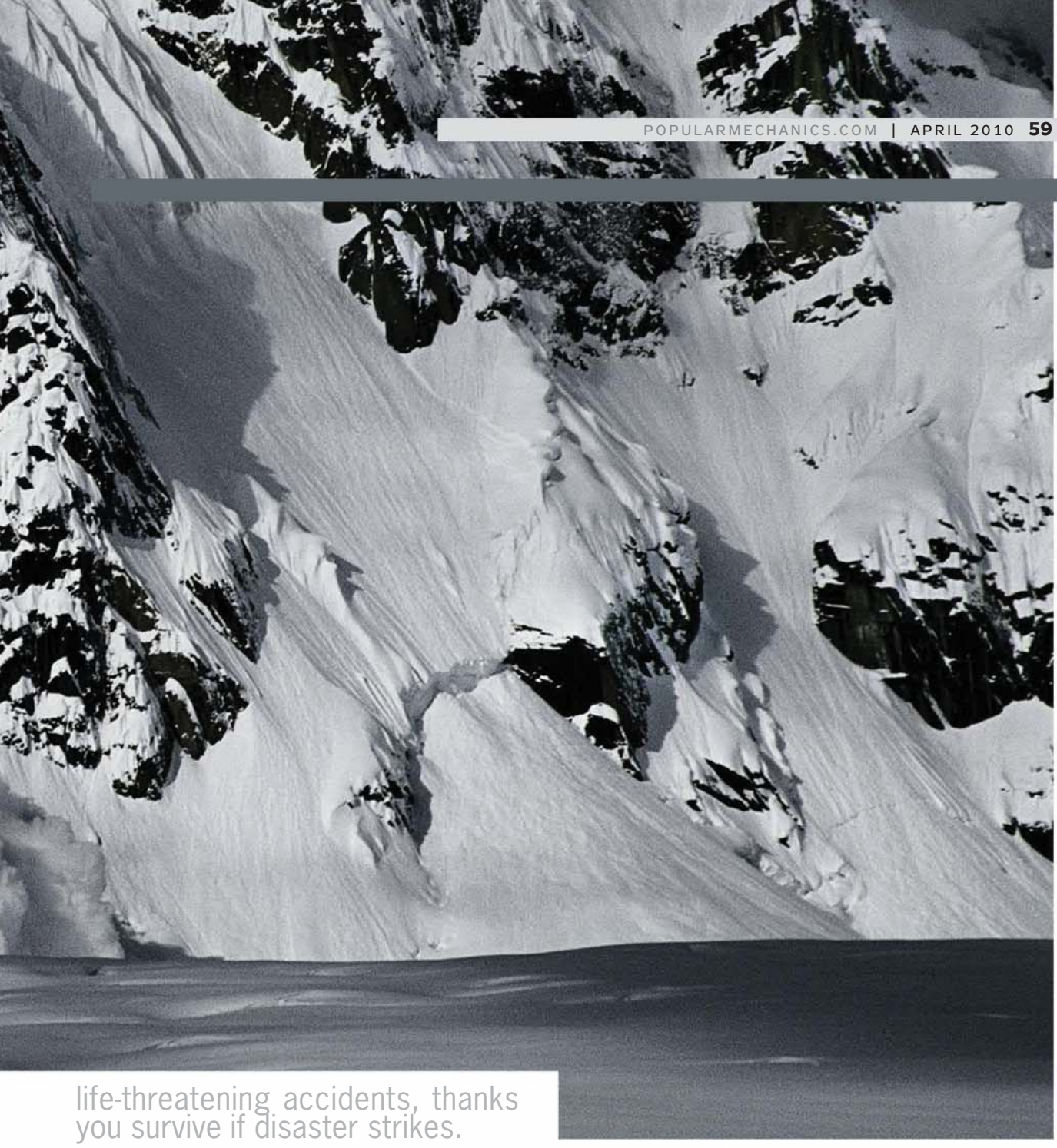
By John Galvin

An engineer, a contractor, a repairman, a pilot—ordinary guys who overcame to preparation, courage and tenacity. Their stories yield lessons that can help

AVALANCHE

- LOCATION **MOUNT NEMESIS, MONT.**
- NAME **SAM KAVANAGH**

Avalanches, like this one in Alaska, can accelerate to 80 mph within 5 seconds.



life-threatening accidents, thanks you survive if disaster strikes.

It was New Year's Day, 2005. Sam Kavanagh, Matt Schuyler, Blake Morstad, Jason Thompson and Chris Maki had snowmobiled 20 miles, then climbed an additional 5 miles with gear to ski the remote slopes of Montana's 9334-foot Mount Nemesis. The group had skied the same route the previous day, and spent the night in a remote, backcountry

yurt. Equipped with shovels and locator beacons, Kavanagh and his friends were experienced backcountry skiers—in fact, two were certified EMTs. They knew to ski within the trees and to avoid steep slopes.

The tragic irony of the day was that it was 24-year-old Morstad who triggered an avalanche. Morstad had a master's in avalanche studies. He was also an incredible athlete who pushed his physical limits, and at the end of the day he had wanted to try one more run a little higher on the open slope.

"When I saw the powder cloud coming," Kavanagh recalls, "I grabbed the biggest tree I could find and held on." The violent rush of snow blasted him off the tree. He heard a snap, and then began cartwheeling 60 yards down the mountain before coming to rest on a rock outcropping. "I looked down and my boot was turned 180 degrees, and 4 inches of bone was sticking through my ski pants," he says. The break had created a 17-inch rip through Kavanagh's lower leg, and he was bleeding heavily.

In 2005 Sam Kavanagh lost his leg through avalanche injuries. Now a Paralympic track cyclist, he's ranked fifth in the world.

Despite his injuries, Kavanagh set his locator beacon to search, turned his leg around to the normal position, then slid down the mountain to help locate Morstad. Schuyler, Thompson and Maki, who were unharmed, worked quickly to dig Morstad out, but it was too late: He was dead from blunt-force trauma.

"I didn't really notice the pain until I saw Blake," Kavanagh says. "Then I heard this voice in my head telling me that if I closed my eyes, that would be me dying. Keeping my eyes open was me deciding to stay alive."

It took 2 hours to drag Kavanagh 400 yards through armpit-deep snow from the avalanche site to the yurt. His friends attempted to reset Kavanagh's leg, but the swelling was too great, so they created a makeshift compression pack using a Therm-a-Rest pad and duct tape.

The next morning, Maki and Schuyler skied out to get help while Thompson took care of Kavanagh. Losing blood and in shock, he desperately needed evacuation. Rescue helicopters attempted to land that afternoon, but bad weather turned them back—forcing Kavanagh to spend a second night in the yurt.

To get through the night, Kavanagh relied on sheer willpower. "Once you've made the decision to live, you have to embrace it," he says. "I visualized going home and being with my wife. And I never once doubted I could make it."

The next day a helicopter crew from Malmstrom Air Force Base finally reached the site and picked up Kavanagh by hovering above the deep snow. By the time he reached the hospital, it had been 48 hours since the accident. "I had lost more than half my blood and my kidneys were shutting down," he recalls.

Kavanagh lived, but his lower leg had to be amputated. Yet he remains a world-class athlete. In 2008, he won the U.S. Paralympic National Championships in track cycling, and he is currently ranked fifth in the world.

EXPERT ADVICE

If you're in an avalanche, there's a 50 percent chance you'll die. If you survive without major injuries but are buried, your chances of surviving go up to 90 percent, but only if you're dug out within 15 minutes. After that, it gets deadly quickly. Skiing solo? Chances are you'll die. So you need at least one partner, a locator beacon, a shovel and a probe. ***The No. 1 survival tip: If you're in an area that has recently had avalanches, you're in dangerous terrain. Get out.***

"People become euphoric in the backcountry," says Mark Staples, an avalanche specialist at Gallatin National Forest Avalanche Center. "They lose sight of danger. Snowpack changes daily, and a span of just 10 feet can have different conditions. We see people skiing on slopes right next to avalanche slides all the time."

PHOTOGRAPH BY TIM LAMAN (AVALANCHE), STACY BENGS (BRIDGE COLLAPSE); ILLUSTRATIONS BY SHINGO

During the 2007 I-35W bridge collapse in Minneapolis, Minn., Gary Babineau's blue Chevy pickup (above) was nearly snapped in half.

The Black Diamond AvaLung II ($130) lets you breathe while buried in snow. It pulls in air through the snow and discharges CO_2 out the back.

BRIDGE COLLAPSE

- LOCATION **MINNEAPOLIS, MINN.**
- NAME **GARY BABINEAU**

It was hot on the first day of August 2007—90 degrees, even at six in the evening. Gary Babineau, then a 24-year-old terrazzo worker, had just finished his day hauling 100-pound bags of rock in a windowless building, so he took his shirt off and rolled down the windows as he drove home in his blue Chevy pickup. Minneapolis rush-hour traffic was heavy. Babineau drove northbound onto the eight-lane I-35W bridge just as several sections broke off and fell onto the banks of the Mississippi River, killing 13 people and sending 145 other casualties to area hospitals.

"It didn't even make a noise before it collapsed," Babineau recalls. "It just fell away." Part of the bridge split in two right under his truck, sending it into a 35-foot nose-dive as it chased the road deck straight to the ground. Babineau's

An overnight fishing trip turned into an eight-day nightmare for Tressell Hawkins, Curtis Hall and James Phillips when their boat capsized and set them adrift in the Gulf of Mexico.

face slammed into the steering wheel before the airbags deployed. His truck landed on the edge of the fractured roadway, bending its frame at a 20-degree angle like a fortune cookie and breaking the drive shaft. "I thought my back had snapped in two," Babineau says. "So I started to wiggle my toes to make sure I wasn't paralyzed."

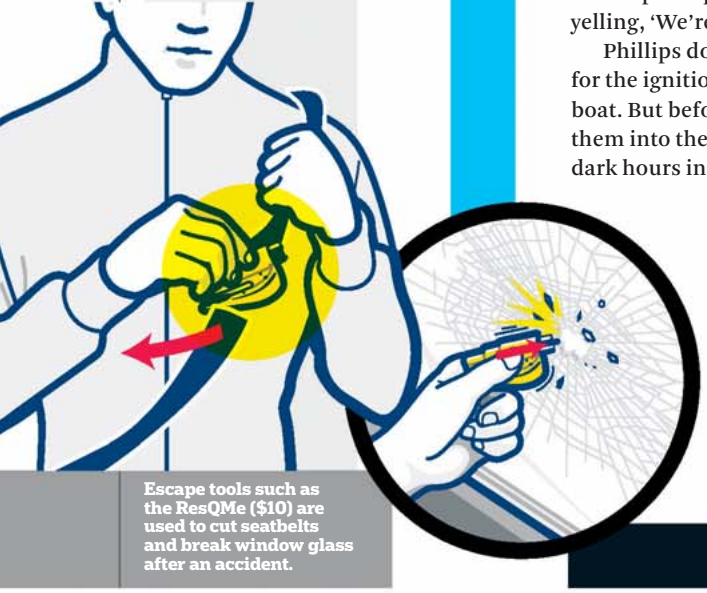
As Babineau reached for his door handle, he could hear the wild screeching of tires right above him where what was left of the bridge now hung precipitously. Then one car skidded over the edge and crashed next to Babineau's pickup. He balled himself up and stayed as low as possible in his cab. Then came another screech and another crash, then a third. Then silence. He opened his door and looked up to see a white sedan that had managed to stop before landing on him. It had been 10, maybe 15 seconds since the collapse.

Babineau approached a woman who was in a car in front of him. They were both stuck on the collapsed section of bridge and wanted to get off. Nobody knew what had happened, or if it was going to get worse. Would the rest of the bridge collapse? Had it been a bomb? Babineau and the woman made it to the

PHOTOGRAPH BY PETER TURNER/GETTY IMAGES

EXPERT ADVICE

After the I-35W bridge collapse, Gary Babineau acted courageously and helped save more than 50 children. He also avoided a classic mistake by staying in his truck until the crashing around him stopped. "It's instinctual to get out of your car," says Sgt. Doug Sheets, an accident investigator with the California Highway Patrol. "But that's how people get killed. ***You can take a pretty big hit in a car if you're wearing a seatbelt, but you don't want to be outside unprotected if a Freightliner is coming at you."*** Sheets suggests rolling down your window before making any moves. "You can hear accidents unfolding," he says. All quiet? Then make a break. "Even if your car has four flat tires, drive out of the way," Sheets says. "It's easier for investigators if you don't, but nobody's going to blame you if it saves your life."



Escape tools such as the ResQMe ($10) are used to cut seatbelts and break window glass after an accident.

side of the bridge and were climbing off when Babineau heard children screaming and crying. He looked over to the southbound lanes and saw a school bus that appeared to be teetering on the edge. He ran under the bridge and climbed up to the bus, working with a few other survivors to help more than 50 children—many of whom were injured—get off the bus, off the bridge and onto safe ground. It took just 3 minutes to evacuate the children.

Babineau returned to help others, but by that time, emergency crews were ordering civilians to stand back. As Babineau made his way to the top of the bridge, the rush of adrenaline began to wear off. He sat down, and the pain set in. It hasn't really left him since. He has a partially compressed spine and several crushed disks. Some mornings it hurts just to put on his socks.

It all happened so fast, but when Babineau thinks about that day, the reasons for his actions are clear: "I had my first child on the way," he says. "And what made me want to get off that bridge was that I wanted to live. But what made me go back was knowing that if my child was on that bus, I would want someone else to do the same for them."

LOST AT SEA

• LOCATION **GULF OF MEXICO**
• NAME **TRESSELL HAWKINS**

Last August, Tressell Hawkins, Curtis Hall and James Phillips set off from Matagorda Bay, Texas, on Phillips's 23-foot catamaran, a Carolina Skiff Sea Chaser, for an overnight sport-fishing trip among the Gulf of Mexico's offshore oil rigs. After dark, the group fell asleep drifting within sight of the Tequila rig some 80 miles offshore. As they slept, a bilge pump failure caused seawater to flood into the catamaran's port sponson. "I woke up and put my foot down into knee-deep water," Hawkins says. "I was yelling, 'We're in the water!'"

Phillips dove for the VHF radio to make a distress call, while Hall reached for the ignition, hoping to gun the engine and force water out the back of the boat. But before they could do anything, the catamaran flipped and tossed them into the ocean. The three men scrambled atop the hull and spent the next dark hours in a state of stunned silence, steadily drifting south.

When the trio didn't return home the next day as scheduled, Phillips's wife Shane called the Coast Guard to report them missing. The Coast Guard scrambled cutters, a Falcon jet, helicopters and a C-130 Hercules out of Clearwater, Fla., running a methodical search-and-rescue grid over some 86,000 square miles—an area larger than Utah. "We found nothing—not a life jacket, not a cooler, not a seat cushion," recalls Capt. Marcus Woodring, commander of the Coast Guard's Sector Houston-Galveston.

On day three, the castaway fishermen saw a helicopter, but

they had already shot off all the boat's flares and couldn't send a signal. The men had set up the boat's blue Bimini top on the hull of the boat as cover from the sun, a move that, in retrospect, they realize may have rendered them invisible to planes in the vast blue ocean. Over the next few days it's estimated the boat drifted another 100 miles south.

The August sun was blistering lips, arms and legs. Their skin began to crack and tear apart. To escape the heat the men spent hours bobbing in the water alongside the boat. This undoubtedly delayed the extreme dehydration that could otherwise have killed them. But it also came with a price. The men were stung by jellyfish, and the saltwater began eating away at their open wounds. During the cold nights, the three stayed in the 80-degree water, floating there to keep warm. "I don't think any of us slept for more than 15 minutes at a time," Hawkins says.

For food and water, the crew had salvaged two bags of chips, a pack of Doublemint gum, a box of crackers and 2 gallons of drinking water that was contaminated with gasoline when the boat flipped. They exhausted the food supply within three days, and the tainted water was making them ill.

By the fourth day, life aboard the capsized boat had become a blur. Minutes melted into hours; the group hit a psychological bottom—and the men started hallucinating. "I'd flip open my hand like a cellphone and start talking," Hawkins recalls. At one point, Phillips stood up and said he was going to the store, then walked right off the boat. "We all had our moments of weakness," Hawkins says. "One day I would completely freak out about not being found, but then James and Curtis would help me calm down. Another time they would be freaking out. We helped each other work through it. That's how we survived out there."

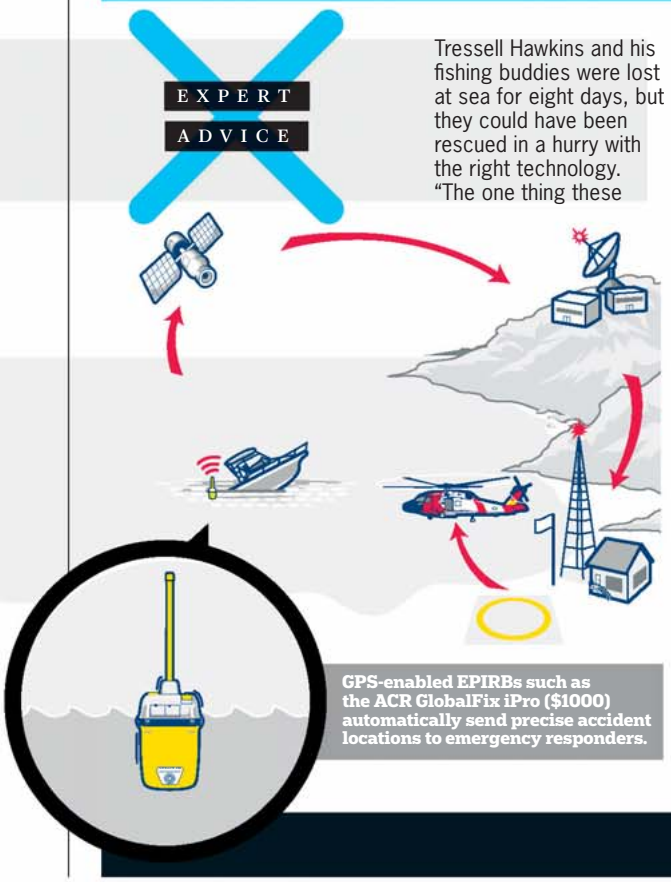
On day five, Phillips noticed a hose floating on the ocean surface. It led to the boat's submerged 30-gallon wash-down tank, which is used to hose off fish slime. When the men sucked water from the tank and found that it was uncontaminated, they knew their lives had been saved. "That water felt like molasses on a cold day," Hawkins says. "I could feel it going through my body."

The Coast Guard suspended its search on day seven. But the trio's second lucky break came when their boat caught a current that sent it slowly northwest back toward the Texas coast.

Finally, after eight days, Hawkins and his friends saw a boat. "Curtis and James were yelling and acting crazy, but I thought we were just hallucinating," Hawkins says. One of them set off a fire extinguisher they'd been saving. The signal worked. Eddie Yaklin, a car dealer from Kingsville, Texas, who was out fishing oil rigs himself, brought his 58-foot Riviera alongside the turtled hull and helped the men aboard. En route to a rendezvous with a Coast Guard vessel, Yaklin cooked the survivors a steak dinner.

EXPERT ADVICE

Tressell Hawkins and his fishing buddies were lost at sea for eight days, but they could have been rescued in a hurry with the right technology. "The one thing these guys didn't have that would have really helped us find them is an EPIRB," says Coast Guard search-and-rescue coordinator Denny Ernster—using the acronym for Emergency Position-Indicating Radiobeacon. ***"With the automatic beacons, when your boat tips over, the unit dislodges itself, floats to the surface and sends out a signal. Then we know exactly where you are, and there's no range limitation on them."*** The internationally recognized frequency for both boat and airplane beacons is 406 MHz. Older models use a different frequency, and the satellite system that supported them has been shut down. Time to upgrade.



GPS-enabled EPIRBs such as the ACR GlobalFix iPro ($1000) automatically send precise accident locations to emergency responders.

DIY Emergency Tactics

• HYPOTHERMIA

Rule No. 1: Exercise if you're freezing cold. It will warm you up. Rule No. 2: Disregard rule No. 1 if you're in the water. With hypothermia, blood vessels constrict, reducing the supply of warm blood to the skin. That keeps internal organs warm—which is what you want. But forcing those vessels open by exercising in the water pushes the warm blood to the surface, where it quickly gets chilled. *If you're immersed in water, stay still.*

• LIGHTNING

Some 600 people are struck every year; about 60 are killed. First, the common-sense rules: *Don't be—or be near—the tallest object around,* and get rid of metal objects that are in contact with your skin. As a last resort, experts suggest squatting with just the balls of your feet on the ground. Cover your ears, close your mouth and eyes, and hope the bolt rolls over you.

• DROWNING

Drown-proofing is a technique developed in the 1940s by legendary Georgia Tech swim coach Fred Lanoue. It enables you to stay alive for hours without exhausting yourself. Here's how it works: *Most humans are naturally buoyant—we float,* but just below the surface. So rest by floating facedown in the water with arms out, scarecrow-style. Every 15 seconds, raise your arms to the surface, then push down. The motion causes your head to rise above the surface long enough for you to take a breath.

• POISONOUS SNAKES

Every year, 8000 people are bitten by snakes—drunken men are statistically over-represented—but few bites are fatal. To check if you've been bitten by a poisonous snake, look for a pair of deep puncture marks. Swelling will be quick, so remove constricting items such as jewelry. Now, try to stay calm and keep the bite below heart level as you head to the nearest hospital. *What about slicing the bite and sucking out the venom? It doesn't work,* and you might slice into something that can't be easily repaired.

• DOG ATTACK

Wild-animal attacks will get you on the Discovery Channel, but they're extremely rare. Dog bites send 885,000 people to the doctor every year. *"Never run from an aggressive dog," says Jeremy Talamantes of K-9 Behavior Services. "If you do, you're just bait."* Conventional wisdom cautions people to freeze, but Talamantes takes it further. "You want to stand your ground, puff yourself up and yell, 'Get back!' That's going to hurt the dog's confidence, and most times it'll stay back."

• MAJOR WOUND

Apply direct pressure by clamping your hand on the wound, then elevate the injury above the heart to slow blood flow. If bleeding continues for 30 minutes, use clothes to wrap the site in a pressure dressing. *"Don't keep checking to see if it's working, even if it's bloody" says Dr. Jeff Gutterman, a fellow of the American College of Emergency Physicians. "That's a classic mistake."* If the bleeding doesn't stop after another 30 minutes, tie off the wound a few inches above the site. If you get emergency help within several hours you probably won't lose the limb.

PHOTOGRAPH BY LUIGI MASELLA

PLANE CRASH

• LOCATION **DENALI NATIONAL PARK, ALASKA**
• NAME **DAN MCGREGOR**

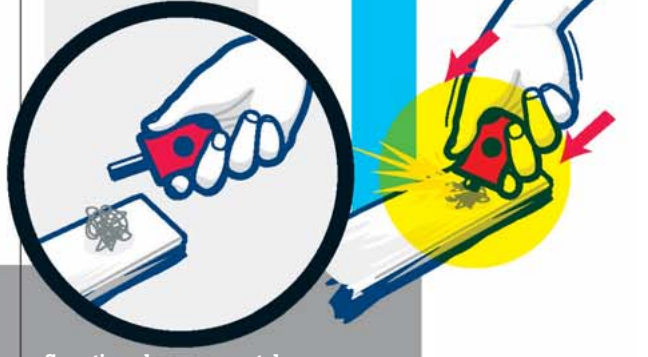
It was around seven in the evening last October, and backpackers Jesse Hoagland and Nick Rodrick were preparing to spend their first night in the Denali backcountry. The two had driven all the way from New Hampshire on a cross-country road trip, and were enjoying the solitude of the park's Igloo Creek campsite—at least until Dan McGregor stumbled toward their campfire. "It was like something out of a horror movie," Hoagland recalls. "He was totally burned up. His whole body was black and charred. He had a flannel shirt on and a T-shirt underneath, but they were mostly burned away. He was in bad shape."

Hoagland and Rodrick gave McGregor some bananas, a granola bar and Gatorade. After apologizing for eating all their food, McGregor told the campers he was a pilot for Denali Air and then explained what had happened the day before. He had been flying famed wolf biologist Gordon Haber around the park, tracking the Toklat wolf pack via radio telemetry. As McGregor and Haber buzzed over the Wyoming Hills, the single-engine Cessna 185 was buffeted by a severe downdraft. McGregor struggled with the controls, but he was unable to pull the plane out of its dive before it

Carving through wilderness on a grand scale, the Toklat River in Denali National Park provided an escape route when pilot Dan McGregor crashed in October 2009.

EXPERT ADVICE

Peter Kummerfeldt, former director of survival training at the U.S. Air Force Academy, sees Dan McGregor's miraculous post-plane-crash hike to survival as the exception to the rule. "You hear a lot about tenacity in survival situations like these," Kummerfeldt says. "This guy had it, but you don't know who else has it until something bad happens. ***I like to take tenacity out of the survival equation. Your best bet is always staying with the plane. It's just easier to find a plane than a person."*** Plus, that plane, if it isn't too badly damaged, has resources: shelter, fuel for fires and foam rubber for insulation. "And you don't need to spend thousands on gear," he says. Case in point: a 50-gallon trash bag. "It's windproof and waterproof. In the bottom corner, cut a hole big enough to slip your head through, then place the bag over your body."



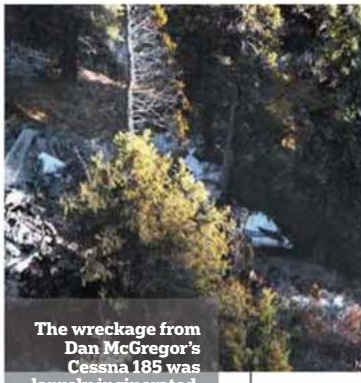
PHOTOGRAPH BY ALASKA STOCK

Sometimes known as metal matches, fire-starting tools such as the Ultimate Survival Sparkie ($15) are used to ignite tinder.

crashed against a steep slope near the East Fork of the Toklat River.

According to a National Transportation Safety Board report on the incident, when McGregor regained consciousness, the plane's cabin was filling with smoke. As the pilot tried to fight his way out of the plane, he called out to Haber but heard no response. Once clear of the wreckage, McGregor tried to work his way back into the cabin through the baggage door to save Haber, but by then the fire was too intense.

The two men had known each other well and had flown together often, and Haber's death was a crushing blow to McGregor. Now he was faced with the prospect of dying himself from exposure. His ankles and face were bloodied and badly bruised, and he was burned from head to toe. He spent the night at the crash site, using the flaming wreckage to fend off hypothermia.



The wreckage from Dan McGregor's Cessna 185 was largely incinerated, leading the rescue team to conclude that he had died.

The next morning, McGregor weighed his options. He was convinced his locator beacon had been destroyed by the crash. In fact, McGregor's plane was equipped with an outdated beacon. Even if the device had survived the impact, it wouldn't have been able to communicate with the current emergency rescue satellite system. The C-130 search-and-rescue plane sent from Anchorage didn't pick up its signal either. A low-lying fog that morning obscured the crash site, complicating the search.

Given those factors, McGregor decided to hike out over terrain he knew well. He slogged 7 miles south, following the East Fork until he reached a primitive park road. He followed it 8 miles east to the Igloo Creek campsite. Ironically, around 3 pm, a Civil Air Patrol pilot had sighted the downed Cessna and radioed the Alaska State Troopers. A trooper then landed a plane nearby and hiked to the crash site. He reported back that he had found human remains. Word quickly spread that both Haber and McGregor were dead.

Finally, McGregor trudged into camp, crying out for help. "He was cold," Hoagland remembers. "He practically stood in the fire he was so cold." After feeding the pilot, the two campers packed up their gear and walked him 5 miles to their van, which was parked at the Teklanika River campground. "He kind of shuffled because his ankles hurt so much," Hoagland says, "and his shoes were practically melted away."

McGregor was flown to Harborview Medical Center in Seattle, Wash., where Hoagland and Rodrick visited him. McGregor has not commented publicly about the crash, but he told PM that his skin grafts have been successful and his other injuries are healing. He is still coming to grips with the loss of his friend and neighbor. But he hopes that someday lessons learned from his experience may save someone else's life. **PM**

WHAT WE BUILT
family tree
OUT ON A LIMB WITH A MOUTH FULL OF NAILS, ONE DAD SUSPENDS A SHACK

by LOGAN WARD
photographs by LAJOS GEENEN

it's a common-sense rule of treehouse construction: Make it lightweight. So I felt some stirrings of anxiety when the stocky, bearded sawmill owner pulled up to the house with a flatbed trailer stacked with oak timbers. Full of water, densely grained and smelling like bourbon, the rough-cut framing lumber I'd ordered spanned 18 feet and looked like bridge supports. As we offloaded the first 2 x 8, each of us taking an end in hand, I smiled doggedly to mask the strain I felt. He peered over the garden fence past the lilac bushes, and politely asked, "What kind of treehouse are you building?"

One thing was certain: It wouldn't look much like the rickety aeries of my childhood, hammered together out of whatever

7 FEET ABOVE HIS BACKYARD.

A chain hoist helped raise a heavy pile of green oak, barn siding and pine flooring up into this formerly unoccupied Kentucky coffee tree.

design, redefined → The scrap-wood citadels of my childhood (above, left) lacked a certain sophistication that comes with actual planning. After struggling to draw my new design on graph paper, I built a model out of cardboard (above), specifying details like a Dutch door, lap siding and an observation deck on one side. I used a chain hoist and ropes (right) to help position the green oak framing before bolting it into position.

construction scraps and packing crates we neighborhood kids could scrounge up. (The most ambitious of these was a three-story fort spanning a creek and topped by a crow's-nest made from an old kitchen chair nailed to the trunk.) This time, I'd enjoy the advantages of milled lumber and a carpenter's square and level, not to mention power tools. Yet I hoped to match the spirit of those earlier tree forts with a rustic structure where my children could waste their afternoons dreaming up rules to games I'd never understand or even hear about.

As kids, my friends and I never bothered with plans. We had an abundance of trees and were eager to start hammering. Today, there are exactly four mature trees in our backyard. I consider them all irreplaceable—at least in my lifetime—so after deciding to build a treehouse, I thought long and hard about where to put it. The ideal host was a 70-foot-tall Kentucky coffee tree standing alone in a corner of our small lot. It rises 15 feet before its trunk sprouts into a balanced, oval-shaped crown that filters sunlight through its leaves like flour through a sifter.

As an adult and a conscientious neighbor, I also thought hard about what the treehouse would look like. I wanted something that would not seem out of place in the historic Virginia downtown where we live. No cheap-looking plywood box or precious playhouse on stilts would do. The structure would be modest in size, and the materials would have an outsize effect on how it looked. I asked my friend John Foster, a capable craftsman who built the log cabin where he lives, for advice.

"I'd use green oak," John said, gazing up at the tree. The timbers would be strong and rot-resistant, and they'd age beautifully, he explained. As proof, he pointed me to the bed of his pickup truck, which held a 4 x 6–inch oak beam that he uses for skidding landscaping boulders. "See that old timber? That's been bouncing around back there since I built my house," he said. Fresh from the sawmill 20 years ago, the green oak had grown silvery gray with a rough, raised grain—a handsome piece of wood, I had to agree. It didn't occur to me to ask how much green oak weighs.

building a treehouse

is a lot like any other construction project, with one main difference: Instead of a foundation, a treehouse rests on a platform. The platform should be sturdy enough so that whatever sits atop it—gingerbread Victorian, open-sided play hut or, in my case, rustic cabin—doesn't attach to the trunk. That minimizes damage to the tree and keeps the swaying on a windy day from prying apart the structure. It also, frankly, is a mark of craftsmanship—the difference between banging together boards as a kid and doing it right, with a measure of adult skill and judgment.

If you're building high off the ground across several trees, even your platform needs to allow for tree movement. You can either install an expensive system of treehouse cables and bolts or rig your own free-floating beam. If the tree is mature and sturdy and your platform rests in the bottom eighth of the tree, you can use a fixed platform. I modified a classic design, sketching plans for an 8-foot-square platform that would surround my tree at a height of 7 feet.

That was plenty high for my son, Luther, and daughter, Eliot, ages 10 and 7, respectively. During the planning phase, I let them climb a ladder to the mark on the trunk where the floor would go. When I held up the 3D cardboard model I had made, their eyes lit up. But to be honest, I had no idea how they would respond once it was built. Society has changed since the freewheeling 1970s, when my boyhood friends and I roamed the neighborhood, scavenging construction sites for scrap lumber and nails like cul-de-sac Robinson Crusoes. Would my kids take to the treehouse, or would they prefer to stay inside playing video games and snapping together Legos?

Seven feet may not sound very high, but working overhead made bolting my platform beams to the tree a major challenge. My anxiety over handling all that heavy lumber eased a

tree-hugger engineering → My daughter Eliot (left) performed a supervisory role during the construction. When constructing the roof, I flashed the gap between the cedar shakes and the tree using a truck tire's inner tube, secured with a bungee cord (above, left). A rustic ladder made of ¾-inch nylon rope and 1¾-inch dowels provides access—or, when hoisted up, thwarts invaders from terra firma (above, right).

bit after I cut the beams down to 8-foot lengths with my circular saw. Still, each one weighed probably 100 pounds. What saved me was a chain hoist, a gadget most often used by shade-tree mechanics to lift engine blocks out of cars. I borrowed one from John, who uses it to lift stone for his landscaping jobs. The mechanical advantage of the gear differentials made raising my beams as easy as tugging on the chain with two fingers. And the ratcheted brake prevented the load from slipping backward. The hoist did the work of two men, never faltering and never once complaining.

That was fortunate, since I mostly worked alone. This was too big a job for Luther and Eliot. They helped in small ways—handing me tools, picking up dropped nails with a magnetic sweeper—but they preferred to stay on the ground, hammering scrap wood into sailboats and slingshots. It was refreshing to know that their prepackaged, adult-designed games were sitting untouched inside.

To minimize my impact on the tree, I anchored each of my four crossbeams with a single ¾-inch lag screw. To those beams, I attached rim joists and floor joists. Using green oak meant that I had to predrill everything. Otherwise, I would never have been able to drive my nails home in that dense wood. Or I'd have split the grain trying. Even the biggest deck screws I could find seemed too thin and brittle for such formidable lumber, so instead I bought a couple of 5-pound boxes of zinc-dipped 20d nails. The going was slow, but I soon found my rhythm with drill and hammer.

Once my platform frame was complete, I began installing 2 x 6–inch tongue-and-groove yellow-pine floorboards. I knelt on loose boards, tapping each plank into place with a rubber mallet and then nailing it home. Soon I had enough floor in place to form a stable perch. I worked around the tree, leaving a 2- to 3-inch gap between it and the floor to allow for growth. I top-nailed the floor using square-headed cut nails. It was easier than nailing through the tongues. Plus, the old-fashioned technique added character—a touch that pleased me, though it would probably be lost on the kids.

at some point between my tree-climbing childhood and late adolescence, I briefly developed a fear of heights. During a clandestine ascent of a water tower during my senior year in high school, I froze 10 rungs up, palms clammy, ground spinning below. Three weeks later, I followed friends up the same ladder, forcing myself not to look down. But then, after a few more climbs, once to the top of the domed reservoir (kids, don't try this at home), my fear seemed to evaporate in the warm midnight air—I had simply been out of practice.

When I began building my kids' treehouse, I felt out of practice again. Though my extension ladder hardly compared to the water tower, scaling it one-handed while lugging the chain hoist or a 2 x 4 made my knees wobbly. I eventually grew comfortable. Still, I decided to adhere to another basic rule of treehouse construction: Build on the ground. You're faster and more efficient in close proximity to your tools, lumber and sawhorses. And face it, no matter how fearless you are working perched at precarious heights, the fewer trips up and down a ladder, the safer you'll be. Real treehouse pros (and today, there are more of these than ever) trim out entire wall sections, including framing, siding, molding and glass windows, before hoisting them up to the platform.

Not knowing exactly how my walls would meet up, I didn't go that far. I did frame three of my four walls on the ground, then raised them with the chain hoist. Once everything was aligned, I nailed the plates to the floor. Connecting the rear butt wall between the pair of side walls made me momentarily curse my decision to use green oak. I was just able to fit my drill and 6-inch bit between the studs. Face-nailing the 20d nails was even more awkward.

The job got frustrating once I started working up high, building the fourth wall and roof rafters. Like some kind of Newtonian poltergeist, gravity spilled nails, tipped boards over the edge and tugged my power cord to the ground, forc-

CONTINUED ON PAGE 126

FAMILY SEDAN TEST

FOUR-DOOR FACEOFF

MIDSIZE SEDANS DOMINATE AMERICAN DRIVEWAYS. AND THREE BIG PLAYERS HAVE LONG DOMINATED THE SEGMENT. BRING ON THE UPSTARTS.

BY LARRY WEBSTER

PHOTOGRAPHS BY CHRISTOPHER WRAY-MCCANN

Midsize sedans blend so seamlessly into the American automotive landscape that you may never really notice them. They're pragmatic transportation vessels that competently and anonymously troll freeways and mall parking lots. These high-quality sedans provide roominess, comfort, efficiency and plenty of luxury features—all at an affordable price.

So it's no surprise that in 2009, midsize sedans were the single largest volume segment, with nearly 20 percent of the market. Accordingly, this segment is a critical battleground, with many new sedans hustling to catch our attention. We knew it was time to see if the

RATINGS ICONS

TESTING PROCEDURE

To produce an accurate picture of performance, the PM automotive team brings out the test gear. Acceleration and braking are measured with either a Stalker radar gun or GPS-based Racelogic Vbox. Handling tests require optical timers. Ben Stewart (opposite) and Larry Webster run down the pretest checklist, ensuring proper fluid levels and setting every car's tires to the factory-recommended pressure.

newcomers could match the perennial top sellers.

We started with the segment's three most popular cars—the Nissan Altima, Toyota Camry and Honda Accord—and drove them alongside five challengers: the Mazda6, Ford Fusion, Suzuki Kizashi, Chevy Malibu and Subaru Legacy. We ran them through our tests, a day of hard driving in the hills near Los Angeles and a 360-mile fuel-economy loop.

Since four-cylinder engines and automatic transmissions make up the majority of the sales in this class, we ordered each car that way. Instead of ranking these very similar vehicles in a finishing order, we decided to call out the combination of each car's strengths and represent them as icons. So, here are eight of the top four-door sedans in America—and what they do best.

Nissan Altima

Inching up in sales volume for the past half-decade, the Altima has become a thorn in the side of Honda and Toyota. Restyled for 2010, the Nissan is the lightest car here by 100 pounds. And engineering out the excess weight in a design is the gift that keeps giving. The Altima was the quickest to 60 mph (7.72 seconds) and returned the best fuel economy (32.4 mpg).

While the scales suggest a flimsy structure, the Altima feels solid and well-built. The interior layout is refreshingly simple, with high-quality materials used throughout. The Altima's continuously variable transmission (CVT), the only available transmission, was not our favorite. The engine has plenty of torque, but it drones in the upper rev range, an unpleasant aspect that the CVT intensifies. But at least there is a manual mode, and we tended to use it during spirited driving.

NISSAN \ TOYOTA

The Altima was a little reluctant to change direction, with excess body roll and slower steering than, say, the Mazda. It doesn't want to hustle. But around town, outside the confines of our test course, we found the Altima to be very refined and comfortable.

Toyota Camry

Since the beginning of this century, the Camry has been the country's best-selling car more years than not. It's sensible, roomy and well-built. But driving the Camry is a slightly less exciting activity than toasting a piece of Wonder bread. Frankly, we need more fiber.

It's not that the Camry doesn't do its job effectively. It was one of the quicker sedans, yet still delivered an above-average 31.5 mpg. It's also exceptionally quiet and serene inside. Only the Honda Accord has a roomier back seat.

The interior that was once lauded for its quality feel now seems cheaply made, with poor panel fitment and low-rent materials. To be fair, the Camry is value-priced, but it's also the only one riding on 16-inch wheels with hubcaps.

We could forgive those sins, but the rest of the car is a big slice of ho-hum. If you push the Camry hard, the connection between man and machine feels as though it's separated by a layer of molasses. Its pillowy body motions reminded us of yesteryear's land yachts. If there's a payoff to this performance, it's the extremely plush ride and hushed interior.

The Camry sealed its reputation some two decades ago with a reliable and competent sedan in a market filled with lackluster cars. The world has caught up, and Toyota has faltered. The Camry was recalled in January and its production halted to fix a sticky throttle. It's time for Toyota engineers to remind us why the Camry deserves its top-selling status.

MAZDA
PM's
Top Pick

Mazda6

It's rare when exceptional cars remain largely undiscovered. But that's the case with the Mazda. And it's astonishing considering that this may be the best all-around sedan. This is a sporty machine, with light, direct steering and a chassis that always feels planted. The responses are fluid, and the Mazda is eager to fly through curves. It's clear this sedan spent many development miles clipping apexes. But unlike some, there's no price to pay for its lively, fun-to-drive spirit. The Mazda has a resilient ride that absorbs bumps with muted thumps. Mazda got the details right: The shifter glides through its detents, just like one on a Mercedes-Benz. And when revved hard, the engine sounds expensive. The only downside to this powertrain was the unimpressive fuel economy. The interior is one of the quietest here, and only NBA-size passengers would need more legroom. This car is a good deal too. A loaded Grand Touring model can be had for about $27,000. The Mazda6 proves that midsize sedans don't have to be the automotive equivalent of Ambien.

Ford Fusion

Sheet metal can be deceiving. The Ford Fusion, recently refreshed for 2010, shares its platform and engine with the Mazda6. Perhaps that's why the two cars went through the slalom and lane-change tests at the same speed. Yet the Ford is the smoother operator in the real world. "The Ford has 85 percent of the Mazda's poise, but with better ride quality," one tester said.

Another critical difference: fuel economy. The Ford's six-speed automatic (Mazda offers five speeds) helped it to top the Mazda by more than 3 mpg in our testing. However, shifting that six-speed manually is akin to operating a three-speed automatic from the 1970s. Your only choice is a D or L position on the shifter. Does the L stand for Lame?

Ford's updated look is handsome. But inside, the dash is plain and uninspired. Still, the interior has plenty of handy storage nooks. On a twisty road you notice the lack of support from the park-bench-flat front buckets. Upside? They are mounted high, leaving room for back-seat passengers' feet.

The new Fusion is a tremendous value. Yet there's blandness to this car. It's almost like a generic version of the

FORD
Smooth and
Efficient

Mazda. The Fusion lineup, however, includes a hybrid version that Mazda doesn't offer. While hybrids are not in the scope of this test, the gas–electric Fusion is noteworthy among its peers and deserves a mention. It transparently delivers nearly 40 mpg in everyday driving and, like the rest of the lineup, favors comfort, ride quality and efficiency.

Suzuki Kizashi

Unlike all the other players in this test, Suzuki has never had a credible entry in the midsize sedan segment. Yet this is not a clone of an established model. Nope. Suzuki went its own way and built an incredibly sporty sedan at an eye-popping low price.

There's no mistaking this car's sporting character, thanks to the aggressive bodywork and the dual exhaust. It's eager for action—like a frothy-mouthed pit bull at the end of a leash.

The Kizashi is the only car here with big 18-inch wheels, and it cut a precise curve, clawing the pavement with 0.87 g's worth of grip. It was over 10 mph faster through the lane change than the Toyota Camry. That's astonishing. The steering is quick and sensitive—the perfect conduit to the front tires. Our tester costs just $22,489—the lowest here—and did not feel stripped down. The cloth seats felt two rungs higher in quality than the Toyota's. It also came with dual-zone climate control, rear air vents and iPod integration.

But the Kizashi isn't exactly the teacher's pet. This sedan offers plenty of uplevel features, but they are delivered in a package that somehow feels less expensive. More importantly,

HONDA
The Benchmark

Honda Accord

Since the first Accord arrived here in 1976, it has slowly and steadily steamrolled over the competition to become a benchmark. This latest version—the eighth generation—is the only car here that's officially classified by the EPA as a large car. But big is okay when hauling the family is the objective. The Accord's rear seat trumps the rest. Two six-footers could spend hours back there. The 2.4-liter hums smoothly, and though the gearbox lacks a sixth gear, it still hit 32 mpg. The suspension is firm in all the right ways, communicating the road surface up into your hands but filtering out the rough edges. The Accord doesn't have an overtly sporty feel, but it can run a canyon road without shouting about its capability through the bullhorn of a stiff ride. Inside, the Accord is a little, yes, boring. But the fit and finish top the class, and the front seats occupy the pole position for comfort. Our $25,340 tester lacked some features, like heated seats, that others offer at a similar price. But there's a reason so many buyers choose the Honda Accord: It handles every chore with solid competence.

the Suzuki is smaller. The rear seat is comparatively tight, and there's less room in the trunk. Still, the Kizashi is an entertaining sedan at a rock-bottom price.

Chevrolet Malibu

GM might be fighting to rebuild itself after a tumultuous year, but the Malibu is a key example of the company's design and engineering chops. The exterior has tight proportions with just the right amount of dazzle, and was chosen as best-looking by our younger voters. Inside, there's an upscale vibe.

The smooth motor is exceedingly quiet and employs fuel-saving direct injection. Chevy channels the 169 hp through a six-speed automatic, which helps the Malibu hit 33 mpg on the EPA highway cycle. (It was only a midpack 30.3 mpg in our testing.) The Malibu weighs nearly as much as the Subaru, but from behind the wheel it feels relatively light. It's surprisingly agile, belying the unspectacular handling-test results. The Malibu's ride was as plush as the Camry's, but without syrupy responses. The Chevy always feels engaged and ready to frolic, and the electric power assist dials up the right amount of effort. The wheel also has handy switches to manually control the transmission.

That stylish, gently sloping rear glass leaves a small, mailbox-like trunk opening. So this sedan wouldn't be our first choice for a trip to Home Depot. Still, the Malibu was one of the best-balanced cars here, blending handling, quietness and comfort into one very sleek and affordable package.

Subaru Legacy

In dismal 2009, when the country's auto sales tumbled by about a third, Subaru was the success story, notching a 15 percent gain, thanks in no small part to the new Legacy.

Subaru, like Mazda, has long been in the hunt for a midsize sedan with mass appeal. But in the past, both cars were just a bit too small. No more. The Subaru has grown up.

The 170-hp boxer engine is inherently smooth and barks a throaty tune, but it could use some extra low-end torque. A six-speed manual is the standard gearbox, but ours had the optional CVT. This transmission takes its time to switch ratios and helped make the Subaru the slowest here, but the deficit is negligible in this class of vehicle.

Yes, the all-wheel-drive Legacy is a bit heavy compared to some, and the driveline has more inherent drag. But it still returned 31 mpg on our route, about average for this group. It also feels very solid, not unlike a German sedan. The suspension tuning mimics the Honda's—initially supple yet buttoned down once the twisties get tight.

The interior is inviting and feels richer than that of most cars here. The steering wheel wears a pair of paddles for manual shifting, and the ignition switch has a lighted ring for nighttime viewing—a nice touch. The front seats were tops in all-day comfort—the rear ones just short of the Accord's.

The Legacy is large enough and comfortable enough to steal sales from the mainstream players. But it hasn't lost the personality that makes Subarus such interesting cars.

SPEC CHART

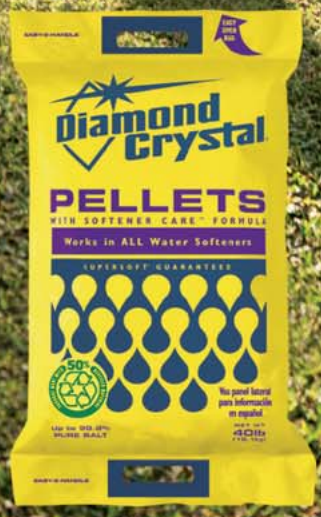
	CHEVY MALIBU	FORD FUSION	HONDA ACCORD	MAZDA 6	NISSAN ALTIMA	SUBARU LEGACY	SUZUKI KIZASHI	TOYOTA CAMRY
BASE PRICE	$22,325	$20,345	$21,765	$19,200	$20,620	$20,690	$19,734	$20,115
AS TESTED	$25,995	$24,700	$25,340	$30,765	$30,530	$29,511	$22,489	$23,629
POWERTRAIN	169-hp/158 lb-ft 2.4-liter I4, 6A	175-hp/172 lb-ft 2.5-liter I4, 6A	190-hp/162 lb-ft 2.4-liter I4, 5A	170-hp/167 lb-ft 2.5-liter I4, 5A	170-hp/175 lb-ft 2.5-liter I4, CVT	170-hp/170 lb-ft 2.5-liter flat-4, CVT	180-hp/170 lb-ft 2.4-liter I4, CVT	169-hp/179 lb-ft 2.5-liter I4, 6A
SUSPENSION (F/R)	strut, coil springs/ multilink, coil springs	control arms, coil springs/multilink, coil springs	control arms, coil springs/multilink, coil springs	control arms, coil springs/multilink, coil springs	strut, coil springs/ multilink, coil springs	strut, coil springs/ multilink, coil springs	strut, coil springs/ multilink, coil springs	strut, coil springs/ multilink, coil springs
WHEELBASE (IN.)	112.3	107.4	110.2	109.8	109.3	108.3	106.3	109.3
LENGTH (IN.)	191.8	190.6	194.1	193.7	190.7	186.4	183.1	189.2
WIDTH (IN.)	70.3	72.2	72.7	72.4	70.7	71.7	71.7	71.7
TRACK (F/R)	59.6/60.0	61.7/61.3	62.2/62.2	62.8/62.8	61.0/61.0	61.6/61.8	61.6/61.6	62.0/61.6
BRAKES	11.7-inch disc/10.9-inch disc, ABS, ESC	11.8-inch disc/11.0-inch disc, ABS, ESC	11.8-inch disc/11.1-inch disc, ABS, ESC	11.8-inch disc/11.0-inch disc, ABS, ESC	11.7-inch disc/11.5-inch disc, ABS, ESC	11.6-inch disc/11.3-inch disc, ABS, ESC	11.8-inch disc/10.9-inch disc, ABS, ESC	disc/11.0-inch disc, ABS, ESC
CURB WEIGHT	3460	3400	3380	3400	3260	3480	3360	3340
TIRES (F/R)	P215/55R-17	P225/50R-17	P225/50R-17	P215/55R-17	P215/60R-16	P215/50R-17	P235/45R-18	P215/60R-16
ACCELERATION (SEC)								
0–30 MPH	2.95	3.06	3.13	2.89	3.06	3.40	3.55	2.88
0–60 MPH	8.29	8.22	8.31	8.24	7.72	8.68	8.57	7.94
40–70 MPH	6.54	6.15	6.08	6.54	5.47	6.47	6.06	6.10
QUARTER-MILE (SEC/MPH)	16.14 @ 85.97	16.04 @ 86.97	16.06 @ 87.40	16.14 @ 86.58	15.75 @ 89.48	16.53 @ 84.72	16.33 @ 87.09	15.89 @ 87.49
BRAKING (FT)								
30–0 MPH	32.39	31.58	30.95	30.87	30.71	31.11	29.95	30.91
60–0 MPH	129.77	125.17	128.22	127.03	126.15	125.96	123.26	127.65
SOUND LEVELS (DBA)								
IDLE	60.2	60.7	61.7	60.7	60.2	60.8	60.5	60.8
FULL THROTTLE	76.7	74.7	76.2	75.0	77.0	74.6	74.7	73.5
60 MPH	73.0	74.2	76.1	73.7	73.7	73.5	73.9	71.4
SLALOM (MPH)	47.04	46.19	46.91	46.19	47.04	45.89	48.9	44.52
LANE CHANGE (MPH)	68.64	69.34	71.52	69.34	69.57	69.81	78.07	67.96
SKIDPAD (G)	0.78	0.82	0.82	0.82	0.81	0.82	0.87	0.80
EPA FUEL ECONOMY (CITY/HWY)	22/33	22/31	21/31	21/30	23/32	23/31	23/30	22/32
PM FUEL ECONOMY	30.34	32.30	31.71	29.19	32.38	30.96	28.87	31.52

Conclusion

The specification and test-data chart shows just how closely these cars are matched when it comes to performance. In terms of full-throttle acceleration to 60 mph, less than 1 second separated these cars. The spread in fuel economy on our PM test loop was less than 4 mpg, and the difference between the heaviest and the lightest car was a mere 220 pounds. That reflects not only how competitive the midsize sedan segment has become, but also how important the subtleties of each car's personality can be. Though we didn't rank these sedans, there was one car that showed up in the majority of our testers' scoring notebooks—the Mazda6. The Mazda's blend of spirited handling, slick style and well-crafted, roomy interior made it the surprise standout in our test. The Mazda was the car we most wanted in our own garages. **PM**

CARING FOR THE FUTURE IS NOW AS EASY AS CARRYING OUR BAGS.

50% PACKAGE MADE WITH RECYCLED MATERIAL



Try our easy-2-handle® bag, now made with 50% recycled material. Your family will enjoy the soft water, and you'll enjoy knowing that our bag is a little easier on the environment.

Visit diamondcrystalsalt.com for more information.

For illustration purposes only. Children should not attempt to carry without adult permission and supervision.

Once it's started on improved soil, grass needs very little care to look crisp, green, cool and inviting.

SIX WEEKS TO A PERFECT LAWN!

Sometimes you have to destroy your lawn in order to save it. If years of weeding, fertilizing and fussing have failed to prod your patch of turf to perfection, it's time to change tactics. PM contributing editor Jim Gorman advises a brutal but effective strategy: Kill off the insipid sod entirely, then start fresh. The result will be a lush, healthy lawn that knows who's boss.

by JIM GORMAN

FACE REALITY

THE FIRST STEP IS ADMITTING YOUR LAWN HAS A PROBLEM. LOTS OF THEM, ACTUALLY: WEEDS, BARE SPOTS, THATCH. PEOPLE ARE TALKING. BUT ARE YOU READY TO EMBRACE THE TREATMENT?

I'm one of those grass guys. You probably know the type. House surrounded by a shag carpet so deeply green it verges on blue. Not a weed in sight. There's a grass guy or two in every neighborhood. In mine, they call me "the grass whisperer."

Looking at my lawn, you'd think I toil relentlessly from April clear through to Thanksgiving, or pay a small fortune to a lawn service. The truth is, I don't do either.

PHOTOGRAPHS BY FILIP KWIATKOWSKI

BROADLEAF PLANTAIN

Weeds invade when the lawn itself isn't healthy. Killing the weeds without healing the lawn means you're only treating the symptoms.

ROLL OUT THE PLASTIC

The old lawn won't go quietly. You have to kill it. We scalped it low and hard using a lawnmower, soaked it with a sprinkler to a depth of several inches and then suffocated it under rows of plastic sheet. Gruesome but effective.

SEAL IT TIGHT

Solarization is hard work. The plastic must be sealed tight to prevent heat and water vapor from escaping.

Dig a trench around the lawn and use the soil to weigh down the plastic. Also use bricks and landscape fabric pegs.

Except for a weekly mowing, a few squirts of weed killer now and then and a well-timed hit of fertilizer every autumn, I do little more than accept compliments from passersby. I don't constantly water, overfeed, aerate, douse with 2,4-D, degrub, defungus or dethatch. If I do have a problem with my turf, it's that mowing is sometimes difficult because of how dense the grass grows. I know, I know: Shut up.

To own a good-looking lawn that's practically on autopilot is a dream widely held. The reality is that getting to that point requires hefty machinery, callus-inducing labor and an enhanced understanding of your lawn as a miniature ecosystem. Take it from me, it's worth it.

Four years ago the front yard of my new home was an unsightly mess. Aboveground there was an assortment of aggressive weeds. Below ground, the soil was compacted by heavy construction equipment and depleted of vital nutrients. Rather than launch a multiyear campaign to coax life out of the few remaining blades of grass, I instead hit the "restart" button and killed my old lawn.

For reasons mostly practical and somewhat philosophical, I wanted my new turf to fend for itself against pest and weed invaders. I am not a Kool-Aid drinking member of the organic lawn-care movement, with its earnest advice to make "peace" with weeds. But if I am going to resort to pesticides or herbicides, I want it to be in response to a particular emergency, not as a matter of routine.

Healthy lawns need a lot less human intervention than we lavish on them. Set a new lawn on the right path at the outset with plenty of organic goodness and busy microorganisms in the soil, then feed it regularly with mulched clippings and autumn leaves, and it will do fine.

A total yard renovation isn't something entered into lightly. But in a variety of situations it makes sense, according to Peter Landschoot, a turfgrass scientist at Penn State University. "If your lawn keeps dying or deteriorating, if your grass is very coarse-textured and clumpy or it continuously

ILLUSTRATIONS BY DOGO

develops leaf diseases, then it's probably time to start a new lawn," he says. And to that do-over list I'd add a lawn that's more weeds than grass.

The front yard of my neighbors Kevin and Karlyn Aires was a prime example of a lawn gone past the tipping point. From the street it looked respectable, especially after being mowed. Up close, however, the picture wasn't so pretty. Much of the "grass" was a wide-leaf, clumpy fescue variety called Kentucky 31, commercially available decades ago and now deemed worthy only of highway medians. Broad-leafed weeds like plantain, dandelion and white clover had established major beachheads. And undesirable and impossible-to-eradicate grassy weeds like nimblewill and orchardgrass were on the loose.

"I'm tired of mowing weeds," Kevin told me one day. With barely any bribing, he and Karlyn agreed to submit their lawn to a total renovation by POPULAR MECHANICS. And why not? They had nothing to lose.

Starting over would allow the Aires to rectify their lawn's soil structure and soil health and trade in their Dodge Dart–era grass for the Lexus GS 460–level performance churned out by busy grass breeders. Indeed, modern grass varieties are nothing like your father's. "Today's varieties are more disease-resistant, they have better texture, density, color and uniformity, and they tolerate drought, cold and wear better than those of 30 years ago," Landschoot says.

LAWN FORENSICS

YOU KNOW SOMETHING IS KILLING YOUR LAWN. BUT WHAT? SCIENCE HAS THE ANSWER, AND THE ODDS ARE GOOD THAT THE CULPRIT IS DEPLETED AND UNHEALTHY SOIL.

On a cool morning in early August, in the midst of one of the wettest summers in memory, our lawn redo project got underway. Not with the clatter of machinery or clank of garden rakes hitting pay dirt—plenty of both would follow soon enough—but with me lifting small scoops of soil from the Aires' front lawn. These I sent off for

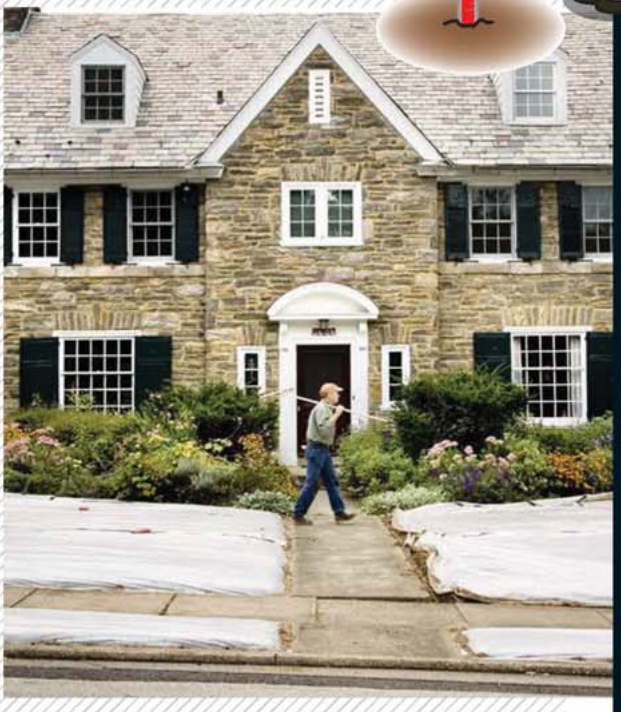
Lawn mowers, trimmers and pressure washers at **Lowes.com**.

LOWE'S
Let's Build Something Together™

For the store nearest you, call 1-800-993-4416. © 2010 by Lowe's. All rights reserved. Lowe's and the gable design are registered trademarks of LF, LLC.

SOLARIZATION, STAGE ONE

The first stage of solarization kills everything but a few hardy survivors here and there. Yank these weeds or grass sprigs by hand. If a shrink-wrapped lawn isn't for you, two applications of a herbicide like Roundup spaced two weeks apart will also work.



SOLARIZATION, STAGE TWO

Roll up plastic and set it aside. Till the lawn under, adding amendments if necessary, then rake and roll the lawn to smooth and gently compact it. Complete the kill by putting the plastic down for a second time.

analysis at the agricultural extension service at Penn State University.

Before planting a new lawn, it's vital to understand why the old one failed. A modestly priced soil analysis (pay extra to test levels of organic matter) is your best forensic clue. "Was the soil low in nutrients, too acidic, did tree limbs overgrow and create too much shade, was there too much foot compaction?" asks Dennis Martin, a turfgrass specialist at Oklahoma State University. "Without modifying those conditions, a lawn renovation doesn't solve your problems."

Just as in painting a house, almost all the hard work in replanting a lawn lies in the preparation. But it is also crucial to schedule the job properly. The process begins by pinpointing the sweet spot on the calendar for seeding in your area, then working backward. In the cool-season grass zone, which I inhabit (generally north of a line drawn between San Francisco and Philadelphia), seed should be in the ground between the last week of August and the first two weeks of September. In the transition zone (the area between a line drawn from San Diego to Myrtle Beach, S.C., and south of the boundary described above), seed should be sown in mid- to late September. Warm-season grasses are another beast altogether. In the arc from south Texas to Florida, seed or plugs go down in late spring to early summer.

Why plant cool-season grass types like bluegrass and fescue late in the growing season? Turf scientists advise it because competition from weeds will be nil, you won't have to spend as much time watering, and grass naturally devotes its energy at that time of year toward building all-important root structure. For warm-season grasses like zoysia and Bermuda grass, seeding needs to happen when the grasses are in their active growth phase, which comes before the summer heat arrives in full.

Figuring that the active phase of our lawn renovation—from killing off the old lawn to putting seed in the ground—would gobble up at least four weeks' time, I knew we had to have all of our supplies and equipment on hand and be ready to go by early August.

A key decision in the planning process is selecting the right type of grass to grow. In this, your state cooperative extension service's website is an excellent resource. There you'll find the results of field trials of specific cultivars under growing conditions that closely approximate yours. For instance, Penn State University's cooperative extension details the performance of Tomahawk

RT and 67 other tall fescues and 103 bluegrasses. For even more timely results on the very latest seed varieties, go to the National Turfgrass Evaluation Program's website (*ntep.org*) and scan the results of turf trials from 30 locations around the country.

For the Aires' lawn, same as mine, we chose a mix of turf-type tall fescues. Deep-rooted, heat-tolerant and slow-growing up top, tall fescues require less watering and mowing than Kentucky bluegrass. They also demand less fertilizer and aren't prone to thatch buildup. Perfect, in other words, for a low-maintenance lawn in southeast Pennsylvania. Fescues falter the farther north you live, where Kentucky bluegrass thrives.

To purchase elite performance seed varieties suited to your particular climate and soil type, you'll probably need to look beyond local nurseries and big-box home centers, where one-size-fits-all mixtures are the rule. Web-based SeedSuperStore and Seedland offer many of the best varieties singly and in blends. Turf experts like Landschoot and Martin advise planting no fewer than four or five varieties of a particular type of grass (e.g. Kentucky bluegrass) to avoid mass die-off caused by disease or weather extremes.

DIE, LAWN, DIE

NOW IT'S TIME TO GET MEDIEVAL ON YOUR SORRY EXCUSE FOR A LAWN. A NICE DOUSING OF ROUNDUP WILL DO THE TRICK. SO WILL PLASTIC SHEET AND LIBERAL APPLICATIONS OF SUNLIGHT.

If you ever want to get a rise out of the neighbors, wrap your front yard in plastic. That's what we did when it came time to kill off the Aires' old lawn. As I unrolled plastic sheeting under a blazing summer sun, dog walkers paused and landscape contractors drove by at a crawl. Normally, I'd terminate a lawn with two sprayings of a broad-spectrum weed and grass killer such as Roundup, spaced two weeks apart. The first spraying kills most of the lawn. The followup application catches any survivors. Then you wait at least 10 days from that last shot of Roundup

Gas grills, charcoal grills and grill accessories at **Lowes.com**.

LOWE'S
Let's Build Something Together™

For the store nearest you, call 1-800-993-4416. © 2010 by Lowe's. All rights reserved. Lowe's and the gable design are registered trademarks of LF, LLC.

AT LAST, GRASS SEED

After enduring comments and questions from neighbors, it feels good to spread seed. Do less visible areas first to perfect an even spread pattern. Twenty seeds per square inch is ideal coverage.

COVER UP

Cover the seeded area with hay (dried grass) or straw (dried grain stalks). Either works as mulch but must be certified from a state agricultural department or other organization to be free of weed seed. Keep the lawn moist for the first three weeks, applying extra water if conditions are especially hot or windy. Avoid forming puddles.

before planting seed.

Kevin and Karlyn Aires, being organic gardeners, weren't having any part of Roundup. (I did my best to explain that Roundup is actually quite environmentally friendly, but they didn't see it that way.) Without that chemical cudgel, our best weapon was solarization, by which the lawn and any weed seeds lurking in the soil are steam-heated into oblivion after one month beneath a layer of clear plastic. Done correctly, solarization sterilizes the top 6 inches of soil by raising temperatures above 140 degrees Fahrenheit. We weren't so lucky.

It took 17 man-hours of labor to cover the 1500-square-foot lawn in plastic and seal it tight at the edges with excavated soil. Then the rains returned and the clouds lingered. The maximum temperature we achieved was 105 degrees, just enough to kill the existing grass, but not hot enough to force dormant weed seeds to germinate and die off. Our plan was also hampered by the fact that the 3-mm plastic we purchased—described as "clear" on the label—was actually closer to white. And that meant that even when the sun did shine, those rays tended to reflect off the sheet rather than baking the soil underneath. Final analysis: Solarization is not worth the effort unless you're a diehard environmentalist, or you like attention. "It was great fun giving passing neighbors something new to talk about," Kevin says in retrospect.

How you go about handling the next stage of a lawn renovation—preparing the soil for seeding—will depend on the results of your soil test. If the test shows your soil is in good shape and needs no amendments, then consider yourself lucky. You can quickly prepare a seedbed employing the same method used at Penn State's turf research farm. Chew the lawn up by making eight to 10 passes with a rented core aerator. Apply seed-starter fertilizer as necessary. Then break up the plugs and furrow the lawn with a vertical mower, also known as a dethatcher. Make two to four passes in a crisscross pattern to kick up more dirt for better seed contact.

Better-quality dethatchers also function as slit seeders, laying down seed in a narrow furrow. If your machine has that capability, now's the time to make use of it. Otherwise, broadcast seed using a lawn spreader.

On my neighbors' lawn, because of dips and bumps that needed leveling, we instead rented a 6-hp rototiller to loosen the soil. A rototiller has

the advantage of thoroughly mixing lime, fertilizer and any other amendment into the top 6 inches of soil. The disadvantage is it leaves plenty of rake work in its wake. Ideally, one should use a sod cutter to remove the layer of dead grass and weeds before tilling. Clumps of dead vegetation made raking and grading much more difficult.

It's necessary to pack down a lawn that's been rototilled. Rake it smooth, then use a lawn roller. You want to be able to step on the soil when it's dry and not sink in. In our case, we put the plastic down a second time and seeded after we removed the plastic. If you're not solarizing, spread seed, then drag a metal leaf rake across the lawn in several passes at right angles to mix dirt and seed. Spread by hand a mulching layer of straw that's certified to contain no weed seeds. "Don't put on too much. You want to see a little of the soil through the mulch," Landschoot says. We used salt hay, a weed- and seed-free mulch available in the Northeast. Mulch prevents seed from washing away in a heavy rain, retains soil moisture and shields seedlings from blazing sun. Now, pass over the lawn with the lawn roller filled partially with water to establish good contact between seeds and soil.

The rest of the operation involves daily to twice-daily watering to keep the topmost layer of soil moist. We experienced every grass guy's worst nightmare the night after planting: an unexpected torrential rainfall. In the deluge, seed migrated into clumps, leaving some areas bare. But after the seeds germinated, we simply reseeded the bald spots.

By late fall the lawn was thick, green and uniform. Come summer, it will be ready for heavy traffic. And then the Aires will learn that, with the hard work over, they can best appreciate their new lawn the way I do mine: watching it grow from the comfort of a lawn chair. **PM**

Whether you're anxious to get going on your spring projects, or simply looking forward to enjoying more time outside, Lowe's has what you need to get the season off to a great start. Visit **Lowes.com**.

LOWE'S
Let's Build Something Together™

For the store nearest you, call 1-800-993-4416. © 2010 by Lowe's. All rights reserved. Lowe's and the gable design are registered trademarks of LF, LLC.

Available at Walmart
Save money. Live better.

- Starts stubborn engines
- Revitalizes fuel system and freshens stale fuel
- Easy to use, just pour in the fuel tank
- Safe for use in 2 and 4 cycle engines
- Smoothes rough idle and cures stalling

GOLD EAGLE

© 2010 Gold Eagle Co., 4400 S. Kildare, Chicago, IL 60632 www.startyourenginesus.com 800-367-3245

The Chips Fall Where They May

WE BATTLE THROUGH A JIGSAW SHOWDOWN. *BY ROY BERENDSOHN*

Few things are as useful around the house and shop as a jigsaw. It's a hacksaw, a fine woodworking tool and a rough-cutting construction saw rolled into one. It makes straight, curved and beveled cuts, and does work that would be difficult to accomplish by hand—such as cutting square holes in a panel.

We gathered six of the biggest and toughest jigsaws we could find. Then we tested them using a fresh bimetal Lenox blade in each. At the end of the day, we had a clear winner and some close contenders. Here's our report.

INSIDE × FLOATING SHELVES + DRY WELLS + RADIANT BARRIERS

PHOTOGRAPHS BY **DOUG ADESKO**

Bosch 1590EVS

★★★★★

PRICE: $155
AMP: 6.4
MAX SPM AND CONTROL: 2800, dial adjust
CROSSCUT 3/16 X 4 IN. STEEL: 24.5 seconds
CROSSCUT 2 X 8: 6.0 seconds
RIP 2 X 8 X 12: 9.6 seconds
SHOE ADJUSTMENT: Tool-free

Likes: Everything. It's rare in our tests that one tool commands the field as convincingly as the Bosch does in this one. It's heavy, smooth and powerful, a veritable locomotive of jigsaws. The ultimate arbiter was the steel crosscut test. Only the Bosch sailed through, leaving a pile of smoking hot steel chips in its wake. It ejects spent blades like shotgun shells, and its adjustable shoe is designed for ease and accuracy.
Dislikes: Nothing noted.

DeWalt DW331

★★★

PRICE: $150
AMP: 6.5
MAX SPM AND CONTROL: 3100, dial adjust
CROSSCUT 3/16 X 4 IN. STEEL: 47.4 seconds
CROSSCUT 2 X 8: 7.2 seconds
RIP 2 X 8 X 12: 13.5 seconds
SHOE ADJUSTMENT: Tool-free

Likes: Solid. This is a carpenter's jigsaw designed to survive construction-site punishment. The nose, shoe and a large part of the sides are protected with thick metal castings. The blade guard and eject lever are bent steel rod.
Dislikes: The blade clamp did not work as reliably as it should. Testers had to check that the blade was firmly clamped by pulling on it.

Festool PSB 300 EQ

★★★★

PRICE: $310
AMP: 6
MAX SPM AND CONTROL: 2900, dial adjust
CROSSCUT 3/16 X 4 IN. STEEL: 42.3 seconds
CROSSCUT 2 X 8: 5.7 seconds
RIP 2 X 8 X 12: 8.8 seconds
SHOE ADJUSTMENT: Allen wrench

Likes: Almost everything. This is a compact, quiet, smooth-cutting saw designed for professional woodworkers. For example, you can equip it with a typical fence but also a track that the saw rides in for the ultimate in smooth and straight cutting. It was the only saw with an easily removable cord.
Dislikes: The performance is excellent, but not the price.

When you fill your walls with healthier insulation, every room inside those walls starts to come to life.

JOHNS MANVILLE OFFERS THE ONLY COMPLETE LINE OF FORMALDEHYDE-FREE™ FIBER GLASS HOME INSULATION.

By removing the formaldehyde, we add something remarkable: improved indoor air quality for the health and well-being of your family. That's the beauty behind our energy-efficient insulation—it helps reduce your family's exposure to formaldehyde. To purchase our naturally white insulation, **visit Lowe's, or for more information, visit JMhomeowner.com.**

Healthier, safer fiber glass insulation from JM. Better Living from the Inside Out.™

Plastic-wrapped Insulation • Mold-resistant Insulation • Tear-to-fit Insulation • Blown-in Insulation

LOWE'S
Let's Build Something Together™

© 2010 Johns Manville © 2010 by Lowe's® All rights reserved. Lowe's and gable design are registered trademarks of LF, LLC. Used with permission.

Makita 4350FCT

***

PRICE: $170

AMP: 6.3

MAX SPM AND CONTROL: 2800, dial adjust

CROSSCUT 3/16 X 4 IN. STEEL: 44.5 seconds

CROSSCUT 2 X 8: 7.4 seconds

RIP 2 X 8 X 12: 9.0 seconds

SHOE ADJUSTMENT: Allen wrench

Likes: Big saw, small package. The Makita packs a fair amount of cutting power in a compact size. It also packs a fair amount of common sense—the blade orbit is controlled with a lever on the side of the saw marked 0 to 3, and to release the blade, you simply pivot the blade guard forward. There's not a mysterious symbol, lever or button to be found on it.
Dislikes: The saw lacks tool-free shoe adjustment.

Milwaukee 6268-21

****

PRICE: $170

AMP: 6.5

MAX SPM AND CONTROL: 3000, dial adjust

CROSSCUT 3/16 X 4 IN. STEEL: 39.6 seconds

CROSSCUT 2 X 8: 6.9 seconds

RIP 2 X 8 X 12: 11.3 seconds

SHOE ADJUSTMENT: Tool-free

Likes: This is a saw for the rest of us. If you don't use a jigsaw every day, then you'll appreciate the little chart on the side that matches cutting speed/orbital action to the material. Need to pivot the shoe? Just swing the large lever beneath the motor. And no need to guess about the shoe angle. It's clearly indicated on the shoe's arch-shaped top.
Dislikes: Nothing noted.

Porter Cable PC600JS

*

PRICE: $90

AMP: 6

MAX SPM AND CONTROL: 3200, dial adjust

CROSSCUT 3/16 X 4 IN. STEEL: 58.4 seconds

CROSSCUT 2 X 8: 15.5 seconds

RIP 2 X 8 X 12: 21.0 seconds

SHOE ADJUSTMENT: Tool-free

Likes: Comfortable. A large trigger and sensibly shaped surfaces plus good weight distribution make this saw an easy handler.
Dislikes: We were hoping this tool represented a good ratio of price and performance. Instead, it flopped. The tradeoff isn't worth it. It's fine for light-duty cuts, but it's brutally slow for more demanding work. We didn't test the company's contractor-grade Model 9543; now we wish we had. That $165 tool appears far more stout than this budget-priced saw.

HARBOR FREIGHT TOOLS

Quality Tools at Ridiculously Low Prices

FACTORY DIRECT TO YOU!

How does Harbor Freight Tools sell high quality tools at such ridiculously low prices? We buy direct from the factories who also supply the major brands and sell direct to you. It's just that simple! Come see for yourself at one of our 330 STORES NATIONWIDE and use this 20% OFF Coupon on any of our 7,000 products. We stock Automotive products, Shop Equipment, Hand Tools, Tarps, Compressors, Air & Power Tools, Material Handling, Woodworking Tools, Welders, Tool Boxes, Outdoor Equipment, Generators, and much more.

NOBODY BEATS OUR QUALITY, SERVICE AND PRICE!

- We Have 10 Million Satisfied Customers
- We Buy Factory Direct and Pass the SAVINGS on to YOU!
- Shop & Compare Our Quality Brands Against Other National Brands
- Thousands of People Switch to Harbor Freight Tools Every Day!
- NO HASSLE RETURN POLICY
- Family Owned & Operated

LIFETIME WARRANTY ON ALL HAND TOOLS!

SUPER COUPON!

20% OFF ANY SINGLE ITEM!

Bring this coupon and Save 20% on one single item purchased at Harbor Freight Tools. Cannot be used with any other discount or coupon. One coupon per purchase. One coupon per customer. Coupon not valid on prior purchases or purchase of gift cards or purchase of extended service plans. Offer good on in-stock merchandise only. Savings discount percentage off Harbor Freight Tools current prices, including sale prices. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount. All Campbell Hausfeld products are excluded from this offer. This offer is not valid on food or beverage items sold in our retail stores. Valid only in Retail Stores through 7/10/10.

75674010

See HarborFreightusa.com/Popmechanic for additional SUPER COUPONS

SUPER COUPON!

3000 LB. CAPACITY LIGHTWEIGHT ALUMINUM RACING JACK

U.S. GENERAL

Item 91039 shown

$59.99

LOT NO. 91039/67408 REG. PRICE $99.99

SAVE $40

44646396

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

CENTRAL PNEUMATIC® 2 HP, 8 GALLON, 115 PSI PORTABLE AIR COMPRESSOR

LOT NO. 95386/40400/67501

Item 95386 shown

$79.99 REG. PRICE $139.99

SAVE $60

58955453

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

LOT NO. 67256

MULTIFUNCTION POWER TOOL

CHICAGO Electric Power Tools

$34.99

REG. PRICE $59.99

SAVE 41%

47578646

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

LOT NO. 67421

STOREHOUSE

11 DRAWER ROLLER CABINET

INCLUDES:

- 6 Drawer Top Chest
- 2 Drawer Middle Section
- 3 Drawer Roller Cabinet

$149.99

REG. PRICE $289.99

SAVE $140

66486911

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

CHICAGO Electric Power Tools

10" SLIDING COMPOUND MITER SAW

LOT NO. 98199/90891/96697

Item 98199 shown

$79.99 REG. PRICE $139.99

SAVE $60

10698207

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

CENTRAL PNEUMATIC®

HIGH SPEED METAL SAW

LOT NO. 113/91753

Item 113 shown

$9.99 REG. PRICE $29.99

SAVE 66%

32840183

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

Pittsburgh

9 PIECE HIGHLY POLISHED COMBINATION WRENCH SETS

SAE - LOT NO. 42304

METRIC - LOT NO. 42305

YOUR CHOICE!

$6.99 REG. PRICE $9.99

SAVE 30%

22087779

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON!

CAMOUFLAGE 12 VOLT 3000 LB. CAPACITY WIRELESS REMOTE CONTROLLED PORTABLE WINCH WITH ROLLER FAIRLEAD

CHICAGO Electric Power Tools

LOT NO. 95912

$49.99 REG. PRICE $99.99

SAVE $50

72165400

HARBOR FREIGHT TOOLS - LIMIT 1

These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 7/10/10.

Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

We Will Beat Any Competitor's Price Within 1 Year Of Purchase!

330 STORES NATIONWIDE

TO FIND THE STORE NEAREST YOU CHECK:

1-800-657-8001

or HarborFreightusa.com/Popmechanic

Homeowners Clinic

by Roy Berendsohn

Q+A

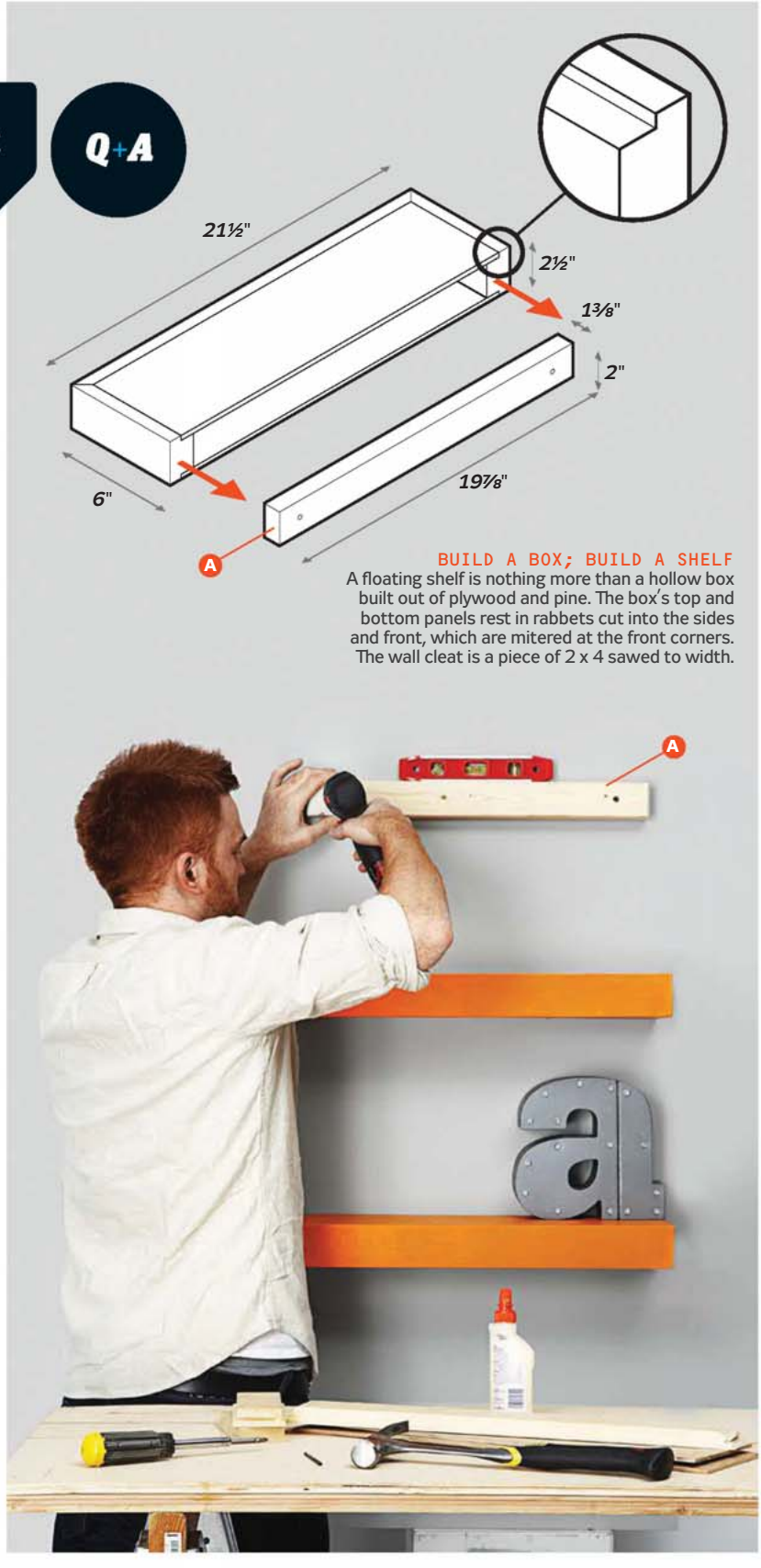
Floating a Shelf Idea

Q I'm fascinated with floating shelves. I've built one—it looked okay, but a little rough. What's the right way to do this?

A Floating shelves are making a comeback. I'm not sure when they first came into being, but PM was covering them as early as the 1950s. Like many old ideas, they've received a boost as new homeowners have discovered their clean and simple look.

One basic execution is to bore a pair of holes into wall studs, insert metal bars or wood dowels into the framing and slip a solid wood shelf over the supports. The problem with this design is that the holes in the framing and the shelf have to be very carefully bored so they are parallel to one another and in the same plane. Otherwise the shelf won't easily slip over the supports.

Our design (shown at right) has more parts, but it's still easy to build and install. It's forgiving of small inaccuracies in construction and installation. Build the shelf, which is nothing more than a small hollow box, and test fit the wall cleat in it. Then simply attach the wall cleat to the studs, slip the shelf over it and screw the shelf to the cleat. Although it's ideal to mount the cleat to two studs, you can also attach it to a stud on one end and use a hollow wall anchor at the other end.



BUILD A BOX; BUILD A SHELF
A floating shelf is nothing more than a hollow box built out of plywood and pine. The box's top and bottom panels rest in rabbets cut into the sides and front, which are mitered at the front corners. The wall cleat is a piece of 2 x 4 sawed to width.

STUDIO D; ILLUSTRATION BY GABRIEL SILVEIRA

Pulling Up a Seat

I need to remove the toilet seat and lid on all three toilets in our house, but the nuts holding them in place are very difficult to get at. I have some access

PHOTOGRAPH BY J MUCKLE

SAVE When You Grow A Zoysia Lawn From Plugs!

To A Fabulous Lawn

ZOYSIA FARM NURSERIES
Improving America's Lawns Since 1953

GRASS SEED WILL *NEVER* GROW A LAWN LIKE THIS!

Save Water! Save Time! Save Work! Save Money!

Grass Seed Is For The Birds!

Stop wasting money, time and work sowing new grass seed each spring, only to see birds eat the seed – or rain wash it away – before it can root. Plant a genuine Amazoy™ Zoysia lawn from our living Plugs only once... and never plant a new lawn again!

Zoysia Grows Where Other Grass Doesn't!

Zoysia is the perfect choice for hard-to-cover spots, areas that are play-worn or have partial shade, and for stopping erosion on slopes. North, South, East, West – Zoysia will grow in *any* soil, no ifs, ands or buts!

Each Zoysia Plug You Plant In Your Soil Is GUARANTEED TO GROW Within 45 Days Or We'll Replace It FREE!

To ensure best results, we ship you living sheets of genuine Amazoy™ Zoysia Grass, harvested direct from our farms. Plugs are not cut all the way through. Before planting, simply finish the separation by cutting 1"-sq. Plugs with shears or knife. Then follow the included easy instructions to plant Plugs into small plug holes about a foot apart. Our guarantee and planting method are your assurance of lawn success backed by more than 5 decades of specialized lawn experience.

©2010 Zoysia Farm Nurseries, 3617 Old Taneytown Rd, Taneytown, MD 21787

Eliminates Endless Weeds And Weeding!

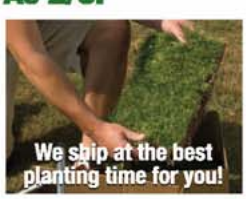
No more pulling out weeds by hand or weeds sprouting up all over your lawn. Zoysia Plugs spread into a dense, plush, deep-rooted, established lawn that drives out unwanted growth and stops crabgrass and summer weeds from germinating.

Environmentally Friendly, No Chemicals Needed!

No weeding means no chemicals. You'll never have to spray poisonous pesticides and weed killers again! Zoysia lawns are safer for the environment, as well as for family and pets!

Cuts Watering & Mowing By As Much As 2/3!

Many established Zoysia lawns only need to be mowed once or twice a season. Watering is rarely, if ever, needed – even in summer!



Meyer Zoysia Grass was perfected by the U.S. Gov't, released in cooperation with the U.S. Golf Association as a superior grass.

www.ZoysiaFarms.com/mag

Stays Green In Summer Through Heat & Drought!

When ordinary lawns brown up in summer heat and drought, your Zoysia lawn stays green and beautiful. The hotter it gets, the better it grows. *Zoysia thrives in blistering heat (120°)*, yet it won't winter-kill to 30° below zero. It only goes off its green color after killing frosts, but color returns with consistent spring warmth. Zoysia is the perfect choice for water restrictions and drought areas!

Our Customers Love Their Zoysia Lawns!

One of our typical customers, Mrs. M.R. Mitter of PA, wrote how "I've never watered it, only when I put the Plugs in... Last summer we had it mowed 2 times... When everybody's lawns here are brown from drought, ours just stays as green as ever!"

Order Now And Save!

The more Amazoy™ Zoysia Plugs you order, the more you SAVE! And remember, once your Zoysia lawn is established, you'll have an endless supply of new Plugs for planting wherever you need them. Order now!

FREE! PLANTING TOOL With Order of 400 Plugs or More!
Saves time, work and effort when making holes for Plugs!

Order Your ZOYSIA Plugs Now — Harvested Daily From Our Farms And Shipped To You Direct!

ZOYSIA GRASS SUPER SALE — SAVE OVER 50%! Get Up To 900 Plugs — FREE!

Please send me guaranteed Amazoy as checked:

PACK	# PLUGS	# Free Plugs	Free Bonus	*Retail Value*	Your PRICE	+ Shipping	SAVINGS
❑ Basic	100	–	–	*$ 8.95*	$ 8.95	$ 2.50	–
❑ 2 Basic Packs + 1 FREE	200	100	–	*$ 26.85*	$17.90	$ 5.00	30%
❑ 4 Basic Packs + 2 FREE	400	200	Free Step-on Plugger	*$ 62.65*	$35.80	$ 7.50	40%
❑ 5 Basic Packs + 3 FREE	500	300	Free Step-on Plugger	*$ 80.55*	$44.75	$10.00	42%
❑ 6 Basic Packs + 4 FREE	600	400	Free Step-on Plugger	*$ 98.45*	$53.70	$12.50	44%
❑ 9 Basic Packs + 7 FREE	900	700	Free Amazoy Power Auger	*$168.15*	$80.55	$15.00	50%
❑ 10 Basic Packs + 9 FREE	1000	900	Free Amazoy Power Auger	*$195.00*	$89.50	$17.50	54%

❑ Extra Step-on Plugger $8.95 ❑ Extra Amazoy Power Auger™ for 3/8" Drill $24.95

Mail to: ZOYSIA FARM NURSERIES
3617 Old Taneytown Road, Taneytown, MD 21787
Dept. 5550

Write price of order here $_____.____

Md. residents add 6% tax $_____.____

Shipping $_____.____

ENCLOSED TOTAL $_____.____

Payment method (check one)
❑ Check ❑ MO
❑ MasterCard
❑ Visa

Card # _____ Exp. Date _____

Name _____

Address _____

City _____ State _____

Zip _____ Phone _____

We ship all orders the same day plugs are packed at earliest correct planting time in your area.

Amazoy is the trademark registered U.S. Patent Office for our Meyer Zoysia grass.

Order Now! www.ZoysiaFarms.com/mag

Not shipped outside the USA or into WA or OR

on one side and almost none on the other. How can I get the old ones off?
The plumber probably attached the seat and lid before installing the toilet. Removing them someday was going to be somebody else's problem. You can do the same thing in reverse, but that's the hard way to go about it.

My fast and painless method is to remove the lid, then saw the head off the seat bolt using a reciprocating saw and an 8-inch, 18-tpi (teeth per inch) metal-cutting blade. Flex the blade so that it cuts the head of the bolt just a hair above the porcelain surface. This requires a few things: a steady hand, a good saw (one with plenty of power and very little vibration) and a flexible bimetal blade. Don't skimp on the saw or the blade—you can easily snap the blade when it's halfway through the bolt, or get it stuck. I use a Lenox blade chucked in a Milwaukee Super Sawzall. Works like a charm and takes about 20 to 30 seconds per bolt. One other tip: I've seen plumbers pull this off without leaving the tiniest scuff on the porcelain. But when I do it, I protect the top of the bowl with a strip of electrical tape. Still, if you scuff the bowl slightly, don't worry. The marks come off with a damp cloth and a gentle abrasive cleanser like Bon Ami or Bar Keepers Friend.

If you don't own a top-quality saw, try using a deep-well socket fitted on a socket wrench to turn the nut off the bolt. Using an articulating universal joint or an extension on the socket may help you get at the troublesome nut more easily.

Finally, if all else fails, hose the bolt threads down with a spray lubricant like Liquid Wrench or WD-40, then patiently turn the nut off the bolt, one tiny twist at a time. Do that once, though, and a reciprocating saw will suddenly seem like a bargain.

The Varnish Truth

I'm buying my son an unfinished pine bed. I'm debating whether I should use a stain first and then apply a finish on top of that, or whether I should just apply a clear coating. Also, I'm wondering about the choice between shellac and varnish. Which is best?
There's no single right answer here—there are dozens of different ways to finish even a simple project. So, I'll outline the three most basic approaches.

→ **Stain and clear coat** This will require that you apply a stain (or wood dye) and at least three coats of finish, each carefully abraded to smooth out irregularities and dust specks. The stain or dye can be a gel or a liquid. As to its chemistry, it can be formulated with alcohol, petroleum solvents or water. The same holds true with the topcoat, applied over the stain or dye. It can be a gel, or a liquid formulated with alcohol, petroleum solvents or water.

My favorite method is to wipe on a gel stain and then wipe on several coats of gel varnish. It's easy, it highlights the woodgrain and there's minimal mess.

→ **Tinted clear finish** This is simply a clear finish with a dye or stain added. You brush it on, let it dry, abrade it per the directions and apply subsequent coats. The more coats you apply, the more you obscure the woodgrain.

→ **Clear finish** This is the simplest route. You brush on or wipe on multiple coats of a gel or a liquid clear finish, abrading carefully between coats. Although this finish doesn't highlight the woodgrain the same way a stain does, it can be very attractive.

You ask a good question about the difference between varnish and shellac, a constant source of confusion. A varnish is any clear or slightly amber coating. Chemically, it can be one of a number of different compounds in which globules of resin are suspended in a solvent—water, alcohol or a petroleum-based liquid. When you spread the material on a project, you dramatically increase the exposure of its resin and solvents relative to the surrounding atmosphere. This causes the solvent to evaporate (or volatize) into the air. The resin globules coalesce and harden, forming a plastic film. (To reduce air pollution from volatile organic compounds

Continued on page 102

HOW YOUR HOUSE WORKS:
→Electric Panel

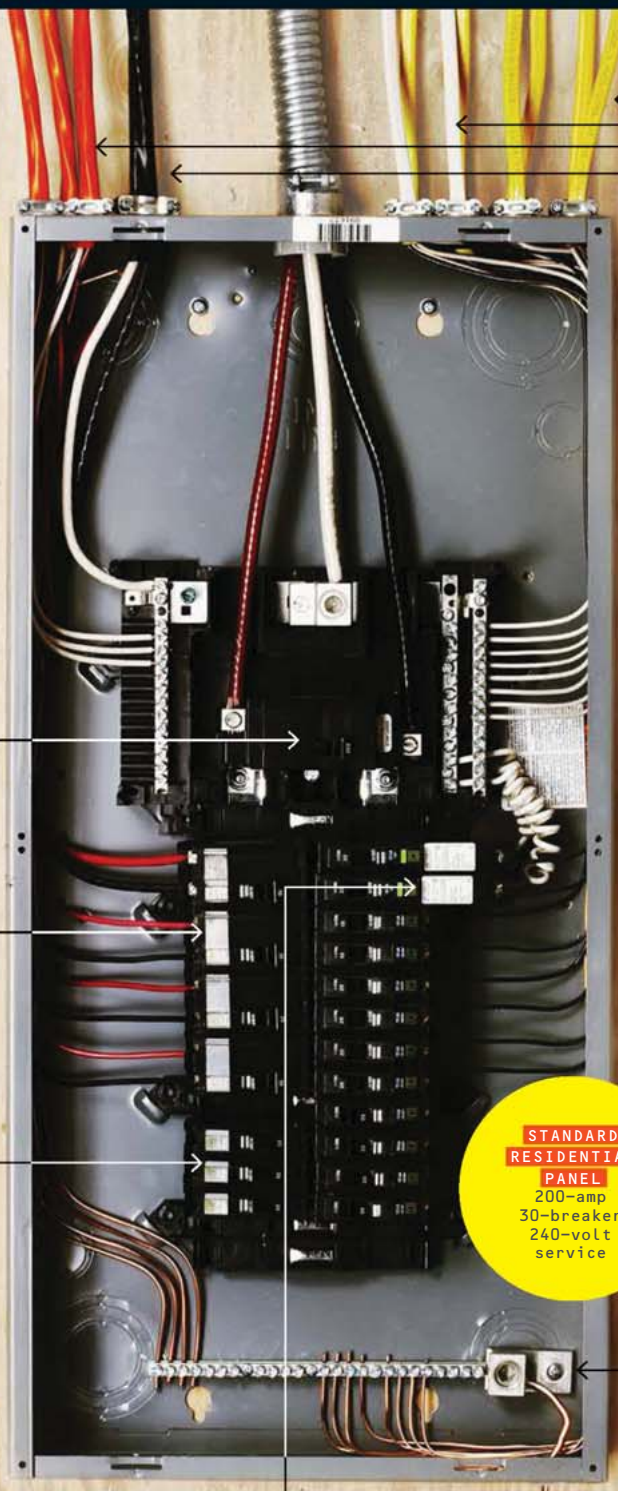
Breaker, Breaker

WHAT YOU NEED TO KNOW ABOUT THE POINT OF ENTRY FOR A HOME'S ELECTRICITY.
BY HARRY SAWYERS

Churning with voltage and resembling an explosion at the wire factory, the breaker panel exudes mystique. But it's just a big switch, filled with other smaller switches, which lead to the switches that any homeowner can fearlessly flip. Doing so conjures a current of electrons that runs along copper wires, energizing our appliances, lights and modern lives. Breaker-panel literacy isn't only for voltage veterans who recite the National Electrical Code. Even if all you wonder is whether your humble hot tub dreams are electrically attainable, or why the toaster oven kills the kitchen lights—the panel has a thing or two to tell you.

OPEN HERE FOR GATEFOLD

INSIDE
→ ELECTRIC PANEL BREAKDOWN → OHM'S LAW → SOLAR AND TURBINE CONNECTIONS → BACKUP GENERATORS → THE SMART GRID



NEUTRAL AND HOT WIRES

Current flows from the panel toward the load along the hot wires and returns along the neutral. Each hot wire's copper tip ultimately connects to its control switch at the circuit breaker, and each neutral connects to a common terminal called a bus bar.

BREAKER SIZES

Main breaker
This is the on/off switch to the entire breaker panel. A 200-amp breaker is appropriate for a home upwards of 2000 square feet. Smaller buildings can use 150-amp or 100-amp; small homes and subpanels can use as little as 50-amp.

Double-pole breaker
Uses the entire 240 volts available to the panel. The 15-amp and 20-amp breakers often handle baseboard heaters, 30-amp serve water heaters and electric dryers, 40- and 50-amp are for electric ranges, and the 70-amp could serve a large air conditioner or a subpanel.

Single-pole breaker
The 15-amp and 20-amp are all-purpose breakers, running everything from lights and outlets to garage-door openers.

15-amp AFI breaker
Arc-fault-circuit-interrupter breakers can prevent fires caused by accidental electrical discharge.

WIRE GAUGE

12-gauge wire
Common for low-demand connections to light switches and outlets, attached to either 15- or 20-amp breakers.

14-gauge wire
Too thin for anything other than 15-amp breakers under small loads.

10-gauge wire
Appropriate for a two-pole 20-amp breaker or a single-pole 30-amp breaker.

8-gauge or 6-gauge wire
Used for 40-, 50- and 60-amp two-pole breakers; large appliances. Also used to serve subpanels.

GROUND WIRES

Grounding prevents a conductor not meant to carry current (such as the metal side of a clothes dryer) from causing injury if it's energized by a frayed hot wire. In a properly grounded system, appliances and metal boxes connect back to the grounding bus of the breaker panel. From there, the system is grounded to the earth via buried ground rods.

STANDARD RESIDENTIAL PANEL
200-amp
30-breaker
240-volt
service

HOW ELECTROCUTION HAPPENS

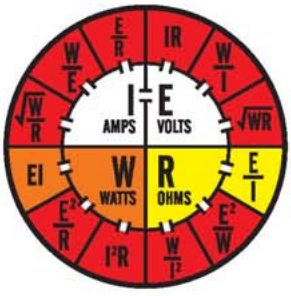
Ventricular fibrillation, the erratic, lethal spasm that occurs as electric current passes through the heart, happens when both of a person's hands touch hot and neutral conductors, causing the current to complete its circuit through the chest. In a ground fault, current can flow into a single hand, zapping the heart as it passes through the body on its way to the ground. When changing live fuses in the old days, electricians worked with one hand while keeping the other in their back pocket—this spared the heart by isolating the current to the nerves of the one hand in the fuse box.

PHOTOGRAPH BY **J MUCKLE**

WHAT IS THE WATT?

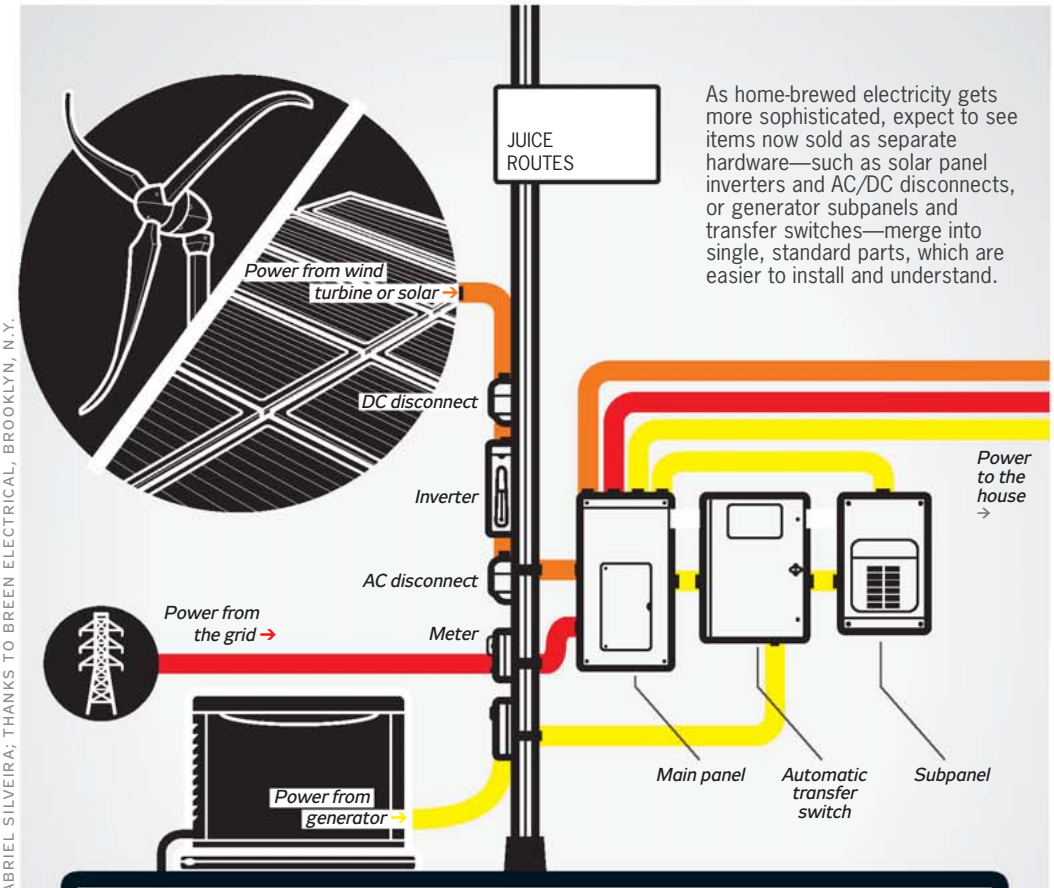
Found in electrical reference books everywhere, the Ohm's law wheel simplifies conversions between watts, volts, ohms and amps. The most important calculation for a consumer is voltage times amperage, which equals wattage—an appliance's power requirements—and the basis of the unit in which electricity is sold.
Watts (W) = voltage (E) x amps (I).

Example: *A 240-volt electric water heater, drawing 18.75 amps current, consumes 4500 watts. (Used for an hour, it consumes 4.5 kilowatt-hours, or kwh.) At a U.S. average of 11 cents/kwh, about 50 cents buys an hour of full-tilt water heating.*



JUICE ROUTES

As home-brewed electricity gets more sophisticated, expect to see items now sold as separate hardware—such as solar panel inverters and AC/DC disconnects, or generator subpanels and transfer switches—merge into single, standard parts, which are easier to install and understand.



Installing a Backup Generator

→ In a power outage, a backup generator provides electricity to designated circuit breakers. Natural gas or propane fuels the generator's engine, which spins an alternator to create a magnetic field that sends current to the home. It's critical that no electricity from the generator back-feeds to the grid—linesmen working to restore power could be electrocuted. An automatic transfer switch isolates the generator's electricity to keep it off the grid until power is restored. Then the generator shuts down and the transfer switch reverses.

Wiring Wind Turbines or Solar Photovoltaics

→ Solar panels and wind turbines feed DC power into an inverter, which converts it to AC for home use. AC and DC disconnect switches allow parts to be isolated for service. These systems constantly back-feed to the grid, but during a blackout—to some grid-tied customers' surprise—their power can't be used. One solution: Store power in a battery backup system. Inverters like Outback Power's Flexpower One cut equipment costs with prewired battery connections and circuit breakers. New micro-inverters convert DC to AC at the panel, eliminating DC wiring runs.

THE SMART GRID IN YOUR BASEMENT

Some benefits consumers could see upon completion of a national smart grid are already available in products like Computerized Electric Systems' Smart Panel. Computer hardware hacked onto a standard breaker panel allows this tool to monitor individual circuits, transfer and balance loads between power sources, or manage power remotely. Simply having more information about each breaker's power consumption can be the start of a more electrically efficient lifestyle—leave the refrigerator's door open, witness the real-time consumption spike, and get motivated.

STUDIO D; ILLUSTRATION BY GABRIEL SILVEIRA; THANKS TO BREEN ELECTRICAL, BROOKLYN, N.Y.

WE WANT YOU

TO TAKE ADVANTAGE OF THE HOME BUYER TAX CREDIT.

NOW EXTENDED AND EXPANDED. Buy a home between now and April 30, and the U.S. government has a substantial incentive for you. Current homeowners can receive a $6,500 tax credit, while first-time buyers are still eligible for an $8,000 credit.*

With the increased number of eligible buyers and the extended deadline, this tax credit is the home-buying opportunity of a lifetime.

For qualification details, work with a REALTOR®, a member of the National Association of REALTORS®. They can explain the process and show you options that best fit your situation. For more information, visit and bookmark **HouseLogic.com/homebuyertaxcredit.**

EVERY MARKET'S DIFFERENT, CALL A REALTOR® TODAY.

NATIONAL ASSOCIATION OF REALTORS®

* Worker, Homeownership & Business Act of 2009. Restrictions may apply, not all home buyers will qualify for the full amount.

©2010 National Association of REALTORS®

Continued from page 98

when using a varnish, look for products labeled Low VOC or No VOC.)

Shellac is a natural or slightly amber clear coating formed from the dried secretion of the lac bug. Sometimes it's called shellac varnish. The material is dried, cleaned, ground up and thinned with alcohol. Durable and fast-drying, it's among the oldest of wood finishes. It can be easily damaged by water, however, including the condensation that comes off a damp glass. Many other types of varnish (including those formulated with polyurethane resins) are far more moisture-resistant than shellac.

Washer Woes

We have a two-year-old dishwasher that up until recently performed very well. Now this $800 appliance is noisy and the dishes come out damp. That's bad, but what's worse is that the dishwasher also gives off a dank odor. We thought the problem might have something to do with our instantaneous gas water heater, which was also giving us problems. We've replaced that, but it's had no effect.

My first guess was that the appliance has a bad heating element, but that wouldn't explain why it's noisy, so I called Chris Hall, president of *repair clinic.com,* a Web-based provider of repair information and replacement parts. "Washers that don't get enough water have the symptoms you describe," Hall says. "They're noisy and have poor wash performance." The solution may be to replace the water inlet valve. "That often solves a host of dishwasher problems," he says.

The valve is activated by a solenoid, a simple electromagnetic gate. When the coil in the solenoid is energized, the valve is open and it admits water. But if there's a break in the solenoid coil or if the valve is plugged with mineral deposits, the dishwasher will perform erratically. Food will be only partially removed from the dishes, and the food particles that are washed off won't be suspended in enough water to be flushed out of the appliance—hence the nasty odor. Finally, low water volume inhibits detergent action, and this can cause water to cling to the dishes rather than sheet off, so the dishes come out damp.

WATER INLET VALVE
To remove the valve, cut power to the washer, slide off the spade connectors attached to its electrical terminals, and undo the plumbing connections. Finally, remove the screws holding the mounting bracket.

Drywell, Good Well?

My yard gets flooded from runoff flowing out of my gutter downspouts. I was thinking of installing two drywells, one at each downspout. A neighbor told me they are illegal. Is a drywell a bad idea? Why would it be illegal?

A drywell can be as simple as a gravel-filled pit or it can be as complex as a perforated concrete vault with dimensions specified by the municipality. In most cases, drywells are legal, but many municipalities do have rules that govern their design and use. Typically, wells can't receive water from anything other than a roof, a foundation drain system or a lawn surface. For example, you can't discharge washing machines or dishwashers into them to reduce the load on a septic system.

By the way, if you're like me, you probably wonder if there isn't a better name for these structures. Maybe yard drain or some other descriptor is more apt, since all a drywell does is act as a subsurface basin that holds water until it can percolate into the ground.

In general, it's best to keep drywells as far from the foundation as possible to prevent water from migrating into the basement or crawlspace. A 10-foot minimum is a good rule of thumb. Also, it's a good idea to line the well with geotextile filter fabric to prevent fine soil particles from clogging it. Once clogged, it won't discharge water into the soil. Finally, check with your municipality whether it's necessary to pull a permit for this.

Radiant Barriers Worth It?

What is your opinion of foil-faced radiant barriers? I wonder if it's worth installing one in my attic. I live in Texas, and you would think that it makes sense in a hot and sunny climate like this one.

Yes, a radiant barrier can reduce heat transfer from the attic to the room below if the attic is poorly insulated. It may cut energy costs from 5 to 12 percent by bouncing as much as 95 percent of the heat out of the attic and into the atmosphere outside. A number of studies, including some performed by the Florida Solar Energy Center, have shown the benefit of these barriers when the attic is insulated to a level of R-19 or less. Their benefit declines the more the attic is insulated and is essentially nonexistent when the attic is insulated to R-30 or above. **PM**

Got a home-maintenance or repair problem? Ask **Roy** about it. Send your questions to ***pmhomeclinic@hearst.com*** or to Homeowners Clinic, Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. While we cannot answer questions individually, problems of general interest will be discussed in the column.

Brought to you by the
NATIONAL ASSOCIATION OF REALTORS®

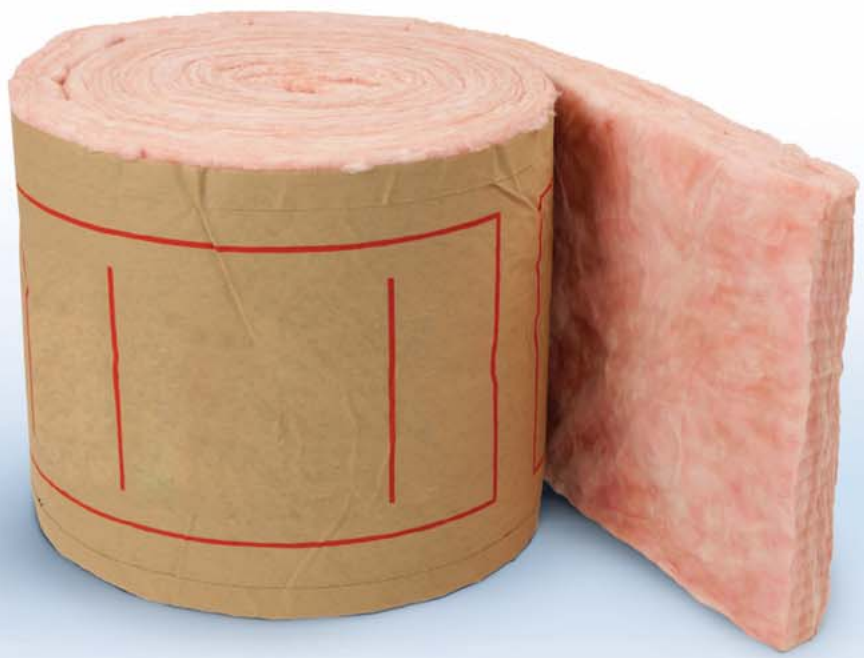
RAISE YOUR HOMEOWNER IQ.

Go to HouseLogic.com for smart ways to manage, maintain and enhance your home.

HouseLogic provides free info and tools to help you become an expert homeowner in areas like home improvement, maintenance, taxes, finance and insurance. Learn how to protect and increase the value of your home by becoming a more confident homeowner.

houselogic

www.houselogic.com



smart tip **TAX CREDIT FOR ADDING OR REPLACING INSULATION**

The $1500 tax credit can be applied toward 30% of the cost of new insulation.

Introducing the next generation of compact angle grinders.

By now, you've probably heard the buzz about FEIN compact angle grinders. After all, they're robust, reliable and built to last. And now there's even more reason to be fired up. Meet the new **FEIN WS 14 series angle grinders** – a new line of angle grinders including a switchless option. It can come equipped with a special safety package, including **TipStart** function with **AutoStop**. If you're more accustomed to traditional grinders, the **WS 14 series** can also come equipped with the sliding lock system. Plus, it's smaller, easier to handle and generates less vibration.

To order your FEIN WS 14 angle grinder or to receive more information, call 1-877-771-0088 or log on to

www.feingrinders.com

fein

diy

Auto

Saturday Mechanic

degree of difficulty | MODERATE

Saggy-Door Blues

REPLACING WORN-OUT DOOR-HINGE BUSHINGS IS QUICK, INEXPENSIVE—AND WILL MAKE YOUR DOOR SHUT LIKE NEW. *BY MIKE ALLEN*

Late, late, late for work. The clock is ticking, so you sprint from the parking lot to the office building at top speed—and hope you don't lose your shoes. You take one last glance across the lot to check on your car, and see that your driver's door is open. Rats. You double-time to the car and slam the door—which simply bounces back open. A second attempt, mightier than the first, only bounces it back further, right into your knee. Ouch. You

Sagging door hinges can often be rebushed in less than 10 minutes for under 10 bucks.

INSIDE ✖ HINGES + ZERK FITTINGS + WORN BELTS

PHOTOGRAPH BY **DENNIS KLEIMAN**

try a kinder, gentler slam, and realize the end of the door has sagged a good inch from its original position. The only way to close the door is to use both hands on the handle (chipping a fingernail) and lift the 75-pound door up until the latch matches the height of the door striker, and then bump it with your hip to click it shut. What a pain. Guess what? Your door hinges are worn out.

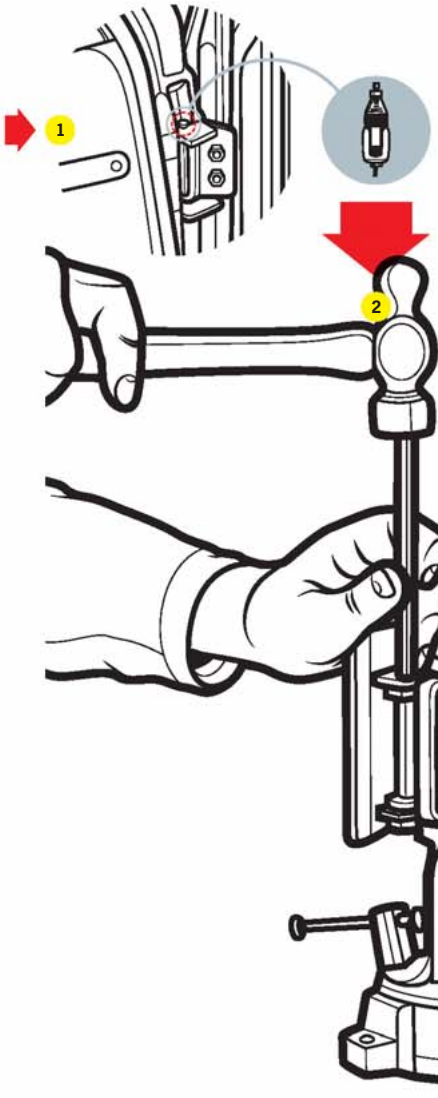
How Much?

A mechanic, supposedly a good, honest one, had told the driver of this '90s Jeep Grand Cherokee that the door hinges needed to be replaced, and that Jeep didn't make the parts anymore. Used hinges were ordered from a salvage yard, and the bill was estimated to come in at $400 to $500.

We'll give the mechanic some credit (his expertise is in engines, brakes and suspensions, not bodywork) for being honest in his estimate. But we knew better. Cutting out the old hinges and welding in new ones would probably cost about that much, but it wasn't necessary. Why spend a couple of days replacing the hinge when all that's worn out are some simple bushings? A trip to the NAPA auto parts store and a few minutes of browsing the catalogs turned up a Dorman part number specific to our Jeep. And plenty of other vehicles were listed, all the domestics and Asian and European cars as well.

In fact, the dimensions—the inside and outside diameter of the bushings, the pin diameter and the overall length—are listed in the catalog. If there isn't a kit, a clever Saturday Mechanic could probably mix and match enough parts to fix darned near any door. A minute's worth of detective work proved that the pin on our Jeep was 0.372 inches, nominally ⅜ of an inch. And the outer diameter of the bushings was 0.503 inches, a nice press-fit for a half-inch hole. Yours will be similar but probably not the same.

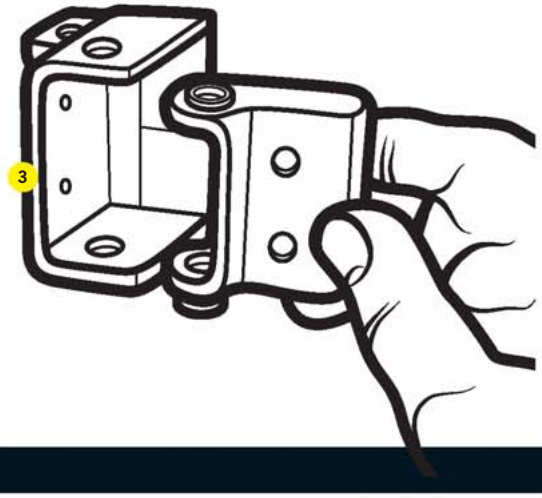
START



1. Got the door-hinge repair kit in hand, and a jack or a faithful minion to support the door for a few minutes? The only real hard part of this procedure is removing the old pin, which has probably been peened over to keep it from coming out. We tried a grinder, a cold chisel and a file on the hardened pin, and ultimately used a carbide burr on a die grinder to remove the pin's lip. You could use a cutoff wheel on a Dremel tool to cut the pin in half, as well. Wear eye protection.

2. Then we simply tapped the pin out with a punch, although here we show you how to do it on a hinge removed from a wrecked car.

3. Once the pin is loose you can unbolt the inner hinge half from the car's A-pillar and remove it to the workbench.



ILLUSTRATIONS BY **GABRIEL SILVEIRA**

✓Yes

✓Yes

✓Yes

xNo

✓Yes

✓Yes

✓Yes

✓Yes

✓Yes

✓ Everyday Low Prices
✓ Easy To Use Website
✓ Huge Selection
✓ Fast Shipping

ROCKAUTO.COM

ALL THE PARTS YOUR CAR WILL EVER NEED

GO TO WWW.ROCKAUTO.COM ROCKAUTO, LLC (EST. 1999) BBB ACCREDITED BUSINESS

Lipped Oilite bronze bushings are available at industrial supply houses in a dizzying array of sizes. A pair of these and a length of bar stock would let you make almost any car door fit.

We didn't need to go to those lengths. We found a $6.95 kit for this truck at the auto parts store—although we did have to order it. We walked into the store at 8:45 am and had the part in our hand right after lunch. Nice.

Lift and Separate

We pulled the truck into the shop, and lifted the open door up slightly with a floor jack to unweight the hinge. No floor jack? A stack of 2 x 4 scraps or a scissors jack will do. Even a patient assistant who doesn't mind reverse-curling a car door for 10 minutes or so will do. Don't let the door hang by only one hinge, lest the remaining hinge bend.

Some OEM door-hinge pins are retained by E-rings or cotter pins, making their removal trivial. Just pop out the cotter or E-ring, and push the hinge pin out. Ours was swaged into place, requiring us to grind the head of the old pin down. If you plan on rebushing a lot of doors, there are special tools to press the pins out. Regardless, you'll need to remove the pin somehow.

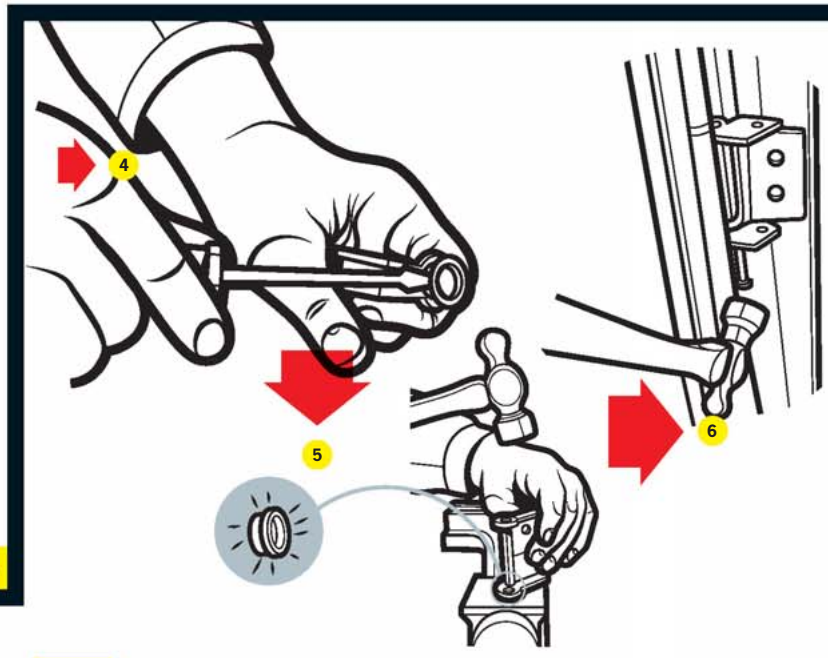
With the pins tapped out, it's a simple task to remove the inner hinge by unscrewing the bolts that hold it to the A-pillar. Press or tap the new bushings into the removed hinge half. Installation is the reverse of this procedure. With a friend or a jack holding the door so all the holes line up, tap the pin into place. Odds are the pin is tapered slightly to help get it started. Lightly tighten the hinge bolts.

Our Jeep's pin had to be tapped in from the bottom, to clear the door sheet metal. Although the head of the pin was knurled to hold it into its gravity-defying place, we elected for a more positive retention system; we just tacked it with a MIG welder.

Now close the door. It should line up properly with the fender or door, front and rear. If not, loosen the bolts slightly, and reposition the inner hinge half to make it fit properly. Tighten the bolts.

Belt and Suspenders

To repair that top hinge, we invested a total of about 10 minutes. Surprisingly, the lower hinge bushings were very lightly worn, so we left them alone. If you need to tighten up the lower hinge, finish the top hinge first, and align the door. Then tackle the lower hinge. There are two reasons for this: First off, there are probably a bunch of wires that run into the door to run power windows and locks, and you don't want to have to hold the door still enough to keep from tearing them free as both hinges are disconnected. Secondly, realigning the door will be much simpler one hinge at a time. **PM**



4. Pry the worn-out bushings from the hinge half. The worn OEM bushings were made of brass cloth wrapped with some sort of fiber, and had worn until there was metal-to-metal contact, allowing the door to droop nearly an inch.

5. The replacement bushings are made of oil-impregnated bronze, and promise to outlast the originals—although we can't really complain about the service life of door-hinge bushings that have seen 145,000 miles of service in heavy urban driving with lots of door-opening activity. We simply tapped the new bushings into place lightly with a hammer. The lip on the new bushings goes where the lip on the old bushings was, at the top and bottom of the hinge arms.

6. Now you can install the hinge back to the A-pillar with the bolts finger-tight. With a little help, line up the holes and tap the new hinge pin into place. The pin on our Jeep had to come in from the bottom because the door sheet metal was in the way.

END

Pick One. Just One.

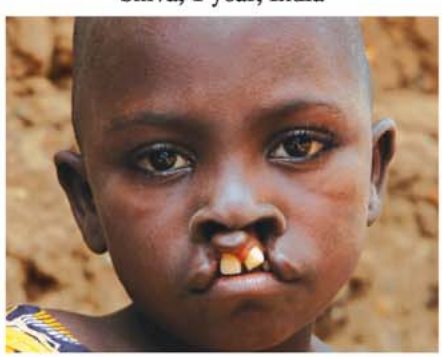
Save Their Life For $250. You'll End Up Smiling Too.

Ming, 6 months, China

Shiva, 1 year, India

Mot, 13 years, Cambodia

Durgap, 5 years, India



Funmi, 8 years, Nigeria

Salazar, 5years, Philippines

Smile Train provides life changing free cleft surgery which takes as little as 45 minutes and costs as little as $250.

It gives desperate children not just a new smile—but a new life.

"...one of the most productive charities—dollar for deed—in the world."
—*The New York Times*

Help children with clefts and other problems.

❒ $250 Surgery. ❒ $125 Half surgery. ❒ $50 Medications. ❒ $ _____

Mr./Mrs./Ms. _____ Zip _____

Address _____ City _____ State _____

Telephone _____ eMail _____

Credit Card # _____ Expires _____

❒Visa ❒MasterCard ❒AMEX ❒Discover Signature _____

❒ My check is enclosed. Z10041053ZFNY23

Smile Train, P.O. Box 96211, Washington, DC 20090-6211

Donate online: www.smiletrain.org or call: 1-800-932-9541

SmileTrain
Changing The World One Smile At A Time.

A Healthy Diet During Pregnancy Can Help Prevent Birth Defects And Clefts. Diet is an important part of pregnancy. Eat a healthy diet that contains lots of fruits and vegetables and foods fortified with folic acid. According to the U.S. Government, women who plan to have a child should be sure to take sufficient levels of folic acid (400 micrograms per day) during pregnancy to help prevent neural tube defects and reduce the risk for cleft lip and palate. When folic acid is taken one month before conception and throughout the first trimester, it has been proven to reduce the risk for neural tube defects by 50 to 70 per cent. Be sure to receive proper prenatal care, quit smoking, and follow your health care provider's guidelines for foods to avoid during pregnancy. Foods to avoid may include raw or undercooked seafood, beef, pork or poultry; delicatessen meats; fish that contain high levels of mercury; smoked seafood; fish exposed to industrial pollutants; raw shellfish or eggs; soft cheeses; unpasteurized milk; pâté; caffeine; alcohol; and unwashed vegetables. For more information, visit **www.SmileTrain.org**. The Smile Train is a 501 (c)(3) nonprofit recognized by the IRS, and all donations to The Smile Train are tax-deductible in accordance with IRS regulations. © 2010 The Smile Train.

Car Clinic

by Mike Allen

Q+A

Many OEM tie-rod ends and ball joints can be drilled and tapped to install a grease fitting, which should double their life span.

Sealed for Life

Q I read in one of your old columns that it's possible to add a grease fitting to the destined-for-failure "sealed" ball joints on new cars. How can I do this?

A This is one of my favorite complaints about new cars. Specifically, that manufacturers exclude a 10 cent zerk fitting on the ball joints and steering tie-rod ends of their vehicles. That way, when the grease dries out in a couple of years, the joint quickly wears out, and you have to replace the part. Pumping in a nickel's worth of grease twice a year would save hundreds of dollars of parts and labor when they fail prematurely.

So, I just thumb my nose at planned obsolescence and add the fittings. (Surprisingly, virtually all replacement fittings—even the ones made by the OEM suppliers as exact replacements—have the proper grease fitting in the box when you buy them at the parts store. Go figure.) It's easy to do:

Start by drilling a 3/16-inch hole in the sheet-metal cap on the bottom of the joint. Odds are you can do this without removing the part from the car, although for some tie-rod ends, you might need to unhook them to get clearance for the drill to run in straight. Coat the drill with grease and go slowly at the end to capture most of the chips. Now use a small pipe tap that matches your fitting to thread the hole. Again, pack the flutes on the tap with grease to catch most of the chips.

Now you can just thread in the fitting. Be aware there are several styles of zerk fittings. You may need a straight, 45- or 90-degree zerk to allow the grease gun to hook onto the end of the fitting. Don't forget the little rubber cap to keep the end of the fitting clean. Now all you have to do is pump some grease into the fitting every 6 months or so. Add grease until the boot is turgid, and grease is leaking out of the seams. Your front suspension will thank you.

Fore!

I have a 48-volt electric golf cart with dead batteries. Can I replace the eight 6-volt batteries with four 12-volt deep-cycle marine batteries?

Short answer: Yes. As you've probably figured, it'll be a lot cheaper. Long answer: You might not want to.

Okay, you might need to make some minor changes to the wiring harness. And don't forget to tie the new batteries down so they can't bounce, both as a matter of

PHOTOGRAPH BY **JASON HAMILTON**

PM MARKETPLACE

LAM-HAMMER JR
Quick & Easy Floor Tool

$55 Includes Shipping
Use Promo Code P10

Makes Installing Laminate Floors a Breeze!

Designed Specifically for the "Do it yourselfers"
Eliminates product, wall & Cabinet damage

www.lam-hammer.com
888.687.2421

DETER BURGLARS

A **FakeTV** recreates the light of a real television. So while you are away, the burglar thinks you are home watching TV. **FakeTV** says "alive" in a way that a light on a timer never could!

$34.99 Plus just $5 to ship
Order Today: FakeTV.com
Toll Free: 1-888-621-5800

Built in light sensor and timer
Consumes just the power of a night light

Safely Motorize Your Bicycle!

Turn your ordinary bicycle into a 2 or 4 stroke gas powered scooter with our universal, easy to install bicycle engine conversion kits.

Bicycle-Engines.com
The Bicycle Engine Conversion Specialists!
1-800-514-8435
www.bicycle-engines.com

To advertise in the PM Marketplace
contact Beth Boyle at (914) 461-3269
or beth@specialaditions.com

GRIP PRO TRAINER

Few people appreciate how important grip strength is. It affects your performance in sports or just opening a jar. **Grip Pro Trainer** very effectively increases finger-hand-forearm strength. It has a natural feel in your hand and is easy to use almost anytime/anywhere. It eliminates the uneven workout of spring exercisers and is for more dynamic than grip balls. Available in 3 levels of difficulty: 30lb,40lb or 50lb of resistance. $7.95 or try all 3 for $19.95.

www.gripprotrainer.com
1-866-574-GRIP
DEALER INQUIRIES INVITED

DR. COLORCHIP
AUTOMOTIVE PAINT CHIP REPAIR SYSTEMS

Can Your Touch-Up Paint Do This?

Fast, Simple, Dramatic, Paint Chip Repair
...with NO PAINT BLOBS

Rated #1 by *The Wall St. Journal* among retail paint repair products

* All Factory Match Colors
* Permanent Repairs
* No Clear Coat Needed
* The Cure for Road Rash

*3 sizes: $39 * $49 * $59*

Drcolorchip.com
(866) 372-2548

Order Your Factory Color Kit Today!

Exciting Business Opportunity Installing Landscape Curbing!

Attractive & Practical Decorative Edging
High Profits • Flexible Hours • Huge Demand

FREE Info & DVD
Go to www.TygarMFG.com
1-888-EZ-TYGAR

TYGAR's Curbing Equipment & Turnkey Systems come with Training & Support!
Need Curbing? Go to CurbingLocator.ORG

THINK OF IT AS A FULL-SIZE VAC THAT FITS IN YOUR HAND!

The all-new Metropolitan® 500 with its incredibly powerful 500-Watt motor makes deep cleaning the interior of any car or truck super fast and easy. It features a rugged steel body with elegant stainless finish, yet weighs less than 3 lbs! Includes all attachments. Made in USA.

www.cardryer.com • 1-800-822-1602

When Put To The Test Maxfilm Outperforms Leading Spray Lubes

Maxfilm outlasts and provides superior protection compared to conventional spray lubes. Visit www.protectparts.com to view recent footage of an independent test comparing Maxfilm to four leading brands.

Maxfilm is available at quality retailers nationwide including:

O'Reilly AUTO PARTS

For a free catalog on Royal Purple products call 866-438-4835.

ROYAL PURPLE SYNTHETIC OIL

safety and to keep the vibrations from cracking the batteries' internal plates.

Those four marine batteries you want to use have substantially less energy capacity than the eight 6-volters you're replacing, unless the 6-volters are pretty small. While batteries vary, overall weight is a pretty good predictor of the energy-storage capacity of a flooded-cell deep-cycle battery. If the capacity of the new battery pack is less, you'll be drawing a lot more current, relatively speaking. And the battery discharge rate isn't linear. Drawing 50 percent more current could reduce the battery capacity by an amount substantially more than 50 percent. Halving the size of the battery pack could reduce your range to only a quarter of the original pack's range. The smaller battery pack will sulfate and fail more rapidly as well, because you'll be asking them to deliver more than they're "comfortable" with.

A better alternative would be six 8-volt floor-polisher batteries. Unfortunately, that swap won't be cheap either. Look around for used or even refurbished floor-polisher batteries—you might get lucky.

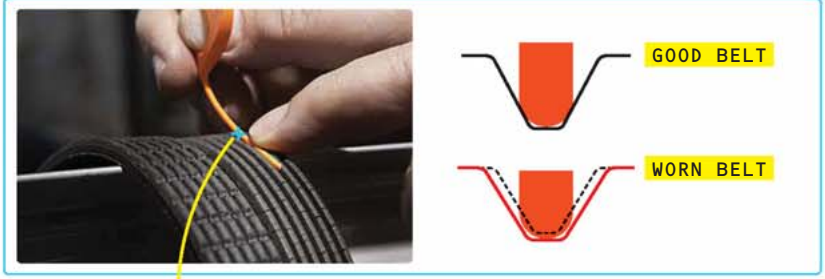
Drinking Games

The gasoline I use contains approximately 10 percent methanol. Is it necessary to add isopropyl-alcohol fuel-line drier to the fuel to remove condensed water from the fuel tank?

First off, I sincerely doubt your gasoline contains any methanol. And virtually all of the car manufacturers prohibit the use of more than 5 percent methanol in their

YOU NEED THIS

Tighten Your Belt



Poly-V belts seem to last a lot longer than the old-fashioned V-belt ever did. It's not unusual for a belt that uses a spring-loaded automatic tensioner to last 100,000 miles or longer. But like any moving part, these belts eventually wear out too. It's easy to see some of the signs of imminent failure, like weather-checked rubber or the dangling strings of the reinforcing fabric whipping around. These both mean it's time to hang a new belt.

Those are catastrophic failures. Normal wear is more insidious. The failure mode here is that the rubber lining the grooves is wearing out, a bigger problem for vehicles that run in dusty or sandy environments. A belt can be so worn that it starts to slip, just a little, before the reinforcing cord shows or the rubber starts to look like alligator shoes. But how worn is worn out?

Gates Rubber manufactures most of the replacement belts in the U.S. market. They've got a clever gauge that will tell you when a belt has exceeded its wear limit. Slide the gauge into a groove in the belt and run your finger over the groove. If you can feel the gauge standing proud in the ribs, fine. If not, time for replacement. You can get a gauge from Gates for free at *gatesrubber.com*. And do I need to remind you to do this with the engine off?

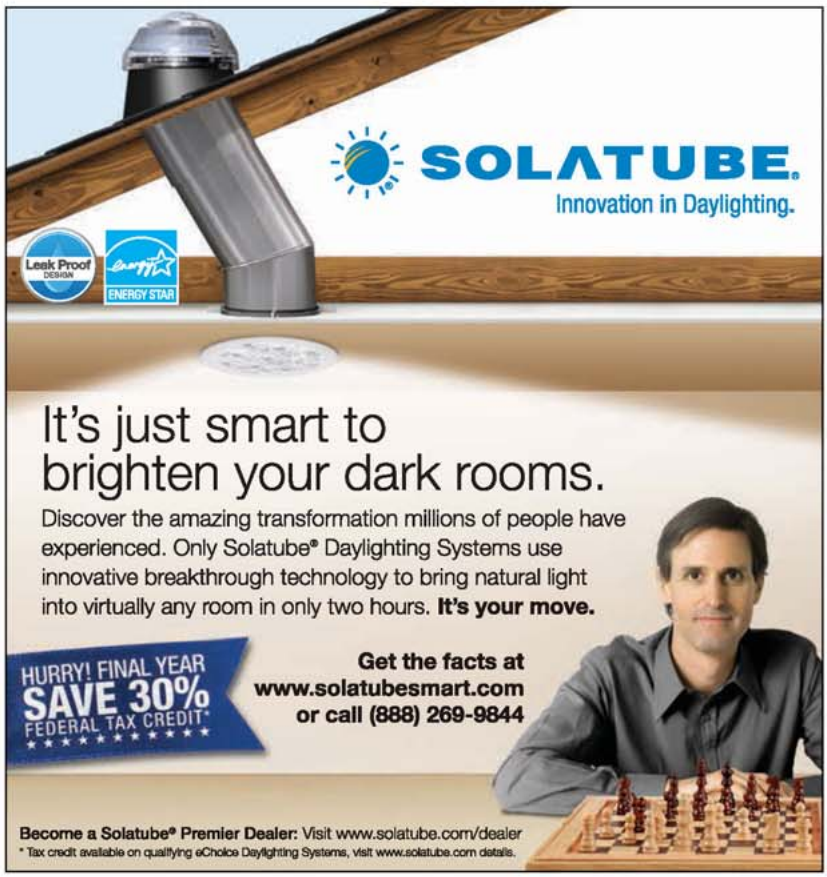
vehicles. It's highly corrosive, and the fuel system needs to be specially hardened to use it successfully. Sure, there were a bunch of M85-capable flex-fuel vehicles on the market back in the '90s, but I doubt many of them are still on the road. And I'm not aware of any methanol-blended gasoline currently available in the U.S.

So you are probably mistaken: Much of the commercially available pump gas in the U.S. has ethanol blended in as an oxygenate, to lower emissions. Regionally and seasonally, it can be as much as 10 percent, and most cars run fine on it.

Consequently, the need for fuel-line driers like isopropyl alcohol is much reduced. Alcohol, whether it's ethanol, isopropanol or methanol will absorb a certain amount of water and hold it in solution. A few percent of water will then simply be carried into the engine, where it flashes into steam harmlessly in the combustion chamber. However, there's a point where even 10 percent ethanol can't trap all the water. Add a few drops more to a mixture of water, alcohol and gasoline that's near its saturation point, and a phenomenon called phase separation occurs. All of the water and alcohol drop out of solution, leaving a cloudy layer under the gasoline. Neither the gasoline nor the water–alcohol mix underneath it will burn, so your only recourse is to drain the tank and start over.

Trailing Along

I read your answer in the December issue about flasher relays with much interest. I've been able to make trailer-light loads a nonissue by replacing the trailer's tungsten filament bulbs with LED light bulbs. The load is so negligible that tow-vehicle electrical systems don't even know they are there. That said, these bulbs are all axial: They shine only straight out of the tip of the bulb. They work well when they point straight backwards, and can hardly be seen at all if the bulb is mounted sideways like they are in some taillights. As a benefit, the trailer brake lights come on a tenth of a second faster



than the standard bulbs. Some of us have replaced brake lights with LEDs for just this reason.

Point well taken about LED trailer bulbs—these bulbs draw so little current compared to conventional incandescent bulbs that the flasher doesn't care, and flash rate is unaffected instead of looking like a Vegas marquee. When you're towing a trailer with a bunch of different cars or trucks and don't want to swap out flashers all the time, using LED bulbs makes things a lot less complicated. Switching to LEDs is even more compelling when you have a vehicle that uses an integrated flasher module that controls a lot of other functions and that isn't amenable to a simple replacement with a 10-dollar heavy-duty flasher relay.

I don't know where you're sourcing your LED bulbs, but I've found some that have a different light pattern. You can get them designed to shine straight back from the socket, or at right angles for light fixtures that have vertically mounted sockets. There are even omnidirectional bulbs that work great in trailers or motorcycles that need to be seen from the side as well as from behind.

Also, the time difference between an LED and an incandescent bulb's illumination is more like 400 to 500 milliseconds, not just a tenth. Do the math: When you slam on your brakes at 60 mph, that's 35 to 44 feet more warning for the driver behind you.

Not So Fast

Was your advice on recharging a dead battery in the December issue completely wrong? After mulling it over for a while, it sure seems so. Let me count the ways:

1. A special-purpose charger is unnecessary since the alternator's primary function is to charge the battery. The car runs off the battery so the alternator is not necessary. I've driven home without one.

Bosch and ACDelco both suggest it's better to charge a dead battery offline. The alternator's primary function is *not* to charge the battery, it's to provide electrical energy to run all of the vehicle's systems. Battery charging occurs when there is excess power after running all the accessories.

2. I would never hook up a dead battery to a donor car without the engine running. You risk having two dead batteries.

The electrical surge when you hook up two cars for jump-starting can damage things like stereos and onboard computers. Better to keep both cars shut off to isolate the electrical systems, then start the donor car after a few minutes. It would take hours to deplete the donor car's battery enough to keep it from starting, unless the donor car's battery is almost dead already.

3. I looked at an alternator, and I don't see where there is room for a cooling fan. Why would a spinning device need one? And I don't see why driving at freeway speeds would be superior to idling.

The fan is internal, blowing cool air over the regulator and diodes. An alternator will generate only a small portion of its rated output at idle. The regulator and diodes actually run much cooler at high rpm and high current output (like driving at freeway speeds) than at idle rpm and low current output (like attempting to charge a dead battery by idling a car in the driveway).

4. I agree with you Mike, car batteries are not designed for deep discharging. But a one-time discharge will most likely have negligible effect. After all, there are lead-acid batteries designed for deep discharging—they simply have thicker plates.

It's well-documented in the battery industry that even a single instance of deep discharging (below 6 to 7 volts open-circuit) will start the process of sulfating, reducing the battery's cranking amps, energy-storage capacity and life span. The differences between a conventional starter battery and a deep-cycle are far more profound than the thickness of the plates. The lead alloy is different, for one thing.

Hot Windshield

I have a 2003 Dodge Ram 1500 with a 5.9-liter V8. No matter where I put the selector switch to direct heat or cool air, it only comes out of the defroster vents. Is this vacuum-driven or is there an electrical switch gone bad that controls where the air goes?

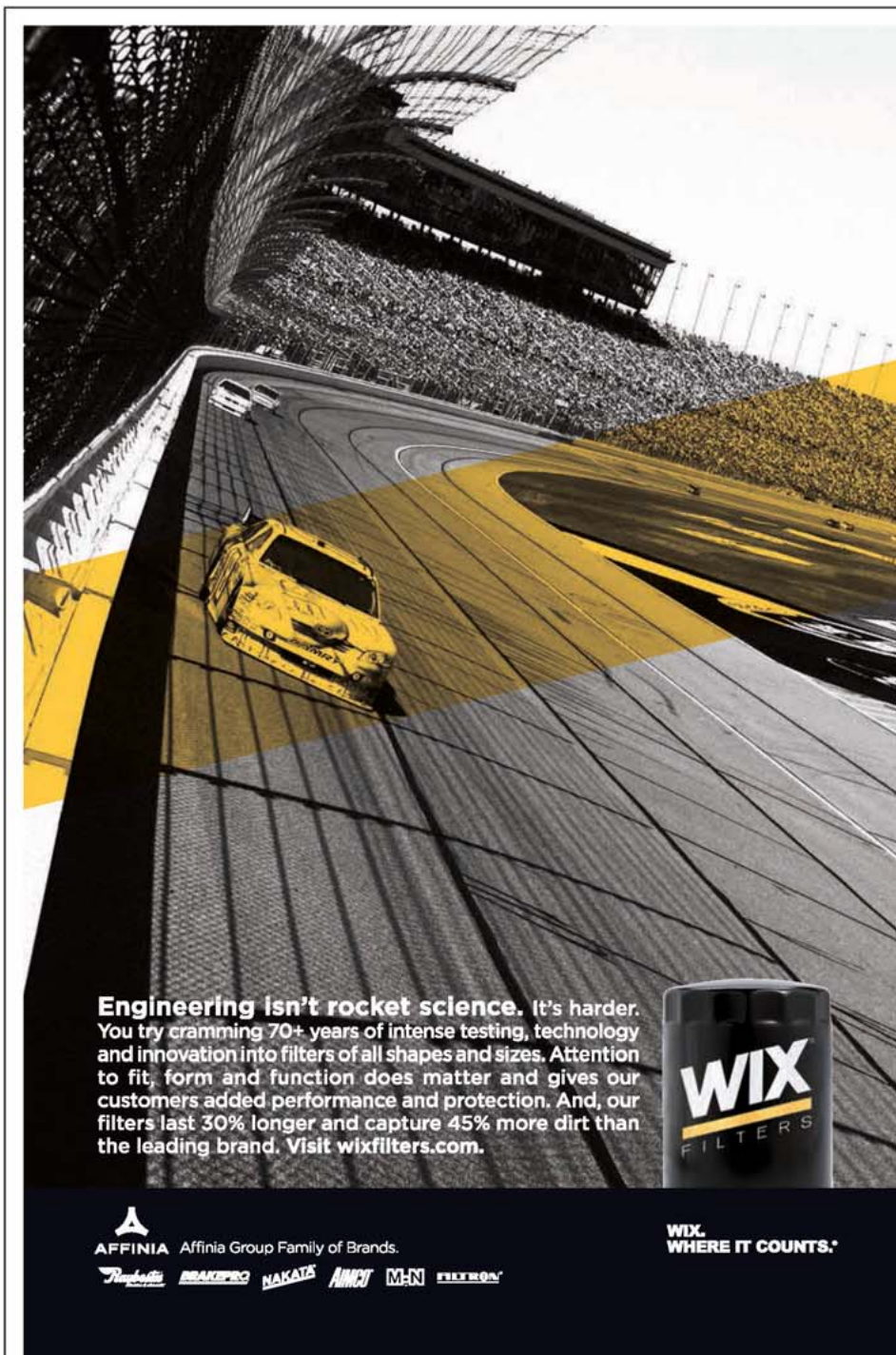
Your pickup, unlike many vehicles, uses electrical actuators rather than vacuum motors to control the mode doors in the HVAC plenum. You may have a problem as simple as an electrical connector that's dislodged or a rod that's fallen off a bellcrank on the mode door. If the rest of the HVAC controls are working, that limits your problem to one small area, so it should be easy to weasel out.

Got a car problem?
Ask **Mike** about it. Send your questions to ***pmautoclinic@hearst.com*** or to Car Clinic, Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. While we cannot answer questions individually, problems of general interest will be discussed in the column.

Struttin'

I have a 2003 Honda Element and I want to replace the rear struts. The lower mounting bolt has rusted itself to the sleeve that goes through the rubber bushing. I tried using penetrating oil, but there's no way any type of oil is going to soak all the way through that whole sleeve. I took the vehicle to my local dealer and they couldn't get the bolt out either. They said the procedure would require cutting out the shocks. So my question is this, is there any reasonable alternative to what the dealer is proposing?

Yeah, that lower bolt on almost any shock can be tough. I've resorted to using everything from a Sawzall to an acetylene torch to get these things apart. But I've never needed to cut the mount off the control arm. My usual procedure is to grind off the head (assuming you've got the nut off) and the part of the bolt sticking out. Then, if you bend the lower U-shaped mount apart just a little, you can pry the whole mess out. The mount will bend right back when you tighten down the new shock. **PM**



WeatherTech®
Automotive Accessories

FloorLiner™ is made from a Sturdy High-Density Tri-Extruded Material, and is Laser Measured to Perfectly Fit Your Vehicle! Available for Popular Cars, Trucks, SUVs and Minivans in Black, Tan or Gray.

Side Window Deflectors for Virtually Any Car, Pickup, SUV or Minivan! No Exterior Tape Needed. Also Available in Dark Tint.

Cargo-Trunk Liner Computer Designed Protection for Cars, SUVs and Minivans. Available in Black, Tan or Gray.

All-Weather Floor Mats for Virtually Any Car, Pickup, SUV or Minivan! Available in Black, Tan or Gray.

See and Order Everything at
WeatherTech.com
800-441-6287

MacNeil AUTOMOTIVE PRODUCTS LIMITED
Specialists in Original Equipment and Aftermarket Automotive Accessories

2435 Wisconsin Street
Downers Grove, IL 60515
630-769-1500 • fax 630-769-0300

Canada Customers;
www.weathertech.ca

©2009 MacNeil Automotive Products Limited

DECK & PATIO OWNERS!

SunPorch®
SUNROOM / SCREENROOM
Warm In Winter & Cool In Summer With...Zero Energy Cost!

Mounts on your deck or patio with...No site prep! No permits & No taxes!*

- Turn your deck or patio into a beautiful outdoor room!
- Goes from sunroom to breezy screenroom... in just seconds!
- Easy-Slide floor-to-ceiling windows with screens!
- A complete, easy-to-assemble kit, comes with roof, walls, windows, screens & door.

*Varies by locale.

FREE! Catalog & Prices

Get FREE catalog and prices at:
www.sun-porch.com
Savings Code: **2630**
or call: **203-557-2630**
SunPorch Dept. 2630, 495 Post Road East, Westport, CT 06880

diy

Tech

Fighting Cable Chaos

IT IS ONE OF THE NATURAL LAWS OF TECHNOLOGY—CABLES TEND TOWARD A STATE OF DISORDER. HERE'S HOW TO GET YOUR WIRES TO BEHAVE. *BY ANTHONY VERDUCCI*

Braided Sleeving
$14 to $30 (depending on length)
This stretchy mesh can expand its diameter by 150 percent. The more expensive stuff wraps around wires, no threading required.

The completely wireless computer, like the paperless society, is a utopian fiction of the technological world. Look behind any desk and you'll likely see a rat's nest of power and data cables for USB-connected drives, printers, multiple screens, keyboards, webcams, mice, digital cameras, camcorders, iPods, cellular phones and—oh, the irony—wireless routers. And the mess of connections is by no means limited to computing devices. Audiovisual gear is just as bad, if not worse. A TV, receiver, disc player, gaming system and constellation of speakers can require such a spaghetti bowl of wires that just determining what is connected to what can take 20 minutes of troubleshooting.

So what's wrong with messy

INSIDE × XBOX BLACKLIST + iTUNES EQUALIZATION + MAC VIRTUALIZATION

STUDIO D

PHOTOGRAPHS BY **J MUCKLE**

THE GOODS

GREAT PRODUCTS AND PROMOTIONAL OFFERS FROM PM ADVERTISERS

GEOBULB® PREMIUM QUALITY HIGH BRIGHTNESS LED LIGHTS THAT LAST

An LED light bulb designed to replace standard 60-watt incandescent bulbs. The **GeoBulb®-3** is built with components that are rated to outlast the LEDs. A super energy-saving LED light bulb that consumes a mere 7 watts, has a minimum 50,000 hour life expectancy and comes with a 5-year warranty. Best use is in ceiling fans and track lighting.

GeoBulb LED Lighting by C.CRANE

Visit **www.GeoBulb.com** for more information.

LAM-HAMMER

Developed specifically for installing interlocking laminate and engineered wood in tight places, the **Lam-Hammer** eliminates damaged drywall and toe-kicks. It requires minimum strength and provides maximum protection against damage to walls or floor surface. New: the Lam-Hammer Jr, designed for the non-professional – smaller and lighter for laminates only.

Visit **www.lam-hammer.com** or call 888-687-2421 for more information.

A WRENCH FOR EVERY JOB™

Since 1941 **Liquid Wrench®** has been making premium lubricating, penetrating and protecting products for those who know that their choice of tools can make all the difference. For people who don't just do things, they do them right.

Liquid WRENCH

Visit **www.liquidwrench.com** for more information.

IF YOUR PASSION LASTS LONGER THAN 4 HOURS...CALL YOUR DOCTOR

If you want to melt her heart, forget subtlety. Go for fireworks. Our **Polished Ruby Necklace** features a whopping 350 carats of smooth-tumbled, genuine rubies. The Polished Ruby Necklace is a grand gesture guaranteed to make her swoon.

Stauer Polished Ruby Necklace
350 ctw—Your price only $145 +s&p
Call now. 1-888-324-1969
Promotional Code RKN163-01
Please mention this code when you call.

Stauer

Visit **www.stauer.com** for more information.

zMAX MICRO-LUBRICANT®

zMAX Micro-lubricant® helps keep your engine's combustion chambers at their peak performance. An application of 12 oz in the crankcase (best after an oil change) and 12 oz into the fuel system (tank should have a minimum of 5-gallons when installed) can help improve mileage by its primary characteristic of soaking into metal thereby dispersing carbon around the piston rings and around the valves, creating a more powerful engine that requires less gas to run.

ZMAX Performance You Can FEEL!

Visit **www.zmax.com** to locate a dealer near you.

ADVERTISEMENT

VOL. CLVIII....No. 35 Natural Science News "For Your Health"

Life is short...or maybe not.

Top Harvard researcher says it's "the Holy Grail of aging research."*

...as seen on CBS "60 Minutes"

Don't wait for the drug companies to drive the price through the roof; get the benefits of this breakthrough *natural* extract for pennies a day!

BOSTON, MA—Leading medical scientists are learning that resveratrol, a natural substance found in red wine, is rewriting the rules on the science of aging.

Researchers at the **Harvard Medical School** and the **National Institute on Aging** already discovered that the red wine extract offset the negative effects of a high-calorie diet in mice and significantly extends their life span (*NY Times*, Nov 2, 2006). Now, the latest research indicates that resveratrol may been even more powerful than first anticipated.

At this moment, drug companies are rushing to create prescription drugs that mimic the awesome health benefits of this simple natural extract. A leading pharmaceutical company has already spent $760,000,000 on purchasing the research and development.

The powerful secret of tomorrow's anti-aging pill can be yours today.

You may have thought that an anti-aging pill would only be available far into the future. But the effects of resveratrol have been proven as scientific fact... today. Even better, resveratrol is a naturally-occurring substance found in the skin of grapes and red wine, not manufactured in some laboratory. The key to living longer may be found inside your favorite bottle of red wine.

But don't try to drink yourself healthy, because it would take **50 bottles a day**! Now there is a way to take resveratrol without the alcohol, calories and high cost. Vinotrol®, with 50mg of resveratrol derived from grapes and roots, provides the equivalent of the resveratrol in **278 five ounce glasses of Pinot Noir.**

"We have something (resveratrol) that **extends the life of every species** it's (been) given to. We're 50 years ahead of where I'd thought we would be 10 years ago," said a leading professor of pathology at Harvard Medical School, reported by the *NY Times.*

Such a potent concentrate delivers all of resveratrol's remarkable benefits, promoting circulation, blood flow, immune system, energy and healthy arteries.

Has the "The French Paradox" finally been explained?

Resveratrol is conjectured to be a partial explanation for "The French Paradox," the puzzling fact that people in France enjoy a high-fat diet yet suffer less heart disease than Americans and live significantly longer lives (in some cases up to 40%).

Even though French diets are crammed with loads of bread, cheese, rich cream sauces and decadent desserts... the resveratrol in red wine may have acted as their secret weapon. It is thought that the resveratrol protected them against unhealthy triglycerides, high cholesterol and skyrocketing blood pressure.

Trick your body into "aging in slow motion"

Reduction in cholesterol, body fat and oxidation is believed to help slow the age process considerably. Not only will you feel better, but the powerful antioxidants in Vinotrol® will help fight the premature signs of aging. Resveratrol will help protect the collagen and elastin in your skin, which can lead to fewer wrinkles and a more youthful appearance.

Can you live years longer and feel years younger?

What's the point in living longer if you're not going to live better? Resveratol floods your system with powerful antioxidants and helps flush out lipids and free radicals. Combined with the extra boost to your brain, immune system and everyday energy, you'll wonder how you ever went without this red wine wonder.

Don't wait decades for giant drug conglomerates to figure out a way to charge you a fortune for the same benefits you can get for pennies on your own. Call today!

Having a Hard Time Finding Vinotrol®?

The manufacturer and the laboratories of Vinotrol® are so confident in their anti-aging technology that they are offering a 30-day, risk-free trial offer. You must call immediately to qualify for the limited number of trials that are available. Start your new anti-aging program today with your risk-free supply of Vinotrol® (50 mg resveratrol) for just a small shipping and processing fee. Call toll-free 888-876-8114.

Call 888-876-8114 to get your Vinotrol® 30-Day Risk Free Trial Offer Today!

Mention Promotion Code VL100092 for a Free Upgrade!

*These statements have not been evaluated by the FDA. This product is not meant to diagnose or treat any disease. Vinotrol is not endorsed, associated or affiliated in any way with Harvard University, Salk Institute or UC Davis Medical. * CBS News, Nov 1, 2006. Customer responsible for return postage.*

Harvard Medical School, Salk Institute and UC Davis Medical Research Proves That Powerful Red Wine Extract Holds the Secret to Living a Longer, Healthier and More Vibrant Life

wiring? If you're asking that question, then maybe the answer for you is "nothing." If the aesthetics, trapped dust bunnies and confusion don't bother you, then embrace your inner entropist and let your wires intermingle freely. But we here at PM believe that a little investment in cable management will make your setup look better and save time when swapping equipment in and out.

Get Organized

Bundling wires together and getting them out of the way is easy, but doing so with no advance planning can

WIRE TAMERS

Velcro Ties
$5 for 10
Also known as hook-and-loop ties, these straps secure your wires like zip ties, but tear free for easy access. Buy in a variety of colors to help keep things organized.

Foam Twist Ties
$10 for six
These soft ties treat cables gently, but tend to be expensive. Want to save money? Check garden centers, where foam-covered wire sells for 30 cents a foot.

WireMate
$20
This plastic enclosure mounts to the backside of a desk, allowing you to wrap up slack on hooks inside, then close it up to hide away the mess where no one can see it.

Cable Turtle
$5 (small)
$6 (medium)
$9 (large)
Another way to manage cable slack, the Turtle pops open its rubber shell to wrap up extra wire, then snaps closed to hold it in place.

Cord Clips
$10 for six
To keep cords from slipping off your desk when not in use, attach sticky-backed clips such as CableDrops (shown below) or 3M Command cord clips to your desktop.

Dotz Cable Identifiers
$10 for 10
These clip-on markers are color-coded and have graphic tags inside that can clue you in to what device is at the other end. For a cheaper alternative, use colored tape flags.

cause more problems than it solves. You'll just be consolidating the tangled mess that you already have. Instead, start fresh and unplug everything, then group your cables by application (e.g., wires that connect your PC and screen).

If you are setting up your system from scratch, think about ordering colored wires from a bulk supplier such as *monoprice.com*. Color-coding wires for each component provides quick visual reference for your connections.

Now is also a good time to reorganize your work area. For instance, if you have a few external USB peripherals connected directly to your PC, a powered USB hub will let you move these devices to a less crowded section of desk a foot or two away. Then you can either tie up the cords for your devices, or replace them with shorter ones. And if you're still using a corded keyboard and mouse, consider ditching them for wireless equipment.

Break Out the Power Ties

You don't need fancy supplies for cable management (although, as you'll see, such things can be useful). You can tidy things up by simply using twist ties or zip ties, magic markers and a roll of masking tape.

Separate wires into bundles with between three and six cables—too many in one group increases the chance that you'll have to cut everything loose next time you want to make a change. Separate power cables from signal cables such as USB and RCA audio. Most cables are shielded, but it's best not to expose signal cables to excessive electromagnetic interference.

Start by using the ties to take up any slack in the wire length—but be sure to leave a few inches of play for components that need to move around on your desk. When using zip or twist ties, don't overtighten, as too much tension damages softer cable jackets. Also, overtightening twist ties can make it difficult to cut the cables free later. If you can, use the ties to secure wires to a leg or the frame of your desk or table; letting cables dangle freely puts unwanted weight and stress on the jacks they plug into. Lastly, use masking tape and a marker to label wires (at both ends) and power bricks.

Wrap It Up

If you are a frequent tinkerer, regular twist and zip ties may be a bit too permanent for you, so it might be worth a step up to more functional cabling solutions. Velcro ties and foam twist ties allow for some quick-release access and are kinder to your cables. Wires that you change less frequently (such as speaker wire), can be gathered together using a mesh sleeving kit or split loom (both are also available in colors). Got slack left over? Wind it around a spool-like device known as the Cable Turtle, or use a cable-organizing enclosure such as the Wire-Mate (see opposite).

And if masking-tape labels aren't pretty enough for you, try pre-printed Kableflags or color-coded, clip-on Dotz Cable Identifiers (see opposite).

The final opportunity for organizational elegance comes in your choice of power strip. Pick a model with color-coded outlets and plenty of space for bulky adapters. And get it off the ground by screwing or zip-tying it to the back of your desk or rack. **PM**

Digital Clinic

by Seth Porges

Q+A

Modded Machines

Q I've heard reports that Microsoft has banned modded Xbox 360s from its Xbox Live online gaming service. What's the deal with this?

A Like other video-game consoles, Microsoft's Xbox 360 comes with built-in guards that prevent it from playing bootleg copies of games. The motivation for this is obvious—Microsoft wants to block pirating—but it is matched by the desire of some gamers to skirt all barriers. Many users have taken to modding their machines so that they can play bootleg games by soldering in a chip or installing unauthorized firmware—warranty-voiding acts that may even be illegal under the Digital Millennium Copyright Act.

Well, the empire has struck back. Over the past few years, Microsoft has taken to banning some modified machines from its Xbox Live online multiplayer gaming service, citing a violation of the console's Terms of Service agreement. And in November 2009 (a date likely picked to coincide with the release of mega-selling *Call of Duty: Modern Warfare 2*), the company dropped the biggest bomb of all, banning a huge number of modified consoles in one fell swoop. Some reports peg the total number of newly banned consoles as high as a million, although Microsoft denies that figure and has not released an official number (nor will the company discuss exactly how it detects which consoles have been modded). And if a console has been banned, it's banned for good—not even stripping out the mod chip will get it back online.

This ban is no small deal for Xbox 360 users. The system may lack the Wii's motion-sensing controller or the PlayStation 3's ability to play Blu-ray movies, but when it comes to online multiplayer gaming, it is the undisputed leader. In fact, the Xbox Live experience is so solid that millions of users willingly

tech term → MIRASOL

E Ink displays give e-readers epic battery life and are easy on the eyes, but they are hampered by slow refresh times and currently come only in black-and-white. That's why future devices could feature Qualcomm's new Mirasol display tech, which matches E Ink's long battery life and readability with an LCD's ability to show vibrant color and video. Like E Ink, it reflects ambient light, dispensing with a power-draining and eye-straining backlight. The company says we should see it built into e-readers as soon as this year.

ILLUSTRATION BY **MIKE HILL**

fork over $8 per month (or $50 per year) to access the service, despite the fact that online gaming is complimentary on the rival Nintendo Wii and PS3 consoles. And Xbox Live has expanded into more than just a venue for die-hard *Halo* and *Modern Warfare* players to duke it out—recent updates have given it the ability to stream movies from Netflix and to access sites such as Twitter and Facebook.

The ban means that anyone shopping for a used Xbox 360 faces an added measure of risk. Remember, it's the machine that gets blocked from Xbox Live, not a user or account. Today, there is no way of knowing if a second-hand console—even one purchased from a legitimate brick-and-mortar retailer such as GameStop—will be able to access Xbox Live. Almost immediately after the latest ban was implemented, a torrent of cheap used Xbox 360 machines flooded Craigslist and eBay, and it's likely that many of them won't be able to go online. My advice: Never purchase a used Xbox 360 console unless you have personally seen it successfully log on to Xbox Live. After all, even if you have no interest in online gaming, you may still want to watch some Netflix movies.

Sonic Steadiness

When I'm listening to music in iTunes, some songs will come out noticeably louder than others, requiring me to constantly fiddle with the volume control. Is there any way to fix this?

If you're anything like me, your digital music library is full of songs from all sorts of different sources. And between all these ripped CDs, various online music stores and free downloads, there's really nothing to ensure that they all come in at a steady volume level. The result: A simple song shuffle can quickly transform your quiet evening of music into an ear-blasting race for the volume dial.

But there's an easy fix (assuming the volume difference isn't too huge). Go to your iTunes Preferences menu

and select the Playback tab. From there, check the box labeled Sound Check—it will automatically adjust the song volumes so they all come out at a relatively constant level.

Opening Windows

I currently use Apple's Boot Camp program to run Windows on my MacBook, but it requires me to restart my computer to switch between operating systems. Is there a way I can run both at the same time?

Apple's free Boot Camp program makes it easy for users of Intel-based Macs to also run Windows on their machines. But because Boot Camp requires users to reboot the computer in order to switch between Windows and Mac OS, you will need a third-party program to run both at the same time. There are numerous such programs on the market, and most of them work well enough, but I personally like Parallels Desktop for its seamless integration of Windows and Mac interfaces.

If you've already installed Windows on a Mac using Boot Camp, you won't need to reinstall it to run other dual-OS solutions—but getting this set up can take a little bit of work.

There are basically two approaches: One allows you to keep booting through Boot Camp. The third-party companies behind dual-OS programs supply detailed instructions online for how to do this.

The other option moves the entire Windows installation away from Boot Camp, making it accessible only to the new program. To do this, you'll need to download a program called a transporter agent, which is typically offered for free online by the manufacturers of dual-OS software.

Easy Panorama

I love shooting landscapes, but am frustrated by the tedious process involved with producing panoramic shots. Is there a simpler way of shooting these ultrawide photos?

Most cameras produce panoramic pictures by stitching together a series of separately shot photos. It works, but it takes time, and problems can arise if the photos don't align perfectly. My preferred method: the unique panoramic feature built into some new Sony point-and-shoots, such as the Cyber-shot DSC-HX5V. When you hold the shutter button down and sweep the camera from side to side or up and down, it quickly takes a series of shots using its burst mode and automatically fuses them together into a panoramic picture. The camera allows you to capture panoramic shots that stretch 270 degrees—a range that far exceeds the capabilities of most cameras.

Cloud Storage

I've read about online data storage services like Mozy. Are these good enough to let me ditch my external hard drive?

Online data backup and storage services, such as Carbonite and Mozy, have drawn a lot of attention lately—and with good reason. For the most part, they are very good at their primary purpose—that is, backing up files on the cloud, so they can be accessed from any Internet-enabled PC or retrieved in the event your computer goes kaput. But an external hard drive is about more than just data backup—it's about media storage and sharing. And when it comes to this, no online service can yet match the plug-and-play ease of a USB hard drive. There's also an issue of speed: Your ability to quickly pull a file off the cloud is limited by the speed of your Internet connection—a shortcoming that becomes problematic if you are dealing with large movie files.

Online backup services have another potential problem as well: There's the possibility that they will suffer their own crashes or data losses—or simply go out of business. And if that happens, you'll definitely wish you had a physical backup as well.

So while I encourage you to take advantage of online data backup services (as long as you are willing to pay the $55 to $60 per year that they cost), they should be viewed only as one part of your data backup constellation, and not as a replacement for external hard drives.

Padded Content

I heard that the new Apple iPad tablet can run regular iPhone apps. Won't they look really weird on a big screen?

The Apple iPad actually has two different modes that iPhone apps can run in. One plays them at their normal size within a window, while the other simply doubles the number of pixels in order to artificially force them to fill the iPad's 9.7-inch screen (which is, of course, much larger than the iPhone's 3.5-inch screen). A double-pixeled picture won't look quite as sharp as an app running in a smaller window, but what's the point of having such a large touchscreen if you don't use it? **PM**

Got a technology problem? Ask **Seth** about it. Send your questions to ***pmdigitalclinic@hearst.com*** or over Twitter at ***twitter.com/sethporges***. While we cannot answer questions individually, problems of general interest will be discussed in the column.

Popular Mechanics (ISSN 0032-4558) is published monthly, 12 times a year, by Hearst Communications, Inc., 300 West 57th Street, New York, NY 10019, U.S.A. Frank A. Bennack, President and Chief Executive Officer; Catherine A. Bostron, Secretary; Ronald J. Doerfler, Senior Vice President, Chief Financial Officer and Treasurer. Hearst Magazines Division: Cathleen P. Black, President and Group Head; John P. Loughlin, Executive Vice President and General Manager; John A. Rohan, Jr., Vice President and Group Controller.
© 2010 by Hearst Communications, Inc. All rights reserved. Popular Mechanics is a registered trademark of Hearst Communications, Inc.
Periodicals postage paid at N.Y., N.Y., and additional entry post offices. Canada Post International Publications mail product (Canadian distribution) sales agreement no. 40012499. CANADA BN NBR 10231 0943 RT. POSTMASTER: Send address changes to Popular Mechanics, P.O. Box 7186, Red Oak, IA 51591. Printed in U.S.A.

EDITORIAL AND ADVERTISING OFFICES:
300 West 57th Street,
New York, NY 10019-3797.

SUBSCRIPTION SERVICES:
Popular Mechanics will, upon receipt of a complete subscription order, undertake fulfillment of that order so as to provide the first copy for delivery by the Postal Service or alternate carrier within 4–6 weeks.
>>> Subscription prices: United States and possessions: $24.00 - for one year. Canada and all other countries: $40.00 - for one year.
>>> Should you have any problem with your subscription, please visit service.popularmechanics.com or write to Customer Service Department, Popular Mechanics, P.O. Box 7186, Red Oak, IA 51591. Please enclose your mailing label when writing to us or renewing your subscription.
>>> Popular Mechanics is not responsible for unsolicited manuscripts or art. None will be returned unless accompanied by a self-addressed stamped envelope.

MAILING LISTS:
From time to time we make our subscriber list available to companies who sell goods and services by mail that we believe would interest our readers. If you would rather not receive such mailings, please send your current mailing label or exact copy to: Popular Mechanics, Mail Preference Service, P.O. Box 7024, Red Oak, IA 51591-0024.

AS A SERVICE TO READERS,
Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from information published in this magazine.

URGENT MESSAGE

Get the Emergency World Radio FREE

$30 Value — Yours FREE

The U.S. Department of Homeland Security* advises that every American home have an emergency radio.

Every home needs an emergency radio in the event of hurricanes, tornadoes, earthquakes, electric power outages, and even terrorist attacks.

Be Prepared in Any Circumstance

This **Dynamo Emergency World Band Radio** picks up the full AM/FM spectrum and worldwide shortwave bands.

Most importantly, the **Dynamo Emergency World Band Radio** includes:

- **HAND CRANK GENERATOR (IN CASE BATTERIES FAIL)**
- **EMERGENCY FLASHLIGHT**

Important Features of the Emergency World Radio:

- 8-Band World Receiver
- Long-Range AM Receiver
- 6 Shortwave Bands
- High Sensitivity FM Band
- High Quality 2" Speaker
- Emergency LED Flashlight
- 360-Degree Swiveling Telescopic Antenna
- Can Operate on 2 AA Rechargeable Batteries (included) or on 2 D Batteries (not included)

Newsmax Magazine's Incredible Offer — $20 Bonus

Newsmax magazine wants every American family to have this emergency radio and we'll send it to you for FREE. Just pay our standard shipping and handling charge of $5.95.

When you order your FREE **Dynamo Emergency World Band Radio**, you'll also receive four free issues of Newsmax magazine — a $20 value — yours FREE.

Newsmax magazine brings you exclusive stories the major media won't report. Even they can't ignore Newsmax magazine — which has been cited on Meet the Press, CNN, Fox News, Rush Limbaugh, MSNBC, and many other outlets.

Each month in Newsmax magazine you'll read hard-hitting investigative reports and special commentaries from **Ben Stein, Dick Morris, Bill O'Reilly, Dr. Laura Schlessinger, James Hirsen, John Stossel, David Limbaugh, Thomas Sowell, Michael Reagan, Christopher Ruddy**, and many others.

Fox News commentator **Dick Morris** calls Newsmax "a must read" for every informed American. Call or go online today to get the **Dynamo Emergency World Band Radio** and 4 months of Newsmax magazine — a combined value of $50 — FREE.

Get Your FREE Emergency Radio

PLEASE HURRY! THIS IS A LIMITED TIME OFFER

Order Online:
www.Newsmax.com/popmech
Order by Phone:
1-800-670-0589

YOUR SPECIAL OFFER CODE **9640-1**

* This offer and radio are not approved or endorsed by the federal government or Homeland Security.

(CONTINUED FROM PAGE 73)

ing me down and up my ladder over and over. Back on the platform, I'd reach for my measuring tape or pencil and see it lying in the grass by my sawhorses. I now marched up the 45-degree ladder as if up a flight of stairs. Nevertheless, I learned to always stow my tools in my tool belt and to loop the extension cord around a limb.

Things got cramped up there. One by one, I nailed the rafters atop the stud walls while standing inside the 5 x 8–foot house, alongside the mature tree trunk. The more rafters I attached, the less space I had for swinging my big California framing hammer. I felt a bit like the storybook Alice after she had grown so large her arm poked out the cottage window. Since the shed roof sloped from 7 feet down to 5 feet, I kept bumping the 6-foot 3-inch high crown of my head on the oak rafters. Recoiling in pain, I'd scrape my back or arms on the scaly tree bark.

Once the framing was complete, I drove a borrowed pickup truck 30 minutes to Dayton, Va., a rural Shenandoah Valley community with a large Old Order Mennonite population. I passed men in straw hats pedaling bicycles and driving horse-drawn buggies on my way to Martin's Native Lumber. The warehouse was surrounded by what felt like an acre of siding, sawn and stacked high overhead, open to the sky and surrounded by pastureland. Martin's had just what I was looking for—milled white-pine barn siding with a rough-sawn face. Most of it had been sitting in the yard long enough to turn a soft gray. When I told them I needed something thin and light for a treehouse, they offered to plane the ¾-inch stock down to 7/16 of an inch for a couple of pennies more per foot, bringing the total price per lineal foot to 50 cents, one-third the cost of the fancier pine siding from my local lumberyard. I ordered the same rustic

Like some kind of Newtonian poltergeist, gravity spilled nails, tipped boards over the edge and tugged my power cord to the ground, forcing me down and up my ladder ... I learned to always stow my tools in my tool belt.

pine in a thicker profile to trim the windows, door and corners.

The lap siding went up quickly and smoothly. The same was true for the roof. I laid cedar shakes over skip sheathing—1 x 4–inch boards nailed 5 inches on center across the roof rafters to allow the cedar to breathe. Snapping chalk lines, I crabbed myself from one side of the roof to the other, tacking down the fragrant shakes. Having to custom cut each shingle to match the contour of the curves slowed my progress. But I didn't mind. That one-of-a-kind look is part of a treehouse's charm. As with the floor, I left a gap around the tree trunk to allow for growth, as well as movement in strong winds.

One afternoon in early August, as thunderheads boiled up over the valley, John and I drove to some wooded property belonging to his wife's family. He had a chain saw and loppers. I brought along gloves and a curved pruning saw. We felled half a dozen young red maples, with trunks as big around as my forearm. I limbed and cut them just as warm, nickel-size raindrops began drumming the hood of his Ford F-150. Back at the house, I cut the poles down to 28 inches and nailed them between pairs of 2 x 3s to create railing sections. I fastened those between 4 x 4–inch oak corner posts for a rustic railing sturdy enough to withstand anything my kids could dish out.

By then, much to my delight, Luther and Eliot were raring to go—to climb, explore and inadvertently test the structural soundness of things the way only kids can do. I quickly fashioned a ladder out of wooden dowels and nylon rope. To keep the heavy hatch from slamming shut on young fingers, I strung a counterweight (an old railroad hammerhead I found at a junk shop) through a small pulley above. As the hatch slowly closes, the weight rises inside a section of PVC pipe. I built a Dutch door and installed it between house and porch. Not long after I had put my tools away, I found a scrawled note on the kitchen counter.

"Dere Dad," it read, "I have gon awt to the tree haws, Eliot." She and her friends Grace and Gillian were hauling blankets and books and snacks up by rope and bucket.

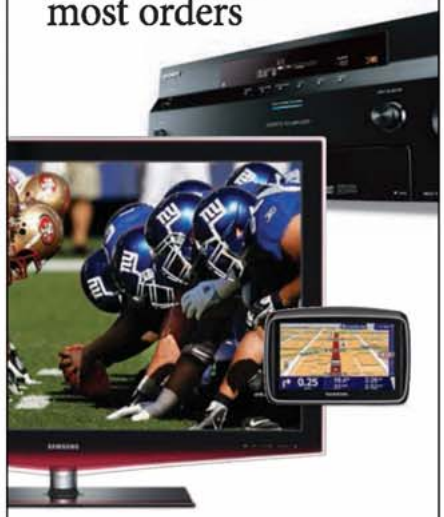
"I love this transportation!" Grace yelled as she hauled up another load. I smiled, realizing this was probably the first treehouse any of them had ever seen. A different era. Soon, they raised the ladder and battened down the hatch, and Luther fired holly berries at them from below with a homemade slingshot as shrieks echoed through the neighbors' backyards.

During the kids' first week back in school, a late-summer wind blustered up. I raced out back, wobbling up the rope ladder and through the hatch under the guise of conducting a wind-worthiness test. The oak framing felt solid underfoot, and I smiled, glad to have built with it, more glad the construction was done. I wedged myself in a corner and rode out the gusts. The sky was a crisp blue, and sunlight flashed through the windows as branches swished and whipped. As the timbers creaked, I felt both snug and exhilarated to be sailing in the wind. For a moment, I was untethered, free—like a kid in a treehouse. **PM**

FREE
Audio/Video Catalog

Count on Crutchfield for the latest in top brand A/V gear.

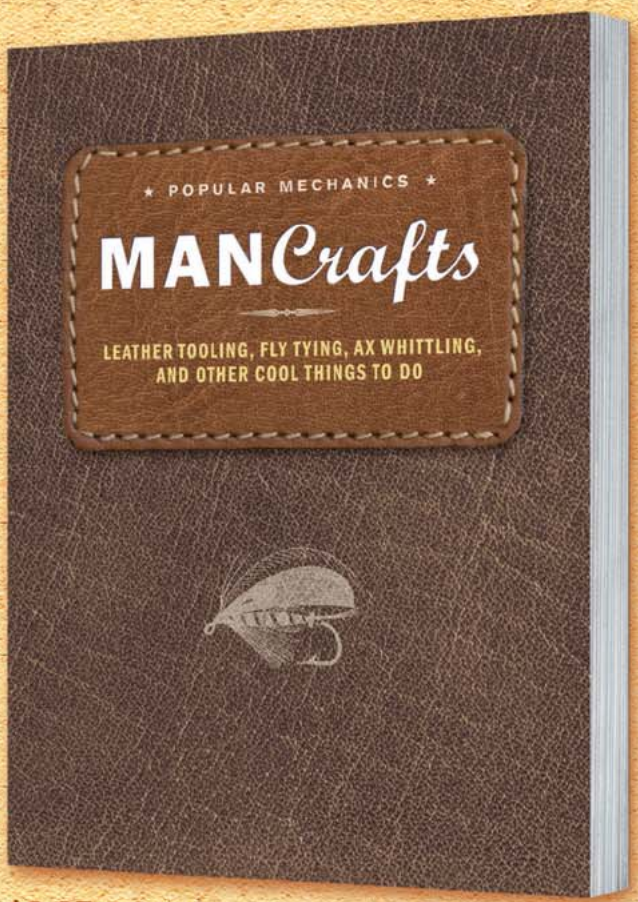
- One-on-one expert help to find the right gear for you
- Free shipping on most orders



Call for your free catalog today
1-800-317-9722
or www.crutchfield.com/mechanic
CRUTCHFIELD

LEATHER TOOLING. FLY TYING. AX WHITTLING. MANCrafts.

Complete with Vintage Artwork!



Revisit the can-do spirit of the greatest generation when men made what they needed and made money making what others needed. This vintage collection of ten manly crafts was originally published as a series of pamphlets to help returning servicemen master new skills after World War II.

Now, you too can learn to whittle with an ax to create rustic furniture and fixtures. Or make a fly as expertly as a seasoned fisherman. Or carve intricate designs into a leather billfold or wallet. From cartooning to coping saw carpentry, there's a new hobby to be found here for everyone.

$9.95 ($10.95 Canada) in paperback
978-1-58816-793-4 · www.bn.com/mancrafts

Available wherever books are sold or call **1-866-338-3778 to order**.
Have a question about our books? We'd love to hear from you. Email us at **booklover@hearst.com.**

HEARST BOOKS
A Division of Sterling Publishing Co., Inc.

BUYER'S GUIDE

For advertising rates call Angela Hronopoulos (212) 649-2930, fax: (646) 280-2930.

STORAGE WITH STYLE !
Aluminum Garage Cabinets

Toll free
888-343-4463

MODULINE
MODULAR ALUMINUM CABINETS
www.modulinegarage.com

Smooth Out Driveways with the
DR® POWER GRADER!

PATENTED DESIGN easily fills in potholes, smoothes washboard.
CARBIDE-TIPPED SCARIFYING TEETH loosen the hardest surfaces.
LOOSENS AND REDISTRIBUTES composite driveway surfaces without the need to haul, shovel, or rake new material.
POWERED ACTUATOR controls grading depth with a remote control.

63298X © 2010

Call for a FREE DVD & Catalog
TOLL FREE 888-212-0854
www.DRpowergrader.com

GREAT SPACE ADDITIONS
FOR EVERY BACKYARD AND GARDEN
Incredible Do-It-Yourself Buildings at Amazing Do-It-Yourself Prices!
SAVE UP TO 45% ON SELECT MODELS

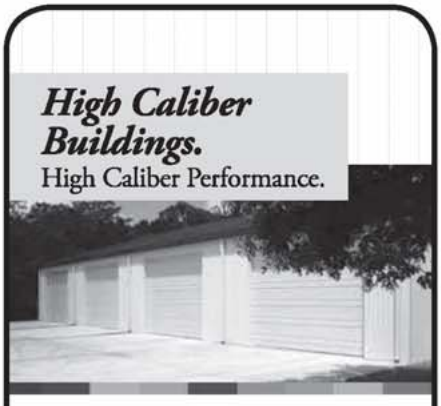
FUTURE STEEL BUILDINGS
Call for your FREE Brochure
www.FutureSteel.com 1-800-668-5111 ext 1530

KITES!
Since 1980, we've made it our mission to fly and sell the best kites in the world. FREE color Catalog with hundreds of kites, flags, windsocks and spinners, or shop online at:
www.IntoTheWind.com
1408-M Pearl St., Boulder, CO 80302 • (800) 541-0314

FREE Shipping
Expand your profitability with Badge-A-Minit buttons. Using our **Starter Kit** you can create customized buttons for customers. Buttons cost less than 17¢ to make and can be sold for $1 or more. For only ~~$75.90~~ **$29.95**, receive everything you need to make your first ten 2¼" buttons.
Request your **FREE** catalog or order today!

www.badgeaminit.com
Badge-A-Minit™
Badge-A-Minit, Dept. PM410, 345 N. Lewis Ave., Oglesby, IL 61348
Call 800 • 223 • 4103

High Caliber Buildings.
High Caliber Performance.



When your building is working properly, everything else just falls into place. **Call Heritage today for your high performance metal building.**

HERITAGE
BUILDING SYSTEMS.
Established 1979
1.800.643.5555 | HeritageBuildings.com

TerraTrike
RIDE IN COMFORT
World's Most Comfortable Ride

WWW.TERRATRIKE.COM
FREE CATALOG 800-945-9910

Buy a subscription to
POPULAR MECHANICS
for your friend!
Visit
popularmechanics.com
for more information

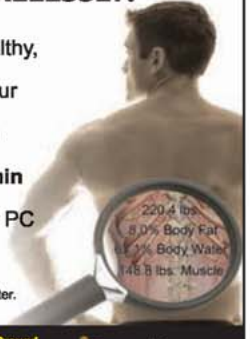
FOR THE TOUGHEST JOBS ON PLANET EARTH®

GORILLA TOUGH™
1-800-966-3458 Made in U.S.A.
© 2010 Gorilla Glue Company

SEE WHAT YOU'RE MADE OF - WEIGHT, BODY FAT %, BODY WATER %, MUSCLE MASS, & MORE - WIRELESSLY!

Do you know your body fat %?
Everyone needs body fat to be healthy, but excess body fat can damage your health. You can determine your body fat % and so much more by just standing on the BC-1000! The BC-1000 will transmit nine body composition readings to your **Garmin FR60** or **310XT** fitness watch*, a **Tanita Remote Display**, or to your PC running **Healthy Edge™**!

*Watch displays weight, body fat %, and body water %; stores all nine for wireless transfer to your computer later.



TANITA

Use promo code **PM410** for **3% OFF select BC-1000 packages** and **FREE UPS Ground shipping** (continental U.S.) at **TheCompetitiveEdge.com** or call **866-859-3343**. Valid to 05/31/10.

the competitive edge

CUT YOUR HOT WATER BILLS BY UP TO 85%!

The Sunward™ Solar Hot Water System is the most affordable, easiest-to-install solar hot water system in the world.

- **30% OF THE COST IS COVERED BY FEDERAL TAX CREDITS**
  Additional incentives available in many states. *Call or go online to see how much you'll save!*
- **QUICKLY PAYS FOR ITSELF**
  Uses the free energy of the sun to heat your water, putting thousands of dollars in your pocket.
- **INSTALLATION IS SIMPLE, EASY**
  Quick-connect components eliminate complicated plumbing and wiring. Two people can do most of the work in a weekend.
- **20-YEAR WARRANTY** on the solar collectors is the best in the business.
- **PROVEN FOR OVER 25 YEARS** in tens of thousands of homes.

Roof and ground-mount systems available.

*Get your **FREE Sunward Information Kit**, including a Catalog and DVD, Site Assessment details, and Factory-Direct Savings now in effect.*

68297X © 2010

SUNWARD™

Call Now TOLL-FREE
1-888-212-0854
www.SunwardWater.com

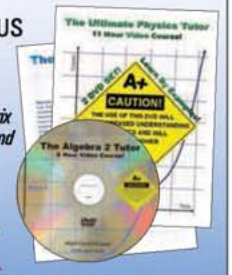
MATHTUTORDVD.COM
Press Play For Success

Having Math Problems? WE CAN HELP!

SUBJECTS:
- BASIC MATH
- BASIC MATH WORD PROBLEMS
- PRE-ALGEBRA
- ALGEBRA 1 & 2
- ALGEBRA WORD PROBLEMS
- ADVANCED ALGEBRA
- GEOMETRY
- TRIG/PRECALCULUS
- CALCULUS 1, 2, 3
- PHYSICS

AVERAGE COURSE LENGTH: 8 HOURS
MOST COURSES COST ONLY $26.99

Subjects Coming Soon: Matrix Algebra, Unit Conversions, and Probability/Statistics.



VISIT OUR WEBSITE TO VIEW SAMPLE VIDEO CLIPS OF EVERY COURSE

#1 Rated Math & Physics Tutorial DVDs

All topics taught entirely through worked example problems.

Raise grades or your money back
877-MATH-DVD

Visit: MathTutorDVD.com/pm

Spiral Stair Kits

Add affordable beauty and space saving functionality to any room.

Metal Spirals from $495

Oak Spirals from $2850

You'll find the spiral stair kit that's right for your budget.

Victorian One Spirals from $4500

THE IRON SHOP®
The Leading Manufacturer of Spiral Stair Kits®

*Call for the **FREE** color Catalog*
***1-800-523-7427** Ask for Ext. PM*
or visit our Web Site at
www.TheIronShop.com/PM

Proudly made in the U.S.A. since 1931

---

5 Minutes From Car To Fishing Machine!

The Better Pontoon Fishing Boat

- 75 lb. hull
- Takes 3 HP
- 12' 4" x 4' 6"
- Holds 1 or 2 Adults

Unlike tubular frame pontoon fishing boats, our Sea Eagle FoldCat 375fc sets up in 5 minutes! It features great standing stability, a full floor, more fishing space, rod-holders, swivel seats, oars, oarlocks and motormount. Just 1 of 19 Great Inflatable Boats!

See more at www.SeaEagle.com or

Call **800-944-7496** for **FREE color catalog, DVD & material samples:**

SEA EAGLE.com Dept. PM040B
Suite 1, 19 N. Columbia St., Port Jefferson, NY 11777

Plant a Billion Trees

Join The Nature Conservancy to plant a billion trees, one tree at a time, in the fight to end climate change at **plantabillion.org**

The Nature Conservancy

Protecting nature. Preserving life.™

Great Investment

Maintenance-Free • Savings Up to 60%

High Quality American Steel Span buildings make a great investment, perfect for workshops, ideal for garages.

www.steelspan.com

800-891-6733 ext 036

VIAGRA®

Cialis® LEVITRA®

and more quality, FDA-approved medications.

Se habla español

VIAMEDIC®

SAFE • SECURE • DISCREET

WWW.VIAMEDIC.COM

800.547.9903

CLASSIFIED ADS

To reach over 9 million prospects, or for additional advertising information, call Kathleen Gleason at **888-473-0788,** or e-mail: **klassmark@aol.com.**
Thank you for choosing Popular Mechanics Classified Advertising, 512 West Burlington Ave., LaGrange IL 60525.
For subscription questions, visit service.popularmechanics.com.

ALTERNATIVE TRANSPORTATION

Electric and Gas Powered Bicycles, Bike Conversion Kits, Scooters, Minibikes, Mopeds, Dirtbikes, ATVs, **WWW.FIVEFLAGSMOTORBIKES.COM,** (850) 941-2080

APPAREL

SUSPENDERS WITH PATENTED No-Slip Clip. Free Catalog 800-700-4515. **www.suspenders.com**

ARTS, CRAFTS, SUPPLIES

WHOLESALE PRICES ON JEWELRY CRAFT ITEMS, Beads & Beading Supplies, Rockhound Supplies, Belt Buckles, Clock Movements. Free 122 page catalog. **Eloxite**: Dept. 45, Box 729, Wheatland, WY 82201, **Ph.: 307-322-3050 Web: www.eloxite.com**

AUTOMOTIVE

AMSOIL, SYNTHETIC LUBRICANTS. Buy Direct, Register to Buy Wholesale. **Free Catalog.** 1-919-269-3331. **www.synthoils.com**

BICYCLES

GOLDEN EAGLE BICYCLE ENGINES 2 & 4 Cycle Geared Belt 25 - 40cc 517-410-2793 bikeengines.com

BOATS, OUTBOARDS, TRAILERS

BUILD A BOAT - Using full size patterns, 7' to 55', send $9.95 for **NEW** Catalog and Free Plans. Glen-L, 9152 Rosecrans/PM. Bellflower, CA 90706. 888-700-5007. **WWW.GLENL.COM/OFFER9**

BOAT KITS - PLANS - PATTERNS - SUPPLIES Catalog $5.00, Clarkcraft,16-6 Aqualane, Tonawanda, NY 14150. 716-873-2640. www.clarkcraft.com

BUSINESS OPPORTUNITIES

Make $500 Weekly, E-Z Assembly work. FREE Information, Send SASE; JDK-P Box 635, Hopkins, MN 55343-0635

CONCRETE CHARLIE™ SAYS: Claim your piece of the $100 Billion waterproofing industry and become a foundation crack repair specialist. Most Complete Training in the Industry! Don't Wait! Territories available NOW! Or, buy a kit and fix **your** cracks! **www.concretecharlie.com** Enter Pop. March Promo Code: 971208.

BECOME A HOME INSPECTOR without spending a lot of $$$. Make $90K to $150K/year. Learn how at www.HomeInspectionBook.com

DO-IT-YOURSELF

HYDRAULIC JACK REPAIR Manual and catalog: $15.00 620-594-2247, Hydraulic Parts Supply, P.O. BOX 97-PM, Sawyer, KS 67134.

ConcretePlus™ DIY epoxy repair system for concrete andmore, flexible joint filler, anti-slip surfacing, cinder block resurfacing, water infiltration inhibitor, 100% solids, environmentally friendly **www.cohesantmaterials.com** 918-615-0123.

DON'T PAY A PLUMBER Secret $99 Drain Cleaner for Power Washers Discovered by Homeowner. **www.ClogHog.com/secret**

EDUCATION & INSTRUCTION

SOON THE GOVERNMENT will enforce the **MARK OF THE BEAST** as **CHURCH AND STATE** unite! Let **THE BIBLE** identify him. **FREE BOOKS/DVDs** The Bible Says, P.O.B. 99, Lenoir City, TN 37771 thebiblesaystruth@yahoo.com **1-888-211-1715**

ELECTRONICS

CONDUCTIVE PAINT, EPOXY From $12. Silver or carbon paint. Silver epoxy. Carbon tapes. Custom formulas available. www.semsupplies.com 301-975-9798 (M-F).

Digital Copyguard Eliminator, Stabilize and Restore Distorted Video. Guaranteed to work with all DVD and VHS Systems. Free information Package 574-233-3053. www.rcdst.com

FINANCIAL

RARE COIN INVESTMENTS. Our clients **DON'T LOSE** money! **FREE** brochure. **DENKO** 1-877-777-1754.

FOR INVENTORS

REGISTERED PATENT & TRADEMARK ATTORNEYS Representing clients across the country Call today for your **FREE PHONE CONSULTATION** 1-866-222-8980 www.mciplaw.com

PATENT YOUR BRILLIANT INVENTION!!! Registered Patent Attorneys Available to Assist You New York and New Jersey Offices Call (646) 373-2504 or Email: **INFO@PATENTANDTAXLAW.COM**

DEAL DIRECTLY WITH REGISTERED PATENT AGENT and qualified US Patent Office Examiner **Don't be fooled by phonies, Free patent information –** "Patent, Develop, Market Your Invention". Richard L. Miller 631-499-4343, 1-800-242-9853, http://www.pto-ag.com

HEARING AIDS

HEARING AIDS - GUARANTEED LOWEST PRICES! No huge commissions. Home trial, terms. All makes. We're the oldest, biggest, best. Custom instrument specialists. Free information, 1-800-323-4212. Lloyds-PMC

HEARING AIDS

FREE HEARING AID CATALOG. CUSTOM DIGITAL AND PROGRAMMABLE. HUGE SAVINGS. 45 DAY TRIAL. BETTER HEARING, PO BOX 219 DEPT 32, BROOKPORT, IL 62910. 1-800-320-3300 Ext. 32

DIGITAL HEARING AID SALE
16 channel bands, any size, any type or BTE $339.95
Options: touchtone, twin mics, custom molded - $50.00
New! Open Fit Technology - most brands - big discounts
Repairs $77.00 (since 1981)
Free brochure & mold kit
Hearing One 1-800-249-4163
100 Main Street, Marty SD 57361

HELP WANTED

$400 WEEKLY ASSEMBLING
Electronic Circuit Boards/Products. Rush S.A.S.E.:
Home Assembly - PM, P.O. Box 450, New Britain, CT 06050-0450.

HOMEWORKERS NEEDED! Top pay for assembling products. Rush S.A.S.E.: HIS-PM, Box 5657, Clearwater, FL 33758.

INVENTORS

PROTECT YOUR IDEA!
Write Your Own Patent Application
PatentPro® Software
www.patentpro.us

INVENTORS: Free information tells how to offer your invention for sale or license. Kessler Corporation, 52+ years 800-537-1133, ext. 25, www.kesslercorp.com

ATTENTION INVENTORS
Do you have a new product idea that you would like to develop? Check us out. Free information.
www.developYOURidea.com

INVENTORS – NEVER SEND IDEAS TO STRANGERS! LEARN AFFORDABLE PROTECTION / MARKETING METHOD NON-PROFIT ORGANIZATION. FREE INFORMATION: 1-800-846-3228. www.inventassist.com

INVESTMENT

LEARN TO BUY GROWTH STOCKS
weekly picks follow my lead
shotguntrades.com

LAKES & PONDS

LAKE OR POND? Aeration - 1st Step towards improved water quality. Complete Systems $169 - $329 11,000 Gal. Per Hour Water Fall Pump only 3.6 amps! Just $399.95 www.fishpondaerator.com 608-254-2735 Ext. 3

LIVE STEAM MODELS

WORKING STEAM ENGINES!
Discounts! Accessories, Parts, Stirling Engines.
Limited Edition Tin Toys, Cars & Trains.
Catalog $6.95 Refundable.
Yesteryear Toys Dept. PMS Box 537
Alexandria Bay, NY 13607
www.yesteryeartoys.com
1-800-481-1353.

METALWORKING

BUILD, REPAIR, RESTORE ANY METAL
Quality Hand-tools & Forming Machines for Automotive, Aviation, Homeshop, Sculpture, Instructional DVDs & Workshops.
20 years & still the best!
Free catalog 530-292-3506
www.tinmantech.com

OF INTEREST TO ALL

FREE CATALOG by mail. Meet nice singles, women, men. Photos. Profiles. All ages. Since 1981. Box 310, Allardt, TN 38504 Call 931-879-4625.

OF INTEREST TO MEN

SINGLE RUSSIAN LADIES
Seek romance, marriage.
E-mail, tours, free ads for men.
Anastasia Intl. Since 1994.
HTTP://WWW.ANASTASIADATE.COM

ASIAN BRIDES! Worldwide! Free Details/Photos! PIC, Box 4601-PM, T.O., CA 91362. 805-492-8040. www.pacisl.com

OF INTEREST TO MEN

HOT LOCAL WOMEN
Listen to Ads & Reply..FREE!
FREE Code 7569, 18+
1-888-634-2628
www.MegaMates.com

SECURITY

SPYBASE.COM
MYSPYLINK.COM
What you don't know could hurt you.
Spy Gps/Cameras/keyloggers/Digital A/V recorders. High end technology, low price. Retail since 1989
1-800-570-5562 (CA)

SIMULATION

HotSeat FLIGHT SIM AND RACING SIMS put you in the cockpit in Dolby Digital Surround Sound. Fly any plane from any airport. Racers available for iRacing online, Grid, RFactor, GTR2, PC's, PS3 and Xbox 360.
www.hotseatsim.com
860-582-5031.

SNOW GUARDS

STOP SNOW SLIDES ON METAL ROOFS!
Practically Invisible, Easy Installation, Online Estimator.
Fast Shipping **www.snojax.com**

TREASURE FINDERS

BURIED TREASURE – Sensitive equipment allows locating from distance. Brochure free. Simmons, Box 10057-MA, Wilmington, NC 28404 www.simmonsscientificproducts.com

TOOL REPAIR

FIX IT YOURSELF
Parts for Electric/Cordless Tools, Compressors, outdoor power equip.
$4.99 SHIPPING
www.alltoolparts.com
or call 480-288-2112

WANTED TO BUY

BUYING GOLD, SILVER, PLATINUM - ANY FORM
60 years experience. Free pricing quotes. Top payment. 1-800-932-1010 www.preciousmetalsreclaiming.com

WATER PURIFIERS

FREE Waterwisdom Report
Shocking truths revealed.
Which water is best for you?
1-800-874-9028 waterwise.com

WINE/BEER MAKING

WINEMAKERS - BEERMAKERS.
Free Catalog. (800)841-7404. Kraus, 7850-L, Independence, Missouri 64054. www.eckraus.com/offers/L.asp

This Is My Job

BALLOON PILOT

Name: BROOKE OWEN
Location: ALBUQUERQUE, N.M.
Age: 35
Years on Job: 14

1. BURNER SYSTEM
Owen's balloons have up to four burners that are capable of producing 20 million Btu at 100 psi. The burners heat the air inside the balloon to between 150 and 250 F, giving it the lift to fly.

2. PROPANE TANKS
Three to four 20-gallon steel propane tanks supply the burners with fuel. The vapor pressure in the tanks forces the fuel through a valve to the burners; in cold conditions, Owen adds nitrogen to boost the pressure.

3. HYPERLIFE FABRIC ENVELOPE
The top of the balloon is made of silicone-coated nylon. Closer to the burners, it is composed of Nomex, a durable heat- and flame-resistant material. The envelope holds 120,000 cubic feet of air, allowing the balloon to lift approximately 2100 pounds.

4. FLIGHT INSTRUMENTS
Owen's Flytec system measures interior envelope temperature and includes an altimeter, a rate of climb indicator and a barometer. He uses a Garmin GPS unit to determine his groundspeed and direction of travel.

5. VENT LINES
For landings in high wind, Owen uses these lines to open a 30-foot-wide valve in the top of the balloon, deflating it.

6. GONDOLA SYSTEM
This basket is made of flexible rattan—a wicker used for its durability, flexibility and light weight—that's woven over a stainless-steel frame.

When hot-air-balloon pilot Brooke Owen goes to a party, he can't escape work—everyone wants to know what a balloon pilot actually does. "It's an odd job," admits the 35-year-old, who got his private pilot's certification at age 21. In the years since, he's flown balloons shaped like a tire, the space shuttle and the Canadian maple leaf. Now, he's a chief pilot for Rainbow Ryders, which carries 11,000 passengers each year 2000 feet above the Rio Grande and the Albuquerque area, where they spot mesas, desert foliage and coyotes. But what Owen enjoys most are the tranquility and unpredictability of the journey. "Wherever the wind blows, that's where you're going," he says. — *EMILY HAILE*

PHOTOGRAPH BY **LARSEN & TALBERT**

Easy to use. Tough to beat. STIHL YARD BOSS®.

The STIHL YARD BOSS® is the gardening multi-tool that's packed with smart, time-cutting features. It's powered by a proven engine and even folds for transport and storage. And with multiple attachments available, the STIHL YARD BOSS® can handle a wide variety of lawn care tasks.

STIHL products are sold only at servicing STIHL Dealers.
To find the STIHL Dealer nearest you, visit STIHLusa.com/yardboss.

Shown with optional wheel kit.
Attachments sold separately.

STIHL®