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FORWARD TO THE PAST

"PERFECT SOUND FOREVER" has passed into legend as the slogan of a 1982 Sony/Philips advertising campaign celebrating their invention of the compact disc. The starstruck world welcomed the demise of vinyl, with its fragility, its inconsistency and above all its irritating snap, crackle and pop.

Or did it?

In 2017, the liquorice pizza appears to be in remarkably good shape for a corpse. This year, according to an annual predictor of tech trends in media, vinyl is expected to aproach US\$1 billion globally in revenues. Yes, we'll be spending around 15 billion ZAR on a technology 35 years after we were dancing on its grave.

What happened?

Deloitte Africa's annual TMT Predictions provides an outlook on key trends over the course of the next 1-5 years in the technology, media and telecommunications industry sectors worldwide. The report's 16th edition says that new vinyl revenues and units are likely to enjoy a seventh consecutive year of double-digit growth. That comprises an astonishing seven per cent of forecast global music revenues of about US\$15 billion. Still, don't expect to see vinyl as the music industry's saviour, the report continues. Digital – streaming and downloads – will be the future of music.

But vinyl is not the only analogue audio medium that just won't lie down and die. Cassette tape, by all accounts, is flourishing as the counterculture gains momentum. A *Rolling Stone* report last year related the story of the largest factory in the US, which churns out as many as 100 000 cassettes a day. Though two-thirds of its output is taken up by small independent labels, the majors are paying attention and artists as diverse as Justin Bieber and Judas Priest are available on cassette.

We can argue about the sonic advantages of vinyl over digital (technically, there shouldn't be any). But good replay systems manage to mask the deficiencies while extracting every scrap of detail from the grooves. That means not only the source – the turntable – but also the amplification and speakers.

To some, the source has primacy in these matters. Which is why what's said to be the finest turntable on the planet, the Clearaudio Statement, involves some pretty fearsome engineering and costs an equally fearsome 140 000 euros. It looks as stunning as its performance and price tag. Turn to page 42's A Beautiful Thing to find out more.

Of course, you don't need something as elaborate as the Statement to take part in the vinyl revolution. What you will need, though, is to fasten your seatbelts when you visit one of the many vinyl fairs that have been popping up around the country. Quality new vinyl is expensive because it doesn't enjoy great economies of scale, but even well used vinyl can command extortionate prices (though you will probably land Springbok Hits XVI for small change).

Anthony

anthony @ramsay media. co.za



The Clearaudio Statement turntable's jaw-dropping architecture showcases a massive, highly damped integrated stand, based around four stainless steel pillars.

COMPETITION WINNERS

Details online at www.popularmechanics.co.za

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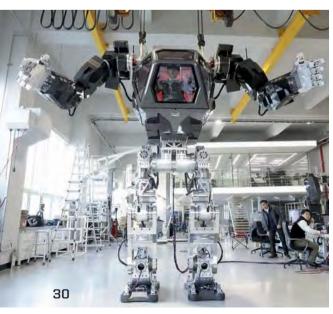
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Senior associate editor
Journalist
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Jorika Moore

Proofreader Margy Beves-Gibson

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Published by RamsayMedia, a division of CTP Ltd Company registration number: 1971/004223/06 ISSN number: 1682-5136

CTP Ltd Directors: TD Moolman, J Edwards, PG Greyling, TJW Holden,

A C G Molusi, A N Nemukula, N Sooka.

Divisional Directors: J Breytenbach, N L Piper

Cape Town head office: 36 Old Mill Rd, Ndabeni, Western Cape, South Africa 7405
P O Box 180, Howard Place, Western Cape, 7450
Tel: 021 530-3100, Fax: 021 531-9495

Gauteng office: Caxton House, 368 Jan Smuts Avenue, Randburg, 2196 P O Box 78132, Sandton, Gauteng, 2146

Tel: 011 449 1100, Fax: 011 449 1104

Email address: popularmechanics@ramsaymedia.co.za

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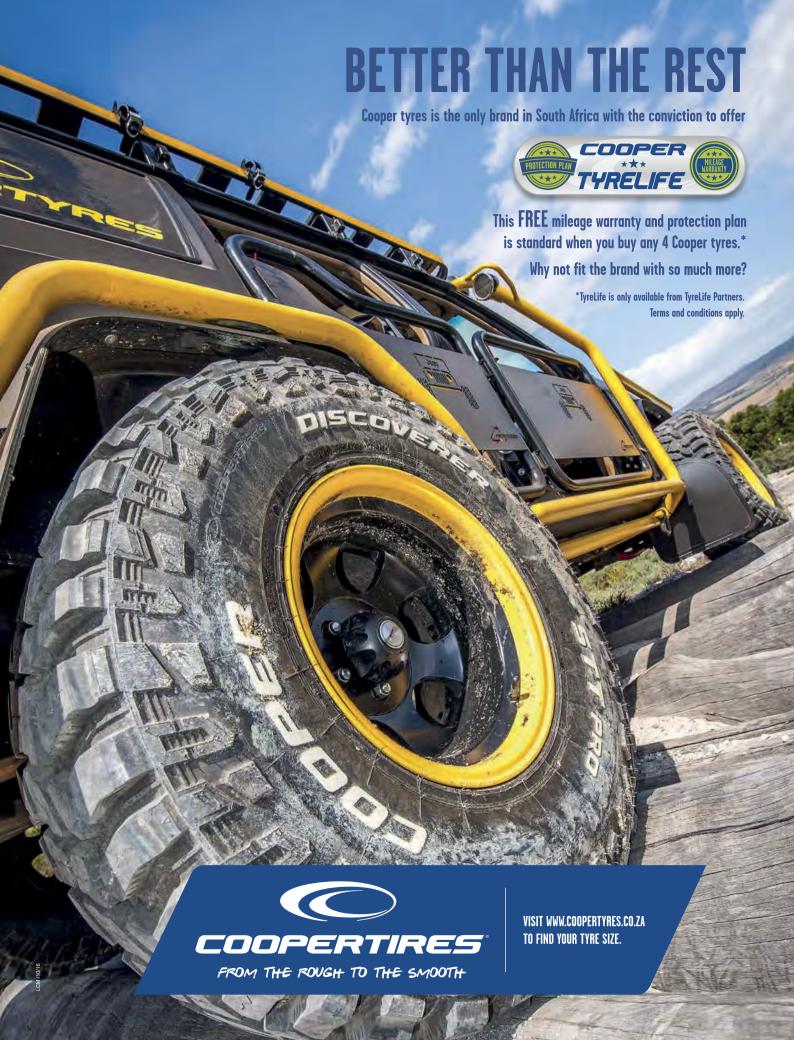
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Total monthly sales: 27 874 (July - Sept 2016)





USE RENEWABLES TO CREATE DRINKING WATER



FROM THE MEDIA, it seems that Eskom is turning up its nose at renewable energy plants constructed all over South Africa (it seems there is now enough coal power station capacity). Eskom has also stated that its power distribution network has not been designed to accept additional power from power sources all over the country.

We all know South Africa is a water-scarce country. Why can't these renewable energy sources be used to produce clean drinking water by either atmospheric water generators or reverse osmosis?

Production of drinking water using renewable energy fits like a glove, as the plants do not have to produce water 24 hours a day. They can operate when the power is available.

Atmospheric water generators can operate in reasonably low relative humidity. The water produced is roughly a linear graph between 35 per cent and a 100

per cent relative humidity (with all the other atmospheric conditions being the same). That is, roughly about three times more energy is required to produce water at 35 per cent relative humidity than at 100 per cent.

A number of Eskom-powered reverse osmosis plants exist along the Western Cape coastline. These could be changed to be powered by renewable sources.

Cape Town and Port Elizabeth have water shortages. Close to both cities are existing wind turbines that can be used to generate power for reverse osmosis plants.

Even brackish undrinkable water, in certain areas, can be made drinkable with reverse osmosis. What about the acidic mine water under Gauteng, which could also be purified with the available renewable energy?

We South Africans have the ability to make things work.

JD CRAWFORD STILBAAI



Write to us, engage us in debate and you could win a cool prize. In fact, this month we take that literally: our winning letter earns a Little Luxury Vitality water cooler + 3 stage tap water filter valued at R1 550.

LIXUE

Water is on, well, everyone's lips, with

drought and water quality among the biggest threats facing our society. For many, filtering their water has become second nature and with Little Luxury Vitality that process is easy and affordable. It's silly to have bottled water delivered to your house, at huge cost financially and environmentally, with diesel truck emissions adding to the pollution.

The Little Luxury Vitality water cooler is the most affordable true mini cooler. It provides 7 litres of ice-cold filtered water at your fingertips. Little Luxury Vitality cooler filters exceed both the USA and the European standards; they use NSF-certified filters, are tested by SGS France and approved by the FDA.

The 3 Stage tap filter is easy to use, providing healthy great tasting water on tap via to the 3 Stage Silvertech Filtration active carbon cartridge. The guaranteed quality filter has a built in selector switch for filtered or unfiltered. The multiadaptor fits most mixer taps and is easy to install (no plumber needed). It comes with a 1 year guarantee

It's the perfect gift for your bar, desk, kids' rooms, next to granny's bed and on your kitchen counter. Available at Dischem and Makro. To find out more or buy online, visit www.littleluxury.co.za

Send your letter to: POPULAR MECHANICS, PO Box 180, Howard Place 7450, or e-mail popular mechanics@ramsaymedia.co.za Please keep it short and to the point. Regrettably, prizes can be awarded only to South African residents.

DON'T MIX YOUR CLEANING COMPOUNDS

In "The Encyclopaedia of Cleaning" (January 2017), you discuss QACs (Quaternary Ammonium Compounds). QACs are, themselves, surface active agents and form foam when agitated with water. However, they are anti-soaps in the sense that they are cationic soaps as compared to anionic soaps. To mix the two, in essence, nullifies the effects of both. QACs have antibacterial

effects – for example, Cetrimide. This is why when adding Cetrimide to a bath in which ordinary soap is being used, the effect of the Cetrimide is countered and only the antibacterial and cleaning action of the soap has effect.

Any surface acting agent will allow a surface to get "wetter".

KPS CUTHBERT DIP PHARM GEORGE

BUILDING BLOCKS OF SUCCESS

It is claimed that the Stumblebloc (How Your World Works, February 2017) is an effective insulator that prevents heat gain or loss by any house built of it. This approach would be most appropriate in the subtropics.

The counter argument also holds advantages. If the walls are heavyweight, with high heat capacity, they absorb the day-





time heat and release it slowly at night when the ambient temperature drops. This is appropriate for the Highveld, where the diurnal temperature can vary by 20 or more degrees between night and day.

A Boksburg company called Hydraform has adopted this approach. In the 1980s the company approached the University of the Witwatersrand and, with their help, developed a block made of soil (stabilised with about 6 per cent of OPC). The block is loadbearing, unlike Stumblebloc; but like Stumblebloc is shaped to require no mortar because of its interlocking design. Walls of Hydraform blocks have been evaluated for resistance to rain penetration. They have even been subjected to tests for resistance to earthquakes and fire.

The block has been so successful that machines for producing Hydraform blocks have been sold from South America through Europe and Africa into Asia and the Pacific. Houses built of Hydraform blocks have the approval of the Certifying Authority Agreement and a large example of a Hydraform building is the civic centre at Humansdorp.

A more detailed article about this South African development might be of interest to your readers.

PROF JOHN MORRIS (RETIRED)
BY EMAIL

NOTHING BEATS A GOOD READ

I looked at POPULAR MECHANICS on the shelves for a long time and wondered if my teenage computer-addict sons would be interested in reading it. Then, a couple of years ago, I bought them their first copy on our way back from the seaside to keep them busy along the long trip home.

Since then they have asked for the magazine again and again and love what you have in store for them every month. First of all they read Tested and Do It Your Way. Sometimes they really roar with laughter. They read everything (and sometimes reread) and know exactly which issue reviewed what gadget, or what's new, interesting or good news – in point of fact, knowledge that will also be useful in life later on.

Recently I overheard a worried member of the teaching profession complaining about most schoolchildren who are increasingly unable and unwilling to read. In reality their level of concentration is so low they are practically unable to learn. According to him, an entire generation of non-reading people is in the making. And

it's true. Today fewer and fewer people pick up a book or magazine in their leisure time. Schools complain of learning difficulties and problems with concentration. Reading progress often falters. Even Universities and businesspeople are concerned about the catastrophic spelling of school leavers. Now it is certainly not a disaster if someone spells one word wrongly, but when youngsters and adults can no longer express themselves properly, when the English language – the language of poets and philosophers – is so abused, then it is a disgrace.

A magazine like POPULAR MECHANICS links you with so much in the whole world, with past and present, allows you to share strange adventures and experiences, conveys illusions and dreams and gives new ideas. For children, reading at any age is strongly recommended. Reading is always worth the effort. I think you cannot even play games properly if you cannot read. Even if the written word does not have an immediate use for its reader, it does generally have the indirect one of conveying the reader into the wonderful world of the imagination, protecting against boredom and frustration and, not least, making the reader more human. Our consciousness, our world view expands or changes.

I would like to call upon more parents to buy their children this magazine – I really think more children will read then, especially boys! Thank you, thank you for bringing out the South African version of POPULAR MECHANICS. I am most thrilled – my children read it! For sure, digital reading rocks, especially for immediacy. But for depth there is no substitute for a book or "paper" magazine – also think "lazy afternoons"!

Congratulations on a marvellous magazine, which we look forward to it every month.

JACOBA BLOEMFONTEIN

(We're blushing. We're also proud to build on a great heritage and to be able to share it with you. Now, if you don't mind, we've got to go and play with some stuff so we can write about it. – Editor.)

CHISEL YOUR WAY TO SAFETY

On the issue of Ford Kugas bursting into flames, and, in particular, the death of a trapped driver in the Wilderness area. In the latter case, bystanders were wary to approach the vehicle fearing it might explode. For the record, vehicles do not explode like they do in the movies except if they carry an explosive cargo. That aside, and with reports of drivers not being able to open doors due to electrical wires being

burned, and/or the difficulty associated with breaking anti smash-and-grab windows, it makes perfect sense to store a small stone-mason's chisel somewhere in the vehicle. The storage compartment in the driver's door is a good place. Despite the compact size of such a chisel, it is heavy, offers a good hold, and will no doubt make it easier to break a window from the inside of the vehicle in case you are on your own, or surrounded by bystanders who may prefer keep their distance. The chisel can be wrapped in cloth to prevent rattles. (You could also try ripping out a head restraint and using its prongs. – Editor)

MAC VD MERWE BY EMAIL

WHAT'S UP. DOC?

November 2016's Great Unknowns discusses how deep one could drill into the Earth, ending with the comment that Bugs Bunny is unlikely to pop up unannounced in Tia-



nanmen Square. Bugs Bunny never drills through the Earth. He always forgets to turn left at Albuquerque!

ROD KRUGER BY EMAIL

BUY PM, SAVE THE WORLD

I read Popular Mechanics every month and enjoy your articles very much. However, January's issue was so outstanding that I need to thank you for an excellent magazine. "The Encyclopaedia of Cleaning" and "The Truth is in the Muck" were the cherries on top.

A subscription to POPULAR MECHANICS is the perfect gift for anyone and a welcome relief from the world of politicians and celebrities.

SHARON BY EMAIL

GET IT RIGHT DEPT

In From the Editor, January 2017, you say that the wings for the new Airbus A350 are manufactured in Centurion. Actually, all wings for the Airbus are manufactured in the UK. The rear of the fuselage is made in Spain, the front in Germany and the assembly is done in Toulouse in France.

Each of these countries must make a large contribution to the costs of the design of the particular part they will manufacture. I believe the kitchens and seats for the A350 are manufactured in Centurion.

HERCUE DE BRUIN BY EMAIL **PM**



Studying online is huge today, but in 1966 you could get an education by pushing buttons on the radio. Called Educasting, a lesson would last an hour and students would respond to answer questions with the push of a button. The mail-order correspondence that came before was seen as too passive. Through answering multiple choice questions via radio, students could take part in active learning.





The Swinging Sixties was a time when businessmen still had to write everything down. They were always on the go as well, so it made sense to have a briefcase that could turn your steering wheel into a writing desk. How, you ask? Well, when unzipped, the case could fit over a steering wheel and turn into a mini writing desk. The half briefcase, half desk is an invention we could definitely still use today.



Survival never goes out of style. This month, our guide to being self-sufficient is aimed at how to live a more sustainable lifestyle. Our 2007 version had a more apocalyptic view and featured tips on how to independently survive just about any disaster: we fought rain, fire and other natural disasters. We would even have told you how to exist without your smart device, be it iPhone, iPad or Android... except that all of those had yet to be brought to market. We leave it up to you to decide whether they're essential to our survival.

2001

In these high-res days, who else misses the good old days of MP3s? MP3 was the most searched word on the Internet in 2001. Storing and listening to music in this way was still new and exciting. We did a review of the best MP3s in the market



and explained how music was transitioning from CDs to these small portable devices.





TAKE THE HOTSEAT

For crime-busting content that's up your dark and dangerous alley, badge up because it's time to hit the mean streets with Live PD on Crime & Investigation. And for even more dramatic series, why not cruise through Discovery IDx, Fox and Universal Channel.

TRY IT. YOU WILL LIKE IT.

For even more nail-biting drama, why not try:



How to Get Away with Murder, Vuzu Amp, Ch 103, Mondays @ 21h30



Judgement Day: Prison or Parole, Discovery IDx, Ch 171, Tuesdays @ 22h00



Murdoch Mysteries, ITV Choice, Ch 123, starts 21 March @ 20h00



The First 48, Crime + Investigation, Ch 170, Mondays @ 19h10

www.dstv.com

Calendar March Get the most out of your month

WEDNESDAY **MONDAY TUESDAY THURSDAY** SUNDAY **FRIDAY** SATURDAY 3 In 1921, Harry Houdini had his diving suit invention patented. Hobby-X starts at the The master escapologist TicketPro Dome today: created a suit that was your go-to expo for easily removable gadgets, drones, 3D underwater. printing and every other hobby you can think of. 10 The Geneva Until March 14th you can attend the SA Na-International In 1876, Alexander Graham Bell made tional Science Festival Motor Show in Grahamstown. This begins today. the very first teleyear the Scifest will Expect jawphone call. be celebrating the dropping super International Year car reveals. 24th of Light. 12 14 15 18 Happy Pi Day, Yes. The Power & Electricity World Africa exhibition this day celebrates the mathematical constant 3,14159265359. starts at the Sandton Convention Centre. The world's largest one-day timed cycle race, the Cape Town Cycle Tour, takes place today. 23 24 25 19 20 22 It's World Water day. Nineties kids and Between 8:30 pm This year's theme is In 1840, John geeks everywhere and 9:30 pm, switch William Draper "Water and Wastewater". THE APRIL will be heading to the off your lights to took the first **ISSUE** of Popular cinema to see the observe this year's successful photo of Mechanics goes new Power Rangers Earth hour. the moon. He made on sale today. reboot starring a daguerreotype -one of the oldest Bryan Cranston and Elizabeth Banks types of photo-26 28 27 31 The Lighting Show More than 200 dele-It's the start of Africa starts at the gates will convene the Cape Getaway **Sandton Convention** at the Gallagher Show. Expect food, Centre. This event Convention Centre for drink, music and showcases leaders IOT Forum Africa 2017, travel inspiration. in the computer one of Africa's biggest hardware/software and Internet of Things (IoT) electronics goods. conferences.



Alexander Graham Bell's assistant Thomas Watson,

located in an adjoining room in Boston, heard Bell's voice over the then-experimental device say to him, "Mr Watson, come here. I want you." The device had been patented just three days before.



As the Internet of Things

slowly becomes one of the most transformative technological phenomena to emerge in the 21st century, IT executives and business leaders will gather for a one-of-a-kind event. The IOT Forum brings together senior IT executives, service providers, developers and practitioners from diverse fields to engage on this new exciting technology.





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DIMENSIONS TENTS + STRUCTURES



WHEELS?

TOP 12 BEST BUYS FOR 2017

What's the best new vehicle in the market? There isn't one, but 12 of them. CAR's editorial team has selected the best vehicles in 12 categories of the South African market, ranging from the best budget car right through to best performance car, SUV and double cab. The winners list is the product of rigorous testing, discussion and deliberation, because you deserve to have the most comprehensive buying guide at your disposal. Let CAR's March 2017 issue help you choose the best vehicle.

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NASA'S VENUS MACHINE

Inside the Glenn Extreme Environments Rig, you can visit anywhere in the cosmos. BY JOE PAPPALARDO

IMAGINE WHAT IT'S LIKE TO BE A SPACECRAFT. Your service life begins with a violent explosion skyward, followed by a hypersonic struggle to escape Earth's gravity, and, if you're lucky, the reward of reaching the minus-270-degree vacuum of space. Then, after months or, in some cases, years, you might get to land on an alien planet with an environment seemingly designed to melt, corrode, compress or irradiate you out of existence. One particularly lethal planet is Venus, where NASA plans to send a probe by 2020. To make sure the expensive machinery survives the mission, scientists at the Glenn Research Centre, a NASA outpost near Cleveland, Ohio, have been testing samples in a 14-ton steel tank called the Glenn Extreme Environments Rig (GEER). With eight gas streams and the ability to mimic the extreme temperatures and pressures of Venus, it can help scientists find the absolute limits of man-made objects before they face them in space. Here's how it works.

THE VESSEL

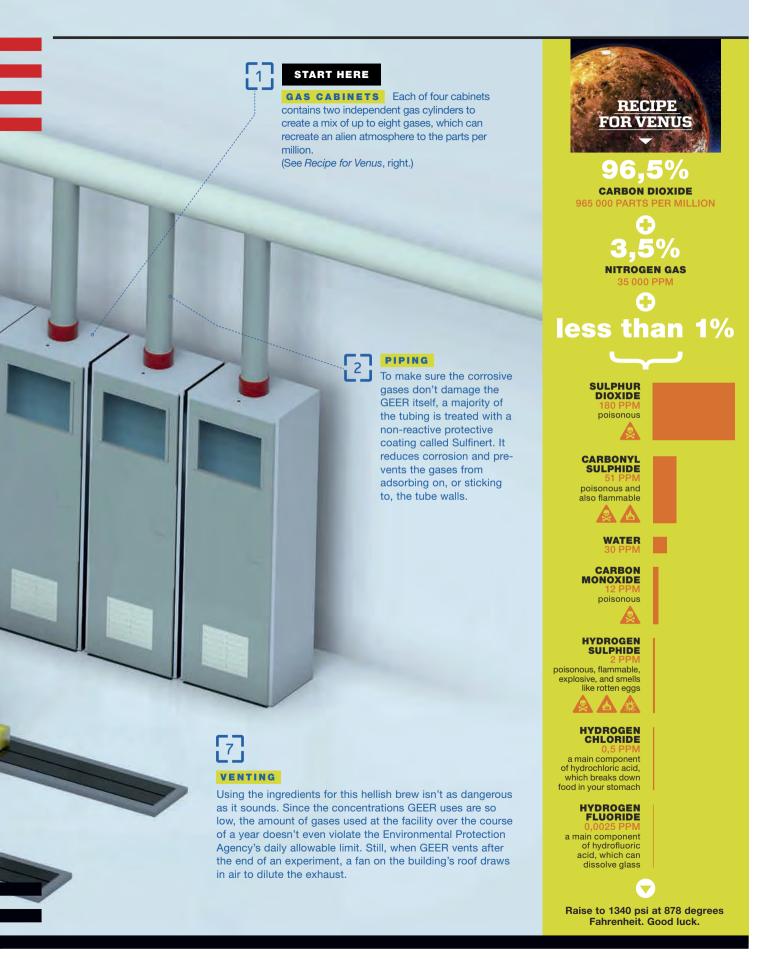
The vessel is constructed of low-carbon 304-type stainless steel, which is nearly tough enough to resist the Venusian atmosphere on its own. In addition, the internal walls are polished to a mirror finish, so that there are no nicks or rough spots to give corrosion a foothold.

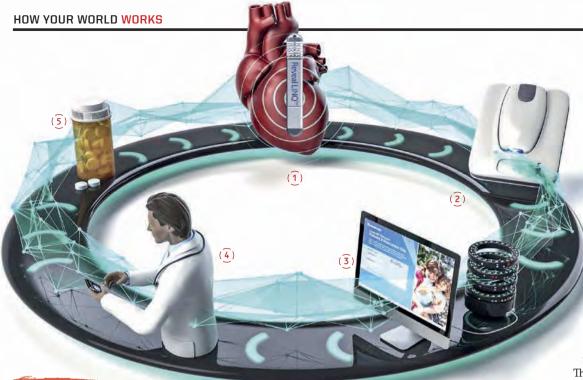
PRESSURE INCREASE

The atmosphere of Venus is primarily composed of "super-critical" carbon dioxide. It's under so much pressure that it doesn't behave like a liquid or a gas, but somewhere in between. Once the gas mix is inside the vessel, the heat and pressure increase to this level, so researchers can find out what it might do to potential probe materials.



meter. In the future, a window will be added to the container, allowing a laser to measure chemical composition and the vessel to remain sealed for the duration of the test.





THE CONNECTED HEART

CARDIOLOGY

A clinical trial heralds the wireless future of personalised medicine.
BY KIRA PEIKOFF

MILLIONS SUFFER FROM ATRIAL FIBRILLATION,

a quivering heartbeat that can lead to blood clots and increase the risk of a stroke by 500 per cent. The condition is currently treated with a lifetime course of continuous blood thinners, which are effective at preventing blood clots, but raise the chances of serious bleeding. Dr Rod Passman, a cardiology professor at Northwestern University in the USA, recently conducted a study with a radically different approach: cardiac monitors the size of a paper clip were inserted under the skin to measure the electrical output of patients' hearts in real time. They alerted Dr Passman with a text message if they detected signs of A-fib. When that happened, he'd initiate a course of next-generation blood thinners that would act just long enough to normalise patient's rhythms. Without inventing a new device or discovering a new drug, Dr Passman's novel integration of the two into an on-demand system stands to transform the way we treat the sick.

POPULAR MECHANICS: So how does this device work?

Rod Passman: Your heart sends out electrical signals, and they can be recorded from anywhere in the body. This implantable cardiac monitor, so small it's actually injected underneath the skin with a special tool, reads the electrical activity and feeds it to a website. When you develop A-fib, the heart rate becomes very erratic. The device sees the irregularity and via the website alerts me with a text.

PM: What led to this new approach?

RP: One piece of the puzzle was the development of drugs that could rapidly thin the blood, and the other piece was that we had to have technology that could provide long-term cardiac monitoring with remote transmission. If we were able to monitor you and let you know quickly, we could potentially thin your blood early and prevent a blood clot from forming, providing the benefits of a blood thinner, with minimal risks.

PM: What did the study show?

RP: In a small group of 59 patients, we reduced time on the blood thinner by 94 per cent. But to show that this is safe, we need a very large study, so we're planning a 6 000-patient trial.

PM: Has this remote monitoring approach been used before to guide clinical decisions?

RP: My study is the first example of using these devices for patient management

REAL-TIME CARDIAC CARE

- 1. The cardiac monitor tracks heart signals.
- 2. A second device uploads the data via cell network
- 3. Patient condition reports are available online.
- 4. If A-fib is detected, the doctor gets a notification.
- 5. The patient is given fast-acting blood thinners until the heart is back to normal.

rather than diagnosis.

The device and drug are
already out there, but we're
using them in a way they weren't
intended to be used. I would say I

didn't invent chocolate, I didn't invent peanut butter, but I invented Reese's Peanut Butter Cups.

PM: My favorite candy. As wireless technology improves, what's next?

RP: The device will communicate directly with a patient's phone. My vision is, just like a diabetic checks their blood sugar and treats themselves, in the future the patient with atrial fibrillation might take blood thinners on their own in response to data from this chip inside their body. Ultimately, these devices will not just see the rhythm of the heart. Maybe they could see things like blood pressure or glucose levels. Tell you whether you've been mobile or not. The potential usefulness of these devices is really quite remarkable.

PM: One day, will we all end up wearing one to monitor us before something goes wrong? Is this basically a Fitbit on steroids?

RP: (laughing) A Fitbit is a toy compared with this. One can envisage it as a long-term health-management tool. The concept of waiting until you've fallen off the cliff to come to the doctor or to recognise a disease after it's got out of control could be obsolete. Think of the efficiency, we could monitor thousands of patients from their homes. We see problems before the patients see problems.

PM: Sounds like a new paradigm that's still far away.

RP: It's a lot closer now than ever.



THE SCIENCE BEHIND THE STAGE

Cutting-edge 3D visualising software gives stage designers an unprecedented virtual preview

FOR YEARS, SOUTH AFRICAN AUDIENCES have bemoaned the quality of our televised awards shows and concerts. From the sound quality to the lighting, we've often harshly (and sometimes unfairly) compared our local shows to their US counterparts. But thanks to some amazing technology, a Cape Town duo is changing the way live shows are produced and giving our entertainment industry the type of quality productions it deserves.

Gareth Hadden and Grant Orchard are the brains behind Formative, a production company using innovative design and smart technology to produce some of our biggest shows.

Formative's first big gig was *Skouspel* in 2014. Since then they have worked behind the scenes on both of Cassper Nyovest's spectacular *Fill Up* concerts, the 2015 and 2016 MTV Africa Music Awards and Anatii's 2016 Album tour featuring American singer, Omarion.

Formative is the only stage and production agency in South Africa to utilise 3D stage visualising software called d3. Before a live show, all artwork, dimensions, time codes and specifications are directly fed into d3. The programme then correlates all the information and queues the mechanical as well as visual elements into one continuous timeline.

d3 is the world's first integrated video production suite. Based around a real-time 3D stage simulator, it is the single solution needed to design, present, communicate, sequence and playback shows. "We can actually watch each performance in our studio before we have even built the stage," says Orchard, creative director of Formative.

"When we get to the site, we simply plug in the system and watch it unfold. It takes about two months for us to put a show together so on the day, we try to do as little as possible."

To get the best out of a performance, Formative run the tracks via timecode so every-





thing can be synchronised to perfection. The team get the guide tracks from the musical director of the show and add a timecode layer.

D3 works at a push of a button. The keyboard player on stage, for example, will push a key to get the programme started and do the same at the end of the show.

With the help of Formative, Cassper Nyovest became the first local artist to fill up Johannesburg's TicketPro Dome. The following year he filled up the city's Orlando stadium.

"Fill Up Orlando was a first for South Africa as the set continuously metamorphosised, seamlessly transitioning from one song into the next over a



Above: Gareth Hadden and Grant Orchard, founders of Formative before a show. Left: Formative's stage designs have wowed crowds at Cassper Nyovest's Fill Up Orlando stadium concert last year and (below) at 2014 Skouspel. Bottom: The D3 system set up backstage at a show. The guys man the system to make any last minute tweaks during a performance.

two-and-a- half-hour process," says Orchard. "Traditionally, concert stage design is quite symmetrical. But that wasn't what this concert called for. Suspended, monolithic LED screens asymmetrically flanked a revolving, mirrored stage on which Cassper performed from throughout the concert. The results were both functional and captivating; the audience were never aware of actual set changes, but rather emotive transitions from one song into the next."

Formative is constantly watching and learning from its international counterparts. "The quality of custom content created for South African stages is improving, but there is still a lot to learn. That said, I know that we can do anything they can do in Europe or America."

It's a common misconception that only large budgets can produce incredible performances, says Orchard. "Certainly, a large budget does allow for more scope in general. But it's using resources skilfully that really makes the greatest impact."

Formative's line of business does not give second chances. Everything is live and under immediate scrutiny, so they have to deliver perfection as soon as they press play.

Hadden and Orchid say that d3 is largely how they have been able to deliver show after show without a noticeable hiccup. "What is important to us is creating moments, and d3 has definitely helped us achieved these moments, moments that will stay with the audience forever."



ME AND MY TECH

POPULAR MECHANICS has hunted down some of South Africa's busiest and most successful people to find out what tech makes their lives easier.

Lalla, we understand that you have a very busy life; where do you get the time to work out?

A It's true, I'm always on the go, dashing to appointments and shoots, but that's exactly why I have to make time to exercise and keep my body in shape. Fitness is extremely important to me and I follow an intense workout schedule to make sure I maintain progress and keep pushing my limits.

How do the TomTom Cardio Spark and Music Watch make your life (and workout) easier?

For me, a workout device really has to fit into your lifestyle so the TomTom Cardio Spark was an easy choice.

It tracks my sleep, heart rate and movements and with a built-in GPS my workout whereabouts are easy to monitor.

It comfortably houses my music and the durability of the device allows me to push myself to my next level.

How long have you been using your TomTom?

A couple months now, I decided a workout device was a must when I started training for the Soweto Marathon last year.

Do you wear your TomTom only when working out or is it something that you have on at all times?

I try to wear it for as long as possible because it really helps to monitor my movements; however, it doesn't quite match my evening gowns. Maybe TomTom should look into that.

Why this particular fitness tracker? What about it makes it special for you?

I was in search of a device that did it all. The Cardio Spark accommodates my music and fitness tracking needs, but what really stood out for me was the wide variety of training options from the watch. Running is great, but I also incorporate other forms of exercise to keep fit and toned; this watch easily adapts to my workout and feeds back with accurate data.





TV Presenter, model and dancer who has been on our screens for more than ten years, the fitness fanatic Lalla Hirayama. She tells us why she can't survive without her TomTom Cardio Spark watch.



What type of music do you listen to while working out?

I'm pretty open in terms of work-out music as long as it's high energy, but at the moment hip-hop is what keeps me going.

Would you say that having a fitness tracker motivates you to exercise?

Absolutely! This watch also allows me the option to race against a previous run on familiar routes, which I love because I'm always trying to beat my best.





JUST SAY SKOL

How a spirit from 16th-century Norway made its way to Montana. And why it should be in your glass.

BY FRANCINE MAROUKIAN

A VIKING BOAT MAY NOT have been able to make it to Montana, but that doesn't mean the Scandinavians couldn't. Along with the US Homestead Act of 1862, which gave settlers 160 acres of land for a small fee and a commitment to live there for five years, the extension of the transcontinental railroad across North America helped Scandinavians migrate to the agricultural frontier of Montana. Today their Nordic heritage remains embedded in the folkways of the Northern Great Plains, so much that it demanded a familiar and hard-to-find drink: "We started making aquavit on request from the local fraternal order of the Sons of Norway," says Ryan Montgomery, co-founder of Montgomery Distillery in Missoula. "And we continue making it not only because we sell out, but because aquavit has significant ties to the culture and climate of the region." Montana's nutrient-rich volcanic earth and abundant snow-

melt provide the exceptional grain and water quality that aquavit relies on.

Aquavit is a traditional spirit distilled from potato or grain mash that has the predominant flavour of caraway (the taste you think of when you think of rye bread), a botanical related to parsley and coriander. It's finished with aromatics such as lemon, fennel and cardamom, resulting in a drink that is savoury and yet fresh, almost minty; - a counterbalance to the salty preservation methods (fermentation, smoking, curing) necessitated by Nordic winters. The aquavit process is a straightforward double distillation. Montgomery uses a 100 per cent non-GMO hard red winter wheat strain called War Horse, grown on his grandfather's farm, which is now tended by his parents. The wheat is mashed with hot water and fermented at a temperature that allows the yeast to digest the sugar. If the temperature gets too

hot, cool water is run into the fermenter's exterior stainless-steel jacket. "When the yeast has eaten all the sugar, what you essentially have is beer," Montgomery says. "The first distillation is a stripping run, not a flavour-determining run. It is just about getting the alcohol out of the beer as fast as we can." The result, called low wines, is about 25 per cent alcohol by volume.

The second fractional distillation, done in a 21-plate copper column still, cuts the spirit to a specific proof and creates a clean canvas – basically like vodka – for the addition of the botanicals. "We return the spirit to the pot still and give it a last run to create vapour infusion," Montgomery says. As the vapour rises, it passes through a cheesecloth bag of aromatics suspended on a metal grate before being recondensed as flavoured aquavit, cut with filtered water, and bottled at 80 proof.

"Making aquavit is our chance to introduce something with great history that is still new to most Americans," Montgomery says. The traditional way of drinking aquavit is straight and ice cold in small glasses – and never without first toasting your tablemates by saying, "Skol". Additionally, Montgomery says, "We substitute it for vodka in our Bloody Marys and other craft cocktails." It tastes good with a little curaçao in a daiquiri, too.

THE SPIRITS



aquavit
Predominantly
caraway, with
fennel, dill and

a hint of citrus.



aquavit
Muted caraway
and dill plus
caramel and
toffee notes.
A slight spice
from the rye
barrel.

finished

Skadi



THE DISRUPTORS

TRACKING FORWARD

Locally built gym management and athlete performance tracking application Boxchamp is spreading beyond our borders. Lindsey Schutters caught up with creator Mark Fawzy.

THE STORY BEHIND BOXCHAMP'S inception is as simple as it is brilliant: "My logbook got wet in my bag," explains Boxchamp founder Mark Fawzy. Recording accurate data is a common problem in gyms around the world, but more so in a CrossFit box because the founders leverage the human competitive spirit as one of its drawcards. Scores go on a whiteboard after each workout. It's gamification at its most simple, and it's very effective. "We launched with WOD (workout of the day) and slowly built the management as gym owners requested functions."

In the initial stages Boxchamp was nothing more than a glorified spreadsheet. I know, because I'm a member of the first CrossFit box to adopt it, CrossFit DurBell. We didn't like it because the old system was brilliant.

"That move is easier said than done when you don't have everything in place. Obviously, since then we've developed slicker transition methods to sync data," Fawzy explains. "The same people who were complaining when we first moved are giving us compliments now."

Boxchamp serves two masters: athletes and gym managers. On the athlete

side, it's all about capturing training data like repetitions and times, whereas on the management side it's payment methods, contact forms, class bookings and scheduling. To date the platform serves about 70 per cent of the CrossFit

boxes in South Africa and has since expanded to the UK and Asian territories. But rapid growth has brought a few complications.

"It's a good thing to be naïve because launching a start-up is challenging. The less you know, the better. I probably wouldn't have started if I knew the challenges," he says. There was a small security breach in early 2016, but that was a blessing in disguise because it forced the team to look at security and

ACCOUNT LOGIN

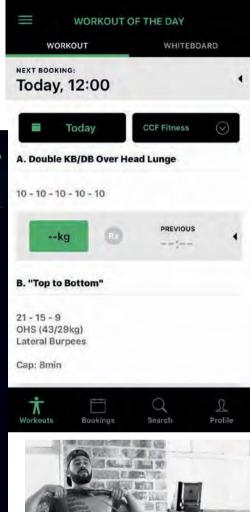
Email

Password

LOG IN

Forgot Password?

"THE WORLD IS MOVING AND TECH IS INEVITABLE,
I BELIEVE THAT TECH MAKES LIFE EASIER. YOUR
TRAINING BECOMES MORE EFFICIENT WHEN YOU
HAVE ALL THE DATA INSTEAD OF WASTING TIME
WORKING OUT WHAT YOUR LAST LIFT WAS"



add AWS encryption and give administrators one-time pin codes.

All development is outsourced and the service has matured to manage customer acquisition and facilitate more coach/athlete communication. Mobile apps have been a big drawcard.

"The only frustrating thing with Apple (app store) is that it takes two to three days to roll out an update after we have released it to them. I understand the thinking behind it because they review every update you send, but if there's a bug that needs to be fixed then it takes longer," Fawzy explains.

The CrossFit community is still growing in South Africa, so the Boxchamp team will expand its traditional footprint. Other fitness facilities have jumped on the wagon and there's a rumoured partnership with a wearables company that will result in live tracking and sync from the gym floor. Fawzy was reluctant to expand on this, beyond confirming the rumour.

THE CONFIDENT TRAVELLER

IGITAL LIFE TAKES FLIGHT

ADDING VALUE TO THE FLYING EXPERIENCE WITHOUT ADDING SIGNIFICANT COSTS BY ANTHONY DOMAN

VIRTUAL REALITY headsets, e-books, pre-flight online duty-free shopping and talking lunchboxes are just a few of the innovations on offer as the Lufthansa Group makes 2017 its year of digital. (Well, the "Smart Box" doesn't really talk: by interacting with a smartphone app, travellers can learn their meal's ingredients, allergens, recipe and even eating and shopping tips for their destination.)

This emerged from the airline group's first Digital Aviation Forum, held in Frankfurt towards the end of last year. The world's biggest airline group, measured in turnover, its members include Lufthansa, SWISS. Austrian Airlines, Eurowings and service companies such as LSG Skychefs.

The digital forum showcased 29 innovations developed in-house for the leisure traveller, corporate traveller, travel management companies, and even pilots and crew. The list includes prepaid SIM cards, a wide selection of e-books and Web surfing on short haul and mid-range flights.

Pre-order duty free. Group members SWISS, Lufthansa and MyAustrian have developed a system that allows passengers to browse, order and purchase items from the entire on-board duty-free catalogue before their flight. Orders are delivered to your seat

Personalised service via big data analytics.

A programme is in place to provide travellers with tailored and personalised products, services and communication, focusing on their needs along the entire customer journey – not just the flight. A specially designed IT infrastructure based on Big Data trends and Analytics, paired with the most modern data sources, provides the background to how the group



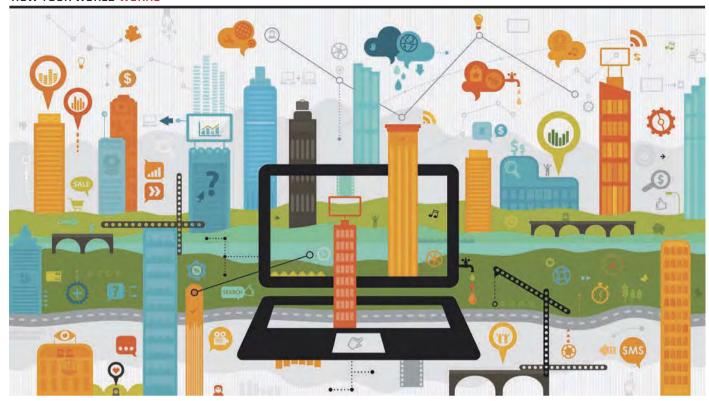
theatre, the Avegant Glyph to your personal space allows travellers to view their favourite entertainment with top-class audio and in HD clarity. The VR headset plugs into any HDMI-supported device and allows watching or streaming any type of existing media, including an immersive 360-degree experience and side-by-side 3D.

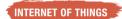
Other innovations include a virtual cabin tour, an allergen app that makes meal choices easy for those with allergies, and a customer service app. You'll also be able to indulge in a whole new world of in-flight shopping via on-board iPads coveing direct sales, pre-ordering, cross selling, ancillaries and seat upgrades.

"Digitalisation is changing the way airlines and partners to the airline industry work, and continues to make the travel experience better, more efficient, and more enjoyable," says Lufthansa General Manager

"(Although) many of these innovations may not yet be available on flights to and from South Africa, we are confident that constant innovation and adoption of digitalisation by airlines within the Lufthansa group, as well as within other airline groups will happen, and happen sooner that what many would expect.







GROUND CONTROL

The Internet of Things is a being mobilised on a grand scale. Gemalto is helping facilitate these connections while also upping the security of the network.

IN THE FUTURE, you'll reach the intersection at the end of your road. It's a blind turn. You can't see what's coming. Your car will know, though. Because it asked the stop sign about the traffic conditions. That request is a packet of data that will wake up the smart stop sign. The sign will then ask the network of cameras for an answer, interpret the information, relay it to your car and go back to sleep. Until your neighbour sends the same request.

At the heart of this transaction is the data communication hardware. Gemalto, digital security specialist, believes that its latest Cinterion EMS31 module is the future of machine-to-machine (M2M) communication. The company can't be wrong, because it's the first commercial outing for the LTE Cat M1 chipset, which caters directly for low-power, wide area applications. Gemalto's M2M and IoT solutions manager for Africa, Mark Warren, explains its significance.

"LTE is about high-speed data, but machine-to-machine or machine-type communication doesn't require such high data speeds. Category M1 is a speed that sits in between 3G and 2G, which is very appropriate for M2M communication. Generally speaking, when machines talk



2G and 3G networks in South Africa will soon – about five years – be re-farmed as LTE, meaning the existing 2G hardware will need to be replaced.



Mark Warren is one of the leading minds in the Internet of Things.

to each other, they exchange packet data. The important thing is how long the solution can be deployed. It may be an installation sitting in a remote location for 10 to 12 years; our solution can be deployed for that time. And the way we support them is through over-the-air applications and firmware via over-the-air application."

The applications the solutions are deployed into can vary from track and trace equipment to home security and point-of-sale terminals that run off battery storage. Our solar-powered smart stop sign is a prime candidate for this technology.

"Any sensor that you would want to connect via secure GSM data is a good candidate for

this module. The only exclusion is for high-speed data like live video streaming. One of the other features of the module is that it has a fall-back position to 2G. So, when you're deploying in an area that doesn't have LTE yet, it will work on that network. The 2G coverage in South Africa is very broad and when the networks re-farm their spectrums, the hardware will still be compatible."

Another plus for Gemalto's latest module is the boot time from deep sleep. The one-second wake time, down from the industry standard 15-25 seconds, saves significant power and improves responsiveness.

On the security side, the EMS31 is equipped with RLS monitoring for jamming detection that will send an emergency signal if there is an attempted jamming.

Developers will be pleased to know that the EMS31 is compatible with Gemalto's Sensor Logic, which will grant access to APKs and existing code for the module application.

"There are two separate categories of these sorts of modules. One is an unlicensed, encryption-based service called LoRa (low range, low power consumption) which works in a similar way to banking cards with encrypted handshakes; and NB-IoT, which is a GSM standard that works on the 3GPP security standard, which we think is much stronger. But really, the difference between the two is that one is a licensed standard and the other is in the open and in the public spectrum. If everyone jumps onto the LoRa spectrum, it will get very busy very quickly and the performance of your service will run the risk of not being optimal."

ONLINE SECURITY

Gemalto's international online security survey* had some interesting results

59% of social media users think that it poses a security risk.

29% of adult internet users believe companies are taking the protection of their personal data very seriously.

59% of consumers fear that they will be victims.

Over half (53%) admit they tend to use the same password across at least some of their accounts (bank, online retail accounts and social media accounts), with over one in ten (13 per cent) stating that they do this for all of their accounts.

One in four people who use online retail accounts say that all of the online retail apps/websites they use require two-factor authentication to secure online transactions.

59% of respondents who use social media accounts say that they use two-factor authentication to secure all of their social media accounts.

While one in two (50%) report that they do not use it for any.

The majority of consumers who currently use the following say they would stop using a retailer (60%), bank (58%) or social media site (56%) if it suffered a breach, while 66 per cent say they would be unlikely to do business with an organisation that experienced a breach in which their financial and sensitive information was stolen.

*Survey had over 9 000 participants



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gamut, the display is remarkable for an LED; apparently it does pay off to have glaredissipating trickery. But while those black scales do a good job of ambient light cancelling,

Animation on this display is a treat thanks to brilliant upscaling, but native resolution content can be ever so underwhelming. And I must admit I didn't think I would ever adjust to this screen size. Still, it has since taken preference in my domestic life. Thanks a lot,

Anyway, I know QLED is coming so maybe I should bide my time. (The smart move here

Back to the TV set. Oh yes, it really is a treat. Surprisingly, over the course of this review my Internet connection rarely missed a beat. Disappointing, then, that the TV's Netflix app kept on hanging. My alternative was to access it on my Apple TV. That brings me to my next point and this really is the biggest highlight: Samsung's one-cable system. You plug in all your devices in this box that you then put out of your sight.

The one-cable system – okay, two, because the power cable is still separate – is paired with automatic device recognition on the TV set. It works like magic because you use only one remote and Samsung's is one of the best.

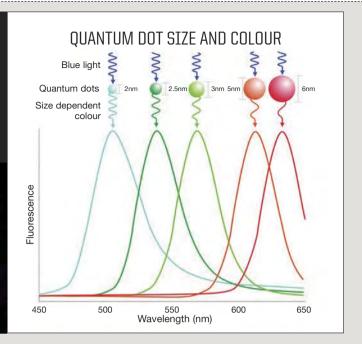
A side note here to explain the genius of the remote design: you see, most smart TV owners have already resigned from terrestrial TV and the number keys have less reason for existence. So, much like a set-top box, the device is more direction-key-oriented.



OUANTUM LEAP

Quantum dot displays rely on nano-particles between 2 and 10 nanometres in diameter. Particle sizes affect the way the dots display light; the biggest particles appear red and the smallest blue. Displays then don't need white pixels and can display more colours. This also enhances peak brightness and provides a greater range of tones (difference between shadow and bright bits), enabling HDR and Dolby Vision.

Colour accuracy is a hallmark of quantum dots because the particles display very precise colour and can be controlled far more accurately on an atomic scale. Combine that with local dimming zones and you have a recipe for excellent picture reproduction.



JUST THE FACTS

Samsung 55" SUHD Curved Series 9

RESOLUTION: 3 840 x 2 160

SPEAKERS: 2 x 20 W and 10 W woofer;

front-firing

CONNECTIVITY: Wi-Fi, Bluetooth, ethernet,

4x HDMI, 2x USB, 2x AV

PRICE: R32 000, samsung.com

Going back to the display: the colour preference profiles are quite breathtaking. Watching HDR content is visual stimulation of the highest degree. Quantum dots ensure that the colour spectrum is highly nuanced RGB, with a depth and dynamic range that's astonishing. And it's very refreshing to have no gimmicks and goggles for 3D.

Speaking of quantum dot displays; I must confess that I have been a little harsh, maybe, on LCD's leading technology. The difference is quite stark compared to its competitors.

Hisense runs it close with ULED, but SUHD pulls far ahead and really gives you more.

Improvements on the technology have come thick and fast recently. Samsung have added metal to the nano-particles for better conducting. The Korean company took the wraps off its new set at CES and named it QLED.

While the rest of the market has moved away from curved displays, Big Blue still believes in making TVs in this way. Well, as long as you're not sitting directly next to it, you'll be okay. But it's best to wall-mount this unit so that it doesn't fall and break.

So now I am a convert to the larger TV real estate. Fifty-five inches is still huge for me, if normal for many in this day and age. But my overall experience was quite great. Audio performance also tops the charts for TV sets, but the real magic is in the connectivity options, with Wi-Fi and Bluetooth not standard on many TVs yet.

If you're in the market and have about R30 000 to spare, you can't do too much better out there. And it's not just about features, either: when you take an SUHD home, you get treated like a king. Gloved installers come out to set you up and help with the unboxing. There's great tech support, aftermarket service and regular software updates, and they can answer any relevant line of questioning.



TEST NOTES

Again my children demanded touchscreen abilities, and again they were disappointed. The only downside of the one-cable system is that you need to first switch the source before turning off a device, if you were wanting to watch a different device. Switching off a device while it is the viewed source will turn off the TV. Lack of 5 GHz Wi-Fi support was a source of much irritation because I run my streaming on that band for less interference.





Adidas Supernova Glide Boost 8 strikes the balance between stability and flexibility, getting our 110 kg runner through the heavy mileage of half-marathon training.

BACK ON THE BUS

Our man is getting back to peak fitness and is trying every gadget and piece of gear to help him get there. BY LINDSEY SCHUTTERS

THEY DON'T TELL YOU that starting was the easy part. Much like when you land your dream job and the interview was the least of your worries. The hard part creeps up on you quite suddenly. Halfway up a steep hill, your leaden legs scolding you and your lungs on fire, but you're too far to turn around; that's when you find out what you're made of. That's when you discover that the pain cave is real.

You learn to love it, but only after it's taken everything from you. Novices suffer more because of ignorance. You go running with too much gear, your nipples bleed, you cramp up, you get the skits and you get blisters. Take only what you truly need, use plasters and avoid cotton, keep the electrolytes topped up, avoid sugar and get proper shoes and socks.

While the properties of ethyl-vinyl acetate (EVA) have remained largely unchanged over the years, manufacturers have always been tinkering with shoe structure to gain an edge. Reebok kicked off the energy return trend with its Energy Return System (ERS) back in the

EVA typically returns roughly 50 per cent of the energy exerted on it through rebounding to its original form. Boost cushioning returns about 70 per cent. The only problem with those numbers is that the testing mechanism involves dropping a weighted ball directly on the cushioning.

TEST NOTES

Transitioning from minimalist shoes to something with more stability was difficult at first, but the Boost cushioning more than made up for the loss of flexibility. The TechFit upper is very comfortable, but Adidas has gone narrower in the toe box so you'll need a half-size up.

'80s. What the company did was run hollow tubes of DuPont's Hyrtel down the length of the shoe to take full advantage of the substance's tendency to return to its original form. The marketing explained how the system released stored energy back to the athlete at the right moment.

In 2013, Adidas released its Boost cushioning, a game changer in the athletic industry. The company called on chemical specialists BASF to cook up a foam that represented a quantum leap in midsole innovation. What came out of the cauldron was thermoplastic polyurethane foam capsules, heat-sealed together. The overall compound was more durable, consistent and handled extreme temperatures far better than EVA. Adidas commissioned a study that concluded that runners using Boost were using one percent less oxygen on average.

Where Boost really shows off an advantage is weight. "For every 100 grams of weight added to a shoe, the energy expenditure increases by one per cent," says sports scientist Dr Ross Tucker, in referring to energy use in distance running. With air pockets central to energy recovery foam technology, the midsoles are getting lighter and, when combined with the favourable energy recuperation, there's a reasonable argument to be made for the superiority of these new foams.



Set one up as little as 30 centimetres from the wall for a picture that fills the room.

A / ASUS ZenBeam E1

MAX IMAGE SIZE: 120"

PORTABLE BATTERY: Yes, 5 hours LIKES: Despite weighing less than a kilogram and having a footprint the size of a smartphone, the E1 is bright enough to use even in some ambient light. The speakers can also get quite loud. Adjustments are intuitive, and the metal shell looks more elegant than the plastic on many other projectors.

DISLIKES: Doesn't project in HD. The keystone correction sometimes inexplicably and annoyingly readjusts the image.

PRICE: R4 500

B / Sony LSPX-P1

MAX IMAGE SIZE: 80"
PORTABLE BATTERY: Yes, 2 hours
LIKES: Beautiful design, good
colour, and passable built-in
sound. We really liked the wireless
aspect: plug the hub into a source
– your cable box or computer – or
connect via Wi-Fi and stream from
your phone or tablet, and you can
place the projector nearly anywhere.

DISLIKES: At 720p, the image starts to soften when you project larger than 60 inches. The bulb isn't strong enough for the picture to be seen in anything but a dark room.

PRICE: R15 000 (US)

C / LG PH450U

MAX IMAGE SIZE: 80"
PORTABLE BATTERY: Yes, 2,5

hours

LIKES: Although the built-in speaker is tinny, you can connect a UE Boom or other Bluetooth speaker for better sound, with a lag so small you won't really notice it. Good colour, and the room doesn't have to be

completely dark to see the picture. **DISLIKES:** Wireless connection works only with Android or Windows machines. **PRICE:** R10 000 (US)

D / CASIO XJ-UT310WN

MAX IMAGE SIZE: 110"
PORTABLE BATTERY: No
LIKES: At 3 100 lumens, the Casio
provided the brightest picture of

provided the brightest picture of our test, with a built-in speaker that sounds as good as any. Focus is controlled with an easy slide lever.

DISLIKES: The combination laser/ LED light source is supposed to hold its brightness over time better than a traditional bulb, but it made for a slightly grainy picture.

0

PRICE: R34 000



GREATESTUFF

2017's TOP CONSUMER TECH TRENDS

CONSTANT COMPANION

Artificial intelligence is making your gadgets more personable

Kuri Robot Nanny

Bosch startup Mayfield Robotics took the idea of the smart assistant from static speaker to mobile droid. Kuri will busy itself with the complex task of learning the rhythm of your home, eventually reaching a point where it can wake you at an appropriate time and then track your movements while playing your chosen playlist via Bluetooth. The company claims to set itself apart by adding genuine personality to tech, expressed in a range of eye and head gestures alongside beeps and chirps.

It's essentially a Bluetooth speaker that is connected to the internet and is equipped with wheels and sensors so that it doesn't go tumbling down the stairs or crashing into things like a drunken toddler. We're still very much in the infancy of mass droid deployment, but at least we've moved away from glorified vacuum cleaners.

Lenovo Smart Assistant

If you think that Lenovo's engineers wanted to combine the Google Home's colour schemes with Amazon's Alexa smarts, you won't be too far off because that's kind of what you're looking at. Harman Kardon is on acoustic duty, so this is a speaker with style, brains and substance.



Mattel Aristotle

It's a baby monitor that can intelligently respond to your child's needs. Does your kid need a nightlight? Aristotle's got it covered. Baby fussing in the middle of the night? Aristotle has the soothing tones. A maths homework question you can't answer? Just ask Aristotle. Voice

search is powered by Microsoft's Bing and Cortana and Nabi (the company that developed it for Mattel) promises future updates.



TVs GET FLATTER THAN EVER

Curved is dead and so is integrated electronics, kind of



Sony A1E

The Japanese electronics giant has officially jumped on the OLED bandwagon. What's interesting is that it still retains the excellent Bravia qualities, even upping the audio ante by reverberating the audio vibrations through the screen, called Audio Surface. Xiaomi tried this trick with the Mi Mix to (ahem) mixed responses.



LG W7 OLED

Show-stopping, jaw-dropping and impossibly thin, the next generation of LG's celebrated (especially in this publication) OLED TV moves all the sound making and electronics to the sound bar, leaving you with a super-slim panel to mount flush on your wall. It's truly a piece of technological magic that needs to be seen to be believed.

The key to the slim design is the organic light-emitting diodes that make up an OLED panel. Since you don't need backlighting, companies are limited only by imagination. This is one step away from the roll-up TV we've been promised. That's a good thing.



Samsung QLED

Just when you thought Samsung had taken the LCD panel as far as it can go, the manufacturer went and added metal to the quantum dots. In short, quantum dot displays use nanoparticles that react to specific frequencies of electric current and allow precise colour control as well as increase the range of hues which can be displayed. These artificial atoms are, to our knowledge, the only thing still keeping backlit display technology in the fight. The one cable system also gets a significant update, now that the power cable is integrated. Just a pity Samsung is clinging to the curve in some models.

GREAT NEW STUFF

GAMING GOES MAINSTREAM

Powerful laptops have a new pied piper: competitive gaming



Samsung Odyssey

A little known fact to people outside of Korea is that Samsung sponsors some of the leading League of Legends eSports teams (Samsung Galaxy White and Samsung Galaxy Blue), so the marketing clout behind its latest Odyssey brand of gaming hardware is quite significant. Design considerations around the trackpad aside, this machine can be specified to run against some of the best custom builds in the world.

Lenovo Legion Y720

The Chinese PC maker's market domination on the African continent is quite significant. Now it has a new, shiny, overdesigned range of gaming hardware to send our way. All the market segment hallmarks like customisable LED strips, enough plastic to make Caitlin Jenner blush and a hardware specifications sheet that could power a small city. Welcome Lenovo.

Asus VivoPC X

Shying away from the portable consumer, Asus has managed to scale down the over-engineered opulence of the desktop gaming machine. The toneddown tower conceals the graphics power of an Nvidia Geforce GTX 1060 and a Kaby Lake Intel Core i7, which will discreetly drive most VR systems. Being certified Oculus-ready will help ship these by the thousands.



Acer Predator 21 X

On the other end of the spectrum comes a seasoned veteran of the gaming space with a fresh "bigger is better" approach and a gigantic 21-inch display. While it's not clear why this is sold as a laptop and not an all-in-one

desktop, you can imagine the advantages of such extreme screen real estate.



QUICK TAKES

The tech you'll actually buy this year





Earin M-2

The original truly wireless earbuds are back with better battery life, a smaller and lighter design, as well as better algorithms for noise cancelling and piping in ambient sounds.



Asus Zenfone 3 Zoom

All the iPhone 7 Plus zoom and wide angle lens trickery, combined with phase detection and laser autofocus, a bright f/1.7 aperture and a cheaper price point. Yes, please.



Come on, who doesn't need a 2 TB flash drive? The obvious answer is those people who don't own the requisite USB 3.1 port to plug it into. But your series collection just got more compact.



Moshi Arcus

Pair those headphones with this amazing multifunctional backpack. Crushproof camera compartment, easy access to your gadgets and understated design? This one has it all.



Lego Boost

is the end of the road for MindStorms, but it does seem like it. Turning your Lego creations into functional robots just got a whole lot easier with the interface resembling MIT's Scratch.

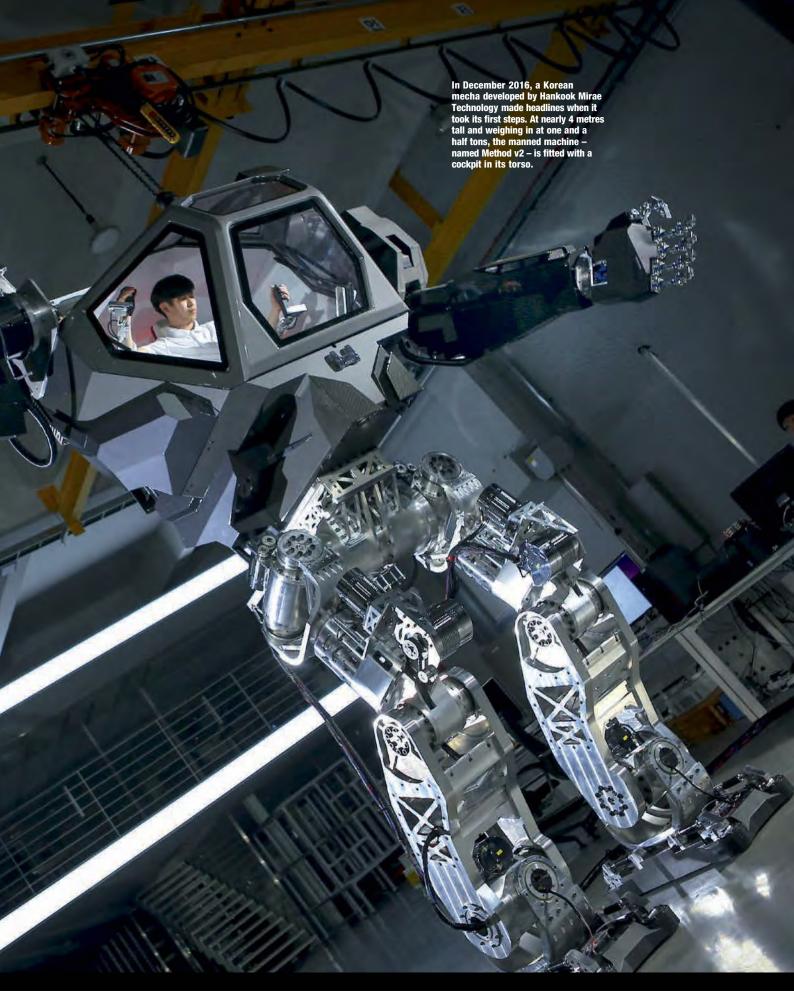


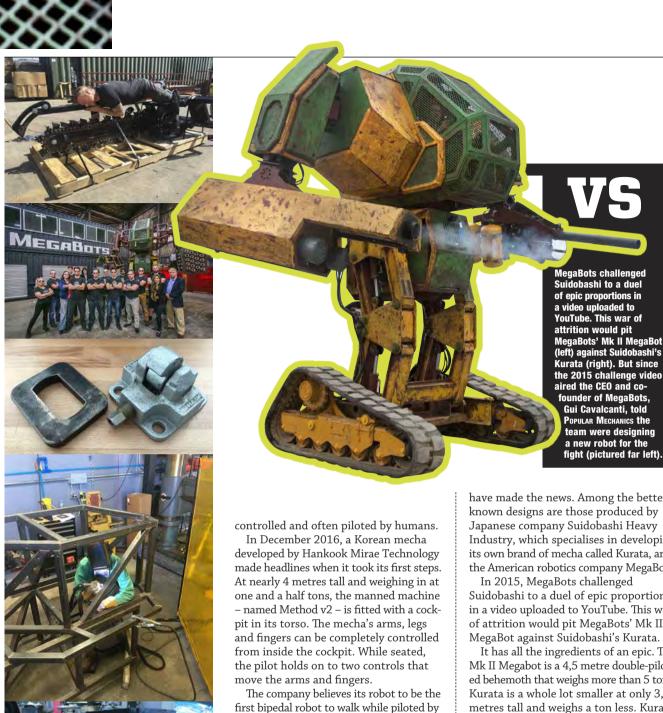












first bipedal robot to walk while piloted by a person in the cockpit. "So far, no other company in the world has produced a similar giant biped walking robot. I'm proud that our technological competitiveness is already the world's best," Yang Jin-ho, the chairman of Hankook Mirae Technology told Korean news agency Yonhap in an interview.

But don't be fooled: this robot is not a toy. Yang told Yonhap he hoped to deploy Method v2 to help decommission the wrecked structure of Japan's Fukushima nuclear power plant. And Method v2 is the tip of the iceberg. The company promises to unveil an even more advanced version of the robot before the end of the year. The new model will, appropriately, be named Mecha.

In recent years, similar piloted robots

have made the news. Among the better known designs are those produced by Japanese company Suidobashi Heavy Industry, which specialises in developing its own brand of mecha called Kurata, and the American robotics company MegaBots.

In 2015, MegaBots challenged Suidobashi to a duel of epic proportions in a video uploaded to YouTube. This war of attrition would pit MegaBots' Mk II MegaBot against Suidobashi's Kurata.

It has all the ingredients of an epic. The Mk II Megabot is a 4,5 metre double-piloted behemoth that weighs more than 5 tons. Kurata is a whole lot smaller at only 3,8 metres tall and weighs a ton less. Kurata - named for the company's CEO and founder - carries a single pilot. Still, size isn't everything, as David seems to have demonstrated in his rather one-sided Biblical match-up with Goliath.

In accepting the challenge, Suidobashi CEO Kogoro Kurata said: "We can't let another country win this. Giant robots are Japanese culture." Sadly, the battle has not yet taken place, but MegaBots have confirmed it is still on. Although no date has yet been set, the company is building a specially designed Mk. III for the battle with Kurata. We'll keep our eyes peeled. If for no other reason than the prospect of full-scale mecha battles a la Robot Wars could be just the thing to distract us from the unseemly grappling of public figures trying to score political points.

THE FIRST MODERN ROBOT

The world's first digital and programmable robot was invented by George Devol in the early 1950s. The robotic arm, called Unimate, was sold to General Motors in 1961 for use in the Fisher Guide Plant in New Jersey. Unimate was used to lift die-castings from machines and welded vehicle bodies.



AT YOUR SERVICE

Robots are by no means a modern invention. The earliest mechanical servant is credited to the 11th-century Chinese polymath Su Song. In the city of Kaifeng, one of the eight ancient capitals of China, Su Song built a hydro-mechanical astronomical clock tower.

The clock tower – a 12-metre pagoda-style structure with five levels – was powered by water and fitted with a specially designed escapement mechanism to tell the time accurately.

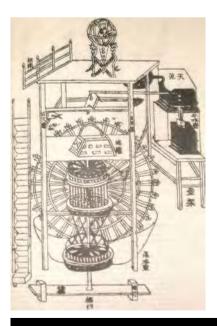
In his magisterial multi-volume Science and Civilisation in China, British sinologist, historian and biochemist Sir Joseph Needham describes the clock tower and its inner workings as follows: "(Su Song's) clockwork, driven by a water-wheel, and fully enclosed within the tower, rotated an observational armillary sphere on the top platform and a celestial globe in the upper storey. Its time-announcing function was further fulfilled visually and audibly by the performances of numerous jacks mounted on the eight superimposed wheels of a timekeeping shaft and appearing at windows in the pagoda-like structure at the front of the tower.

"Within the building, some 40 ft high, the driving-wheel was provided with a special form of escapement, and the water was pumped back into the tanks periodically by manual means. The time-annunciator must have included conversion gearing, since it gave 'unequal' as well as equal time signals, and the sphere probably had this. Su Song's treatise on the clock, the *Hsin I Hsiang Fa Yao*, constitutes a classic of horological engineering."

Four centuries later, Leonardo da Vinci designed an automaton in the form of a

knight. In the book *Leonardo's Lost Robots* author and roboticist Mark Rosheim writes that Da Vinci showcased a working model of the knight at a pageant in Milan in 1495, where it was able to move independently.

The design notes of the automaton, now known as Leonardo's mechanical knight, were discovered in the 1950s. It was found that the knight operated using a series of pulleys and cables. Rosheim reconstructed the knight in 2002 and noted that the design was fully functional.





The clock tower – a 12-metre pagoda-style structure with five levels – was powered by water and fitted with a specially designed escapement mechanism to tell the time accurately. Da Vinci showcased a working model of the knight at a pageant in Milan in 1495, where it was able to move independently.

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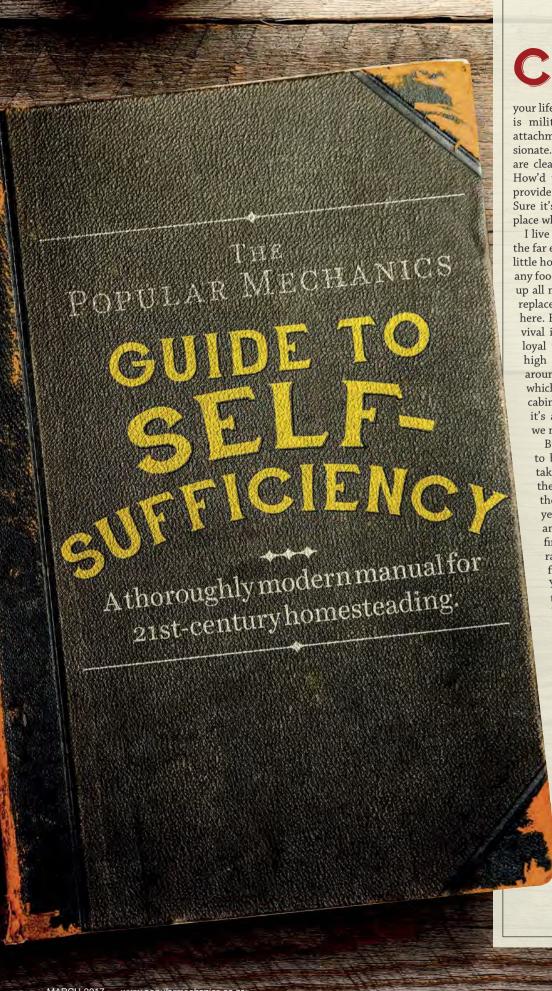
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limb to the highest point on your land, in your house, even in your apartment situation - just get up high - and look down at your life as a kind of map. The perspective is military; the distance makes your attachment to your possessions dispassionate. From your promontory, the edges are clear. This is the world you created. How'd you do? Can what you've made provide beyond the next grocery run? Sure it's a place you can live, but is it a place where you could survive?

I live in Indiana, at a great remove. On the far end of an empty country road, in a little house on a broad creek. I don't grow any food. I don't own any livestock. I used up all my firewood last year and haven't replaced it. But I feel I can make it out here. Even though my best tool for survival is the epic snarling of my nastyloyal yard dog. When I first went up high on this property for my look around, I paused in the loft of my barn, which stands on a hill. A house, two cabins, a barn, and a garage. I thought: it's a compound. Surely, this was all we needed.

But the list of structures turned out to be only the shell. Self-sufficiency takes trade-offs and lessons years in the making. You have to buy a goat, the right kind at the right time of year. You have to take a weekend and rewire the barn. You have to find a way to store water, kindling, rain gear, beans. You gotta get a freezer. You gotta get a generator. You need flares. You have to master the small-scale solar install. You have to learn, to really master, sharpening a chainsaw and an axe, rigging a pulley system. You'll learn how to make repairs on refrigeration units, shed roofs, and forgotten tractors.

When all of this stuff starts to fall together for you, in your head and on your shelves, you'll be able to stand at the highest point on your property and know what each building carries for you, each and every inventory of all the corners of your land and yourself. You'll see that you have built survival into the place and into yourself. Only then can you lift your eyes above your own stuff, look to the horizon, and watch for whatever trouble you might have to survive.

- TOM CHIARELLA



SHOP LIKE THE

AMISH!

Lehman's opened in 1955 as a hardware store in Kidron, Ohio, selling equipment to northeast Ohio's Amish community. Today, Lehman's has expanded to sell products through, uncharacteristically, the Internet. Here are a few to pick up for your off-grid kitchen.

OVEN/SUN FOOD-DRYING RACK

→ These solid oak and glass fibre drying screens separate fruit and vegetable slices so they (the slices) can be dried. R1 200

STARTER FRUIT PRESS

DIAMANT GRAIN MILL

→ A cast-iron flywheel turns iron and steel burrs to grind grains into flour or cereal. Use with the corn sheller to make cornmeal. R13 000

→ Not only will it instantly turn any kitchen table into a tableau of farmhouse charm, it can press eight litres of soft fruits, such as grapes, into juice. R2 700

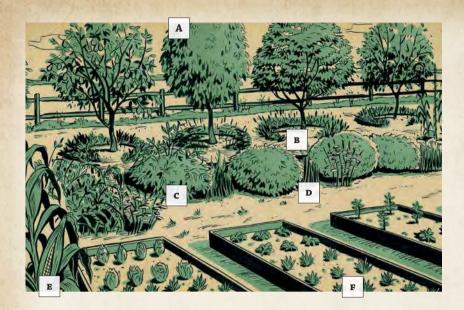
CAST-IRON CORN SHELLER

(firecorn?). R4 000

→ Use this to remove the kernels from

dried corn so they can be fed to live-

stock. You can use the cobs as firewood



THE GROW-FOREVER

GARDEN

Connor Stedman, an agroforestry specialist and ecologist at garden design firm AppleSeed Permaculture, uses a farming practice called permaculture that exploits natural relationships between plants to create a long-lasting garden that will grow without fertiliser.

Here's how to do it at home.

A) TREES

- → Place trees on the southern side of your garden, then try to arrange the rest of the plants in a descending order from south to north. This ensures that no tall plants are blocking the Sun from shorter crops.
- → Try planting pear (rose family), cornelian cherry (dogwood family), and pawpaw (custard apple family) trees together. All three produce edible fruit, but won't spread disease to each other.

B) UNDERSTORY

→ Directly underneath the trees, create a functional support system. Wild senna adds nitrogen to the soil and attracts beneficial insects, comfrey brings up nutrients from deep soil and is medicinal for burns, and anise hyssop can be used for tea.

C) BUSHES

→ Try highbush blueberries, gooseberries, and Nanking cherry.

D) BETWEEN-BUSH PLANTS

→ Plant asparagus, which grows when the berries aren't ripe, and yarrow, which is medicinal for colds.

E) THREE SISTERS

→ Plant maize on the eastern and western edges of the garden, where it won't block the Sun from other vegetables. Then plant green beans and squash in the same bed, as native Americans did. The crops, known as the three sisters, are complementary.

F) BEDS

→ Rule-of-thumb plants to keep together and apart: vegetables in the cabbage family (cabbage, broccoli, brussels sprouts) like leafy greens and beets, but won't do well with strawberries. Peas don't get along with garlic. Corn, tomatoes and potatoes shouldn't be planted together because they don't make sense geometrically. Try to rotate your vegetables each year.

IF YOU BRING ONLY

ONE PAN



The problem with being a cook and also a gearhead who believes in having the right tool for the job is that somehow I've ended up with 47 pots and pans. I could justify each of them, but when I start homesteading, I'm going to pack just one: my Le Creuset enamelled cast-iron 30-centimetre skillet. Unlike traditional cast-iron pans, this one has shallow, slightly sloped sides, making it more like a sautée pan. Once the thing heats up (this takes a while - it's a Btu hog), the cast iron holds a consistent temperature, which allows for uniform cooking. I've used it to make pancakes, fry eggs, and even roast whole chickens. I have half a mind to throw it on top of our fire



pit and sear some steaks when the weather improves, because I know the pan can take the heat. Best of all, it comes in 12 colours, which makes it a piece of equipment everyone in the family can get behind. – WYLIE DUFRESNE

You need



A GAS FRIDGE

Rather than a compressor, a tiny propane flame drives the refrigeration cycle, using reactions between ammonia and hydrogen gas to remove heat from the interior. And though they can be expensive – a typical 230-litre model might run

as much as R8 500 – they're incredibly efficient: a propane fridge requires a bit more than a half a kilogram of propane a day under normal operation, and can use even less if your kids don't stand in front of it looking for snacks with the door open.



We can teach you how to procure

THE HOW AND WHERE OF

WELLS

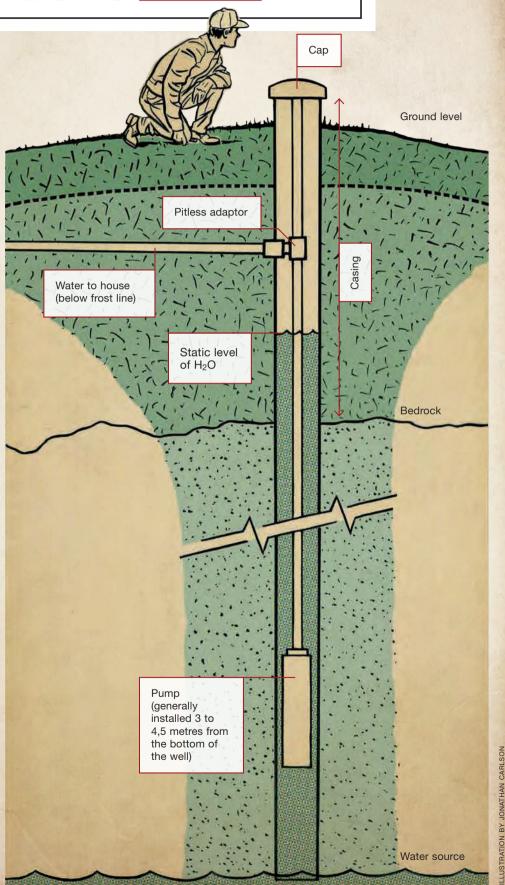
Forget Wi-Fi. Modern homesteader Ben Hewitt faced the greatest obstacle to living far from utility lines: how do you get water?

hen I was one, my family moved from a large farmhouse in northwestern Vermont into a small cabin my parents had built at the edge of a nearby hardwood forest. The cabin featured neither electricity nor indoor plumbing. It was lit by smoky paraffin lanterns, and we bathed in a metal washtub filled with water heated atop an old wood-fired stove.

At first, my parents hauled containers of water to the cabin in the back seat of their rust-bitten Volkswagen Beetle. When they tired of this, my father rigged up a hand pump and managed to pull water from a stream nearly a kilometre distant and at least 30 vertical metres below the cabin site. He was understandably proud.

Though I was too young to grasp the implications, that pump was my first experience with water that hadn't come from a municipal authority. My next would come 25 years later, after my wife, Penny, and I closed on 16 remote hectares of our own. Seeking a more permanent solution than my father's stream-fed hand pump, we chose to drill a well.

It has been another two decades since then, but I remember clearly the day the rig arrived to set its bit. At the time, Penny and I had just sufficient money (like all drillers, ours charged according to depth) to take us to 45 or so metres down. If we didn't strike water by then (we needed a small reserve to pay for the steel casing that would line the well from surface to bedrock), we'd have to pull the plug.



Two-thirds of the way to our limit, the bit struck a vein of water that produced 120 litres per minute. According to the EPA, the average American family of four uses 1 600 litres of water a day. We'd have plenty to spare. Better yet, the total bill, including the casing and well cap, came to around two-thirds of the money we had. That night, we ate steak.

Last summer, Penny and I drilled yet another rural well, to serve a house we are building on 40 hectares in Vermont's remote Northeast Kingdom. Again we faced the obstacle that all property owners do when they drill for water: there is no way to know with certainty how deep the water lies, or how much water there is to be found. If the 1 600 litres a day statistic is correct, a mere 1,1 litres per minute is all that's necessary to supply the average family of four, but that leaves little wiggle room for times of heavy use or variations in flow. Besides, we keep livestock, including a small herd of cattle, thirsty beasts capable of drinking 120 litres a day apiece.

I wish I could report that this time around money was not an issue. Alas, my career as freelance writer and small-scale farmer has ensured that I cannot.

Despite the

modern tech-

nology, the rig

looked prehis-

dinosaur ready

to chew up my

toric, like a

vard.

Compounding the problem was the fact that many of the neighbouring wells ran to 120 metres, and delivered only around 12 litres a minute, barely sufficient for our needs. Worse yet, according to the well maps provided by the state, one nearby property owner had drilled 180 metres without hitting water. Nor had drilling costs magically defied the one-way rule of inflation: in rural Vermont, it now costs approximately R525 per metre to drill, and the 15-centimetre steel casing is R750 a metre. At those rates, assuming 30 metres of casing, a 120-metre well would cost us the better part of R90 000 before we installed a pump.

So we hired a dowser, a sort of water psychic who locates ideal drilling locations by watching the movement of copper rods. This despite numerous studies clearly demonstrating that the practice is no better than a coin toss.

The dowser arrived on a late-summer morning. I don't know what I'd expected, exactly – flowing robes? a flower crown? – but I was nonetheless pleased that he arrived in a commonplace Toyota pick-up and wore the utilitarian garb of a rural working person.

"I'm going to have you find the water. I want your energy in it," he said to Penny and me, before handing us each a pair of 30-cm-long copper L-rods fashioned out of wire. Sleeves installed over the short end of the L allowed the rods to rotate freely in our hands, ostensibly in response to the presence of potable water.

My confidence increased when my L-rods crossed mere minutes after I started off on my walk around the property. It felt almost as if I could not have stopped them from crossing if I'd tried. Penny got the same result, as did our coach, though I couldn't help considering that they'd both seen me go first. Still. My rods had crossed entirely unbidden by human force. They absolutely had. Hadn't they?

In matters of faith, one can choose to believe or choose not to. The agony, I've found, resides in the middle path. Besides, we'd shelled out R3 400 for the dowser's

You need

A SAND-POINT WELL

A sand-point is basically a spear tip with a metal screen behind it. If you have a reasonably high water table and sandy-gravel soil, pound that sucker into the ground using either a slide hammer or a drop weight and pulley on a tripod. Keep pounding until the point penetrates about three metres past the water table. It's slow and gruelling, but it works. And it's cheap. The sand-point method can save you thousands compared to having a well drilled professionally.

time. A flagged stake was planted.

Three weeks later, the rig arrived. The drill carriage was mounted on a lift. When raised, by levelling jacks that hoisted the rig's front wheels off the ground, it stood 12 metres in the air. Despite the modern technology – diesel engine, digital display, high-flow hydraulics – it looked prehistoric, like a dinosaur ready to chew up my yard. At 50 metres, it punched into a vein that shot past at approximately 200 litres per minute. "Truth is, I'm not sure exactly how fast it's flowing," the rig operator told me. "It's coming in too damn fast. But it's the best well in town, that's for sure."

That evening, I threw a couple of T-bones on the grill and got my sons to move the picnic table from the rear of the house to the front. It'd be another day before the casing was fully installed, and another week before a friend and I dropped in the pump and ran water to the house. Still, I wanted to look out on our good fortune while I ate my steak.

Can I say with certainty that divination produced our desired result? I cannot. We've got water. That's all I need to know.

GREAT UNKNOWNS

SELF-SUFFICIENCY!



What's the closest anyone's got to creating no trash at all?

Astonishingly close, though it certainly takes an effort that most folks aren't prepared to expend. The average American, per Environmental Protection Agency statistics, jettisons two kilograms of trash a day. Lauren Singer, a Brooklyn-based blogger, on the other hand, has managed to fit several years' worth of waste into a single mason jar. Of course, she drinks her iced coffee through a reusable straw and makes her own toothpaste. Singer is one of several young bloggers dedicated to sharing strategies to cut down on waste. For starters, you'll want to be conscious of what you buy; items in nonrecyclable packaging are no-nos. Obviously, you'll want to recycle or compost absolutely anything you can. Otherwise, think of a way to reuse it. Styrofoam blocks might make for stylish lightweight headgear, and used PC towers serve as sleek, modern side tables.







How To PREDICT WEATHER

IN YOUR BACKYARD



With Ginger Zee

Good Morning America and ABC World News Tonight chief meteorologist Ginger Zee grew up on a 1,6-hectare farm that ran on geothermal power and a small woodburning stove. It's important to

record and understand your home site's microclimate, she says, especially when you're growing food. You'll need the following tools.





1) SNOW BOARD

→ Obviously this applies only in areas that get winter snow. Cut a 40-centimetre square out of plywood, paint it white, and place it on even, open ground next to a vertical metre stick. Mark the location with a bright flag. By measuring both snowfall and the water equivalent of snow (use your rain gauge, below), you'll be able to tell how much water your crops are getting in the winter.

2) THERMOMETER...

→ Shell out for a thermistor thermometer. These register electrical resistance and are very accurate. Record temperature for a few years to get the average first freeze.

... AND HYGROMETER

→ This will give you dew point, the highest temperature at which water vapour will become liquid. High dew points at low temperatures can protect your plants from frost damage.

3) CUP ANEMOMETER AND WIND VANE

→ The anemometer will give you wind speed, while the vane will show wind direction. Strong winds at night can prevent frost from sitting on, and damaging, crops.

4) 10-CM RAIN GAUGE

→ Recording total rainfall over time will help you predict your property's threshold for how much rain is too much (for example: at what point your basement will flood).

5) ANEROID BAROMETER

→ An aneroid barometer, which uses a vacuum box to measure pressure, will last longer than a liquid barometer, which is subject to evaporation. Depending on what side of a storm you're on, air pressure will drop or rise as it approaches.

You need



A MANUAL WASHING MACHINE

Even if you rarely use it, a fat, crankable egg, such as the Wonder Wash mobile hand-powered washing machine, is easily worth R600 just so you don't have to dunk your undies in the sink during a power outage. Stuff it with clothes, add two glugs of camping soap, and start sloshing. It doesn't look like it, but a toddler could muscle the handle. Give it a full turn, a hard yank in the opposite direction, then a full rotation, then back again. Enjoy the therapeutic slushing. Two minutes in soapy water, two minutes in a fresh water rinse, and you're done. Or mostly done. Without a spin cycle, your clothes will be fairly soggy. Two dozen black socks washed in the US equivalent, the EasyGo, took two full days to dry on a shower-curtain rod, even with the window open. If climate permits, use a clothesline. Or plan your underwear schedule accordingly.





THE

SHORTCUT SHACK

Don't want to build your own cabin in the woods? You don't have to.

A premade, off-grid-compatible house can function wherever
you decide to call home.



ACRE DESIGNS

- → **Best for:** Design enthusiasts
- → Comparable to: A four-star resort
- → Coolest feature: It combines all your utilities into a single appliance, the ZeroBox, which includes an electrical panel, a distribution panel, a 7,2-kilowatt inverter, an energy recovery ventilator, and a whole-home water-filtration system and emergency shut-off.
- → **Cost:** R5 million to R7 million; available at *acredesigns.com*



ZEROHOUSE

- → **Best for:** People who wish the Jetsons were real
- → **Comparable to:** A motel in Japan
- → Coolest feature: High-efficiency solar panels produce all of the zeroHouse's electrical power, storing it in battery banks that can operate for up to a week without sunlight. A 10 000litre cistern collects rainwater from the roof, while a digester unit under the house processes organic waste into dry compost.
- → **Cost:** Approximately R5 million; available at *zerohouse.net*



ECOCAPSULE

- → **Best for:** People who don't shower much
- → **Comparable to:**Wrapping your comforter around yourself like, well, a wrap
- This pod can survive anywhere, without connection to anything, for up to a year. It powers itself through solar cells that cover the roof and a retractable 750-watt wind turbine, and the shape maximises collected rainwater, which built-in filters make safe for consumption.
- → **Cost:** Approximately R1,1 million; available at *ecocapsule.sk*

How to make your own POWER

Set up one of these systems and then bellow like Zeus every time you turn on the coffeemaker.

SOLAR

- → **Location:** North- or west-facing rooftop or unwooded area.
- → **Equipment:** At least 24 solar panels, charge controller, breakers, switchgear, inverter and batteries.
- → **Output:** 7,5 kW
- → **Cost*:** R340 000 to R400 000, depending on whether it's a rooftop or a ground array.

GENERATOR

- → **Location:** Level ground near the house.
- → **Equipment:** Generator, panel, breakers, and switchgear. A 400-litre or larger liquefied petroleum gas tank. Propane.
- → **Output:** 7,5 kW
- → **Cost***: About R130 000, but it can vary based on distance to the house, plumbing, and interconnection to a battery.

SMALL WIND TURBINE

- → **Location:** Breezy area, high ground.
- **→ Equipment:** A wind turbine, set atop a 25- to 30-metre tower, turbine disconnect, electronics, inverter and batteries.
- → **Output:** 7,5 kW
- → **Cost*:** R500 000 on average. Cost varies based on whether there is road or trail access to tower location and how far the tower is from your home.

MICRO HYDRO

- → **Location:** A water source with a vertical drop and a steady flow measured in litres per minute.
- → **Equipment:** An intake gate called a penstock, valves and pressure gauges, turbine, switchgear, inverter and electronics. Low-output or variable-output systems may require a battery bank.
- → **Output:** 7,5 kW
- → **Cost*:** Anywhere from R100 000 to R400 000, depending on the length of your penstock, whether there is road or trail access, and how the turbine will be sheltered.

*Costs do not reflect tax or other incentives or locally required permits.



ENTERTAINMENT SYSTEM

Because a man can play only so much candlelit Pictionary.

- "PROCURE" MOVIES

 → The legal way: Buy movie files from iTunes, Google,
- or Amazon. → The... legally complicated way: Travel back to the early 2000s and find DVDs. On a laptop with a CD drive, download an app called HandBrake (free) to turn those discs into video files and save them to your laptop.

SYNC MOVIES TO A BIG **SMARTPHONE OR A**

→ A 256-gig iPhone 7 Plus (R17 500) is ideal, but a 128-gig Google Pixel (R10 000) or iPad Air (R11 500) will also work. **FYI: Most Android phones** will need Google Chromecast to play video, which requires extra power to run.

CREATE POWER

→ During the day, connect two 20-watt Goal Zero solar panels (R3 000) to each other, and plug them into a Sherpa 100 battery (R 6 000) with an optional inverter (R1 000) that can run power-hungry devices that have two- or threeprong plugs. Three to five hours of Sun will fill this battery with enough power to charge a projector and your phone or tablet.

SET UP YOUR HOME THEATRE

→ The AAXA P300 (R14 000) can display an image up to 120 inches, but a full battery will run for only about an hour. The Sherpa with the optional inverter will get through about ten 90-minute movies before everything runs out of juice. Connect your phone to the projector using an HDMI cable and an adaptor. Stand it up on a Joby GorillaPod (R750).Press Play.



HOW TO

ENTERTAIN YOUR KIDS

IN THE WOODS

WITH MATT ROSS

n HBO's Silicon Valley (returning in April), Matt Ross plays smug, frivolous technology executive Gavin Belson, a man given to such statements as "I don't know about you people, but I don't want to live in a world where someone else makes the world a better place better than we do."

Ross himself is less wealthy, more sensible. He lives with his wife and two children in a duplex in Berkeley, California, and often worries about how much time his kids spend in contact with nature. It's an outgrowth of the way he himself was raised: in a series of communal societies deep in the woods of northern California and Oregon, where he learnt to hunt, make fire, build shelter, track animals, and read stars. "At one point we lived eleven kilometres from a cement road. We were 30 or 40 minutes away from the general store, and it was literally called The General Store," he says. When local hunters hadn't delivered venison for a while, his single mom sometimes slaughtered a goat.

Ross's experiences living off the grid, along with the questions about his own children, inspired him to write and direct *Captain Fantastic*, a film about a man who devotes his life to raising a family of six in the Washington wilderness. The film, starring Viggo Mortensen, is an extreme exaggeration of Ross's childhood, a sort of thought experiment about what it would be like to abandon modern convenience entirely in the service of raising a self-sufficient brood. The borderline-illegal parenting is a little scary, but the movie, which was released nationwide in July, won Ross a best director award at the 2016 Cannes Film Festival.

Ross's own childhood may have been less militant than the one depicted in *Captain Fantastic*, but he still had to do "intense chores". He remembers chopping wood into kindling in the rain for "something like six hours". He also felt a sense of isolation

that he tried to show in the film. "I played football, but that was the only connection I had to the town," he says. "Just going to a movie took an hour and a half to get there. I felt like I wanted to be around kids my own age, and we weren't, at all, and that was really hard."

All of this sounds like kids don't much

Matt Ross also appeared in American Psycho and Face/Off, neither of which, presumably, were based on his life.



appreciate growing up far from civilisation, or, at the very least, that such a life can go dangerously off-track, which is true. But for all the challenges, Ross has a degree of creativity that came in large part from his early freedom. Without access to TV or video games, he and his brother used to wander through uninhabited woodland for hours at a time, hauling bows and arrows, jumping fences, and pretending to hunt. Now, Ross often has to explain to his own kids that being bored means you're simply not trying hard enough to entertain yourself.

"One time, I remember hiking and hearing this otherworldly sound," he says. "I had no idea what it was, and then I come up a ridge and see hundreds of deer, and they are making the strangest sound. It was one of those sounds where you're convinced it can't have come from the animal you're looking at. It was like bayahhhooooyaaaahhhh [Ross makes an incredible noise that is a cross between a yell, a moo, and a bay]."

Another time, Ross says, he woke up at dawn and walked to a lake, and a plane swept down and dropped live fish into it. Rangers were repopulating the lake for some sort of scientific purpose, but what Ross remembers is that it was raining fish. "You have a pretty rich fantasy life when you live like that."

A FAMILY ITINERARY

Matt Ross's recommendations for a fun, productive day in the wilderness

- → Swim in a mountain river or lake
- → Set the kids up to fish so that they can entertain themselves
- → Go for a hike
- Teach the kids to track and hunt



INTO THE WILD By Jon Krakauer

→ What many people learn from this true story of survival gone wrong in the Alaskan backcountry: if it's your first time surviving on your own, maybe don't choose the Alaskan backcountry.

MY SIDE OF THE MOUNTAIN

By Jean Craighead George

→ A twelve-year-old boy lives off the land in a hollowedout tree while his family is surprisingly relaxed about the whole thing.

BALL BLUE BOOK GUIDE TO PRESERVING

→ The gold standard for preserving fruits and veggies for midwinter consumption. Bonus: will help you avoid giving everyone botulism!

THE OUTERMOST HOUSE

By Henry Beston

→ Why do novels about homesteading always take place in the woods, when the beach on Cape Cod is a much better idea? Think of the lobsters!

THE UNSETTLERS: IN SEARCH OF THE GOOD LIFE IN TODAY'S AMERICA

By Mark Sundeen

→ A new non-fiction collection about modern pioneers trying to find the "simple life" in a complicated world. Read it on your Apple watch.

THE BUSHCRAFT FIELD GUIDE TO TRAPPING, GATHERING AND COOKING IN THE WILD By Dave Canterbury

→ Because you can only eat so many carrots.

WALDEN

THE SELF-SUFFICIENCY CLIFFS NOTES

Henry David Thoreau was tired of life's meaningless distractions 150 years before smartphones. Though most of the guidance in Walden, his memoir about living alone in a cabin in the woods, is philosophical in nature, it does contain some practical advice.

PACK WISELY

→ "At the present day, and in this country, as I find by my own experience, a few implements, a knife, an axe, a spade, a wheelbarrow, etc, and for the studious, lamplight, stationery, and access to a few books, rank next to necessaries, and can all be obtained at a trifling cost."

GET UP EARLY

→ "I would advise you to do all your work if possible while the dew is on."

REDUCE YOUR RELIANCE ON LUXURIES

→ "I did not use tea, nor coffee, nor butter, nor milk, nor fresh meat, and so did not have to work to get them."

PLAN AHEAD

→ "While yet it is cold winter, and snow and ice are thick and solid, the prudent landlord comes from the village to get ice to cool his summer drink; impressively, even pathetically wise, to foresee the heat and thirst of summer now in winter."

DON'T GET AHEAD OF YOURSELF

→ "Beware of all enterprises that require new clothes."

BRING A CHAIR

→ "None is so poor that he need sit on a pumpkin."

GREAT UNKNOWNS

OF

SELF-SUFFICIENCY!



Could you power anything with a horse?

Absolutely – they don't call it horsepower for nothing. A horse or cow (or any other reasonably robust creature – pet alligator, caffeinated goat, malingering teenager, etc) can be suitably motivated to walk on a treadmill attached to a generator in order to yield electricity, which may be used immediately or stored in rechargeable batteries. Problem is, the gambit is inefficient from both energy production and economic standpoints. Solar power, for one, is a better bet. Solar's initial startup costs may be higher (R300 000 or more), but decent horses aren't free, either to buy (about R40 000) or to feed (call it R50 000 a year for 25 to 30 years). And then, of course, you have the indelicate issue of the horse's substantial "exhaust".



Preparing the beans Crafting a better pot of coffee begins before you start brewing.



You don't need to roast your own coffee. But you also don't need to fix up that old pick-up yourself, or build your own deck. Roasting at home puts you in the driver's seat to make the perfect bean for your household. Unlike other home roasters, the Aillio Bullet R1 Coffee roaster (R38 460) can roast up to a kilogram of coffee at a time. You can also connect

the roaster to your PC via USB to have complete control of the roaster from your screen. You can buy green, unroasted beans online. For your first batches, try beans from Central America. They have consistent size, quality, and a wide range of flavours, which makes them especially forgiving if roasted too long or too little.

(2) STORE



To keep beans fresh longer, store your coffee in a dark, temperature-stable environment (like your cupboard), with minimal exposure to air, says Todd Goldsworthy, the 2014 and 2016 US Brewers Cup champion. Specially designed to keep out light and air, the Vacu Vin Vacuum Coffee Saver (R399) is a perfect place for your coffee beans to retain their flavour. Goldsworthy also urges you to stop storing beans in your freezer. They won't last longer, but will absorb unpleasant flavours.



WEIGH

To brew a consistently delicious cup, you need to be consistent in your dosage and how long you let the coffee brew. Which means you can't just trust your instincts. You need a scale. Unlike the average kitchen scale, the Brewista scale (R1 599) comes programmed with six



different modes. For brewing a pour-over on the scale, a timer senses the weight change from the water and automatically starts once you begin dousing the grounds.



GRIND

There are two types of grinders, blade and burr, but you'll never find a blade grinder in a barista's kitchen. The whirling blade operates like a blender, but heats up the grounds and burns off flavours. It also produces a wildly variable grind, which can be even worse. The mix of too-fine and oversize particles leads to inconsistent steeping since the bigger the grounds are, the more quickly water passes through them - and weak coffee. Burr grinders crush beans between rotating plates for uniform, uncooked grains. The Severin Conical Burr Electric coffee grinder (R1 899) has 10 different grind settings and an electronic grind-timer based on number of cups. For a little more money, the Baratza Encore Grinder (R3 750) offers 40 settings for enthusiasts seeking the perfect grind for every brew method and type of bean.





THE BEST HAND GRINDER

The hand-cranked Hario Skerton Ceramic Burr Manual Coffee Grinder (R669) offers an affordable and portable option if you don't mind using a little muscle in the morning. The grind adjusts in seconds from fine to plunger coarse.



You are ready to make coffee

THE NEW IMMERSION BREWERS



NOT SURPRISINGLY, the immersion process immerses (or steeps) grounds, typically for three to five minutes before filtering out the coffee. Submerging the grounds extracts flavourful oils and acids from the beans over time, producing coffee with a heavier body than drip brewers produce. Just don't leave grounds in the water too long. After more than five minutes, the contact time between the coffee and water tends to release the bitter flavours of the bean.

FOR THE TRAVELLER

B / AEROBIE AEROPRESS

It's cheap, fast, simple and perfect for travel, if you're the kind of person who packs your own coffee-maker when vou leave town for the weekend. Just mix grounds and hot water in the chamber for half a minute, then press out your coffee through the filter. (R689)



FOR THE BREAKING BAD FAN

C / YAMA SIPHON ----

This hand-blown coffee chemistry set heats water in the lower globe until the building vapour pressure sends boiling water to the upper globe where it cools slightly and mixes with grounds. Cut the heat after a minute and your coffee descends back down through a filter, ready to be enjoyed. (R999)

FOR THE COFFEE HACKER

A / ABID CLEVERDRIP

accurate coffee making primarily because it allows you to control brew contact time. Too little contact between water and ground coffee results in a dull, watery extraction. Too long and you get a bitter mud. A Cleverdrip allows you to accurately decide when to stop brewing. (R399)

FOR THE PLUNGER DEVOTEE

D / BODUM KENYA FRENCH PRESS

French presses don't have to make a bitter cup. Just pour all the coffee after it's brewed so it doesn't steep longer on the grounds. This insulated, double-walled brewer has a built-in scale to measure your grounds and water, and a timer to tell you when your coffee is ready. (R389)



Shop notes: Coffee



The coffee-brewing tank for any worksite

The OXX Coffeeboxx is built to travel and simple to use: Fill the tank with water, insert a K-cup pod, select a size serving, and then wait for it to brew. Its 2,5-litre removable water tank can make ten cups of coffee. and its watertight design prevents spills on rough rides. The Coffeeboxx has a rubberised handle, a metre-long retractable power cord to make it mobile, and a chassis rated to withstand a 680-kilometre load. That makes it the only coffeemaker you can sit on or, in a pinch, use to prop up a grand piano.

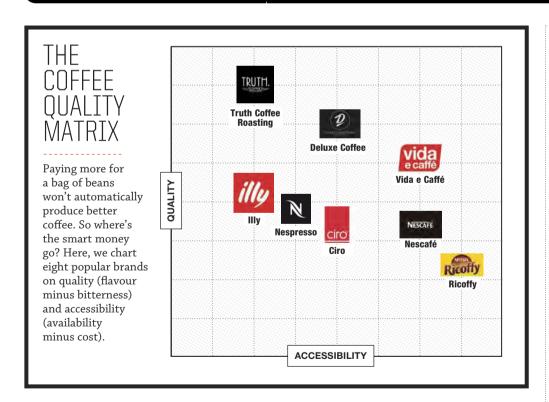
HOW I BREW

By Ben Jones, 2016 US AeroPress Champion

I think of brewers like cars. A Kalita or Chemex is like a Toyota Camry: not flashy, but will always get you from A to B. These all have a restricted flow rate, which reduces the barista's impact. Hario's V60 (R190 for the 1-4 cup size) is more like a Porsche or 427 AC Cobra. It has aggressive channels and a large drip hole, which lets water flow through very quickly. The unrestricted flow can create a wider range of cup profiles. Faster pours make a bright, light-bodied coffee. Slow your pour and the body increases while the flavour tones down.

THE EASIEST WAY TO MAKE BETTER COFFEE

Buy whole, fresh beans. Fresh means within three weeks of roasting, says Shawn Steiman of Coffea Consulting (which is not a typo), who holds a PhD in coffee science (which is a real thing).



PAPER VS METAL FILTERS Your choice of filter carries an outsize impact on what you end up sipping. Because of their holes, metal filters allow more oils and fine particles into your cup, giving your coffee more body. Paper filters, however, keep those tiny bits of grounds and oils out of your mug. That might mean less body, but it also means more distinct flavours. It's up to you. Just avoid brown paper filters. They have a weird taste.



UPGRADE

RECYCLING, SCALED FOR HOME USE

Out of the factory and into your home - here's to recycling your own plastic **THINK OF PLASTIC** as a precious commodity that, like the oil it's made of, might not be around for ever. Now, how would one preserve this commodity and increase its lifespan?

Well, the team behind the Precious Plastics project spent two years developing machines that allow people to recycle waste locally and get the most out of plastic products. Once recycled, the plastic can be used to create new products through processes such as 3D-printing and injection moulding.

The machines are easy to build and were designed to be put together using basic tools and materials available to the average consumer. The blueprints are even free to download from the Precious Plastics website.







THE FOUR MACHINES INCLUDE:



INJECTION MACHINE: It heats plastic flakes and is ideal for recreation of small projects with injection moulding.



SHREDDING MACHINE:

Tears up plastic waste into small pieces for use with the other machines.



EXTRUSION MACHINE: This machine creates a continuous line of plastic and can be used to create 3D-printing filament.



COMPRESSION MACHINE:

Heats and mould presses plastic for the creation of large objects.

DIFFERENT TYPES OF PLASTICS



PET

USES: Soft drink and water bottles, platter domes, biscuit trays, food containers

polyethylene terephthalate



HDPE

USES: Shopping and freezer bags, milk and juice bottles, ice cream containers, hair product containers, crates

high-density polyethylene



PVC

USES: Cosmetic containers, electrical conduits, plumbing pipes, blister packs, roof sheeting, garden hoses

polyvinyl chloride



USES: Cling wrap, garbage bags, refuse bags, mulch film

LDPE

low-density polyethylene



USES: Bottles, ice cream tubes, straws, flower pots, dishes, garden furniture, food containers

polypropylene



USES: CD cases, plastic cutlery, imitation glass, foamed meat trays

PS polystyrene



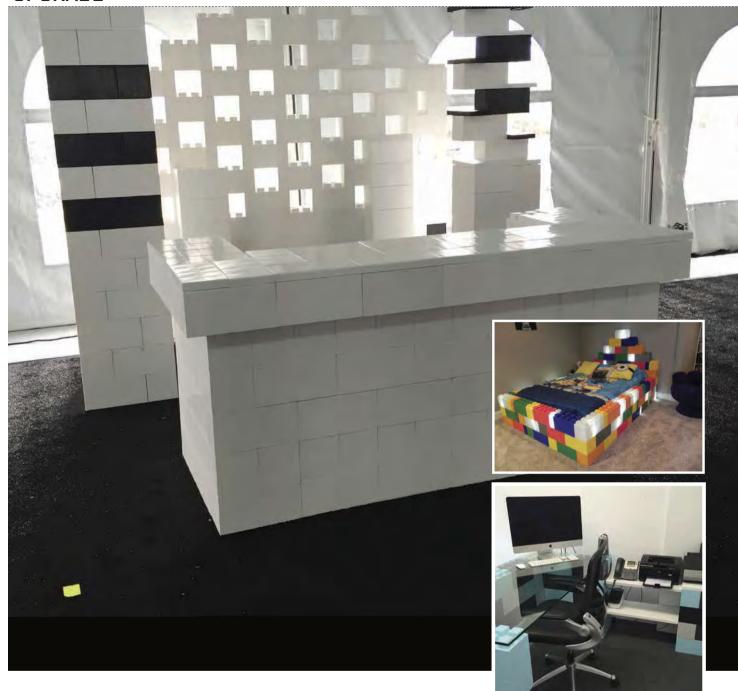
USES:

Automotive parts, electronics, packaging and many more

OTHER

All other plastics

UPGRADE

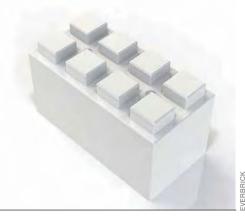


LIVING IN A MODULAR PLASTIC WORLD

Imagine using life-size building bricks as you need to create, renovate and play

PLAYING WITH LEGO allows one's imagination to run wild. The possibilities are nearly endless. Now a company aptly named EverBrick has taken the modular brick concept and made it very, very big.

These oversized polypropylene bricks are ideal for creating temporary or semipermanent structures and furniture. The bricks can easily connect with each other or be taken apart. The bricks can be built in staggered patterns to create a variety of shapes and patterns in multiple colours, just like the classic toy bricks.





SOLAR POWER TO THE PEOPLE

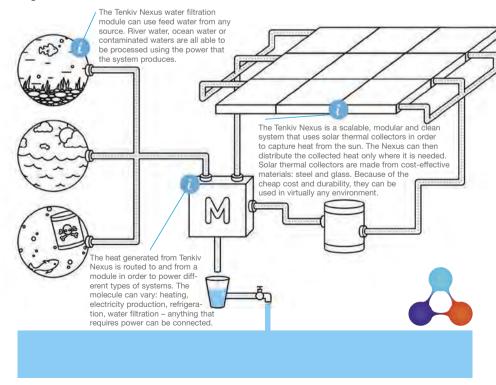
An autonomous water sanitation system to aid those without water

ACCORDING TO THE WORLD HEALTH ORGANISATION a human needs five litres of water a day for survival – which includes drinking water. Another five litres of water is required for basic hygiene to be maintained and for cooking.

This number is quite low, but it's shocking if you consider that in excess of 14 per cent of the world's population of 7,4 billion people don't have access to clean water.

With an eye on remedying this problem Tenkiv – a solar tech start-up from California – is developing a modular renewable energy system that can purify up to 2 000 litres of water a day. The system is completely autonomous, making it ideal for communities that have no access to electricity and would rely solely on this system for their water needs.

After a previously successful campaign on the crowdfunding website Kickstarter, the company decided to attempt to fund the production of the first batch of water sanitation systems (called Nexus) there as well.



A BEAUTIFUL THING

Clearaudio Statement turntable

There are many ways of reproducing music stored in the grooves of your vinyl LP records, but surely none more impressive – visually, mechanically and aurally – than the Clearaudio Statement.



IT'S THE AUDIO EQUIVALENT

of the cost-no-object Swiss timepiece. Or the ultra-luxurious Maybach automobile. In short, a design that elevates an industrial product to the realm of art.

Based in Erlangen, Germany, Clearaudio makes a range of highend audiophile products that includes turntables, tonearms, phono cartridges, phonostages, amplifiers, accessories and audiophile vinyl records. CEO Robert Suchy visited South Africa late last year to introduce locals to the new V2 version of the company's flagship product. Suchy's father founded the business 40 years ago and is still involved, as are Suchy Jr's brother and sister.

Launched last year, the current V2 model is said to be even better than the 2006 original. Elements such as speed control circuitry, spindle, motor pulley and drive belt have been redesigned and every part of the Statement system is developed in-house.

All of this carries an eye-watering price tag of 140 000 euros. But, bear in mind that this *does* include the matching arm and cartridge (the deck can in fact accommodate four arms for those who like to mix and match their cartridges). And your purchase price includes having a senior member of the Clearaudio team travel to wherever in the world you are to set up your Statement.

If you order now, you will have to wait up to six months for delivery. All 350 kilograms of it. Even the packaging – the components arrive in two massive wooden crates – is enormously heavy and reinforced to be able to withstand being dropped. "You don't need insurance against theft," Suchy says. "No burglar will be able to carry this away."



The Statement's jaw-dropping architecture showcases a massive, highly damped integrated stand, based around four stainless steel pillars. Its sandwich construction features aluminium plates filled with Panzerholz, a high-density bullet-proof manufactured wood that is prized for its acoustic damping properties. In the top layers of the stand, thousands of embedded metal ball bearings help to control resonance.

The high-speed microprocessorcontrolled motor used to drive the sub-platter drew directly on the technology used to propel the Mars Rover. Apart from the gee-whiz factor, this design is intended to provide unmatched speed stability.

But there is no mechanical connection between platter and drive motor. Instead of driving the platter directly, the motor uses a belt to drive a sub-platter containing powerful magnets. Floating a tiny distance above this is an upper sub-platter containing opposing magnets and located by a bearing spindle.

Lower down, a 95-kg damped self-levelling pendulum hanging from the gyroscopic bearing forms the basis of an innovative selflevelling mechanism. The metal plates forming the counterweight are drilled and rotated to ensure that the platter is level with the Earth's surface and tonearm. The result is practically impervious to impacts from boisterous Great Danes, grandchildren, or staff carelessly wielding a vacuum cleaner. And because it rests on gimballed supports, the whole structure can tilt. If you wanted to, you could have one installed on your yacht; apparently some have.

Supplied as standard is the Statement TT1 tangential tonearm, which by moving laterally







across the record groove ensures error-free tracking. If your vinyl is less than perfect, you'll be pleased to know that the dual record clamp system has central and outer clamps that flatten minor warps and rigidly hold the vinyl in place.

To celebrate its 40th birthday, Clearaudio will be producing additional limited-edition products. Will we see something as special as the Statement? Suchy was coy, limiting his comments about what we can expect to, "It is going to definitely be a turntable."

NEED TO KNOW

CONSTRUCTION Stainless steel, aluminium, acrylic and bullet-proof wood

SPEED RANGES 331/3, 45 and 78 r/min

DRIVE UNIT Non-contact magnetic

drive system

SPEED ACCURACY Less than ± 0,03 per cent

TOTAL WEIGHT 350 kg

DIMENSIONS 690 (w) \times 570 (d)

x 1 325 (h) mm

140 000 euros

WARRANTY 10 years

www.clearaudio.de

SA distributor 13 Hof (13Hof.co.za).



PM

DRIVING

Compiled by ANTHONY DOMAN anthony@ramsaymedia.co.za

EYE ON THE DRIVER

BIOMETRICS WILL RADICALLY TRANSFORM OUR DRIVING, WELL-BEING AND VEHICLE SECURITY

You're a little stressed out. You're running late for an early-morning appointment and tired from pulling an all-nighter to finish that important assignment. So your first few stabs at the Start button accomplish nothing more than a sullenly uncooperative engine and a purring yet insistent voice that nags: "Fingerprint not recognised. Please try again."

Eventually you fumble out of the driveway, noting that your heart rate has rock-

eted into the red zone. Also, your shallow, rapid breathing is not sucking down nearly enough oxygen. Must be the caffeine turboboost of those last two espressos. Actually, no: two kilometres up the road, there's that purr again. "Erratic steering. Possible drowsiness. Please pull over and rest as soon as possible."

You snarl: "Activate Autonomy, dammit." The last words you hear, in a rapidly diminishing purr: "Stress levels dangerously high. Wellness sequence activated. Commencing sedative atmosphere pump. Sweet dreams..."

Advancements in biometrics will radically transform the driving experience, health wellness and well-being (HWW), and security of vehicles by 2025, according to a report from analysts Frost & Sullivan. *Biometrics in the Global Automotive Industry, 2016-2025* predicts that our cars will be able to do much more than just drive themselves (also see "Putting the brakes on autonomy"). Our cars, the analysis suggests, will become one with The Quantified Self: the data-driven connected existence that measures





every conceivable aspect of our lifestyles.

The analysis predicts that, by 2025, one in three new passenger vehicles will begin to feature fingerprint recognition, iris recognition, voice recognition, gesture recognition, heart beat monitoring, brain wave monitoring, stress detection, fatigue monitoring, eyelid monitoring, facial monitoring, and pulse detection. "These will be driven by built-in, brought-in and cloud-enabled technologies," says Frost & Sullivan. Big automotive original equipment manufacturers and suppliers will have their work cut out keeping up with technologies, business models, and regulations shaping the automotive biometrics ecosystem.

Signs of the emerging technologies were evident at this year's CES. Honda's NeuV concept is described as an electric automated car equipped with an artificial intelligence (AI) "emotion engine" and automated personal assistant. The concept, says Honda, creates "new possibilities for

KEEPING TRACK

Emerging innovators in the automotive biometrics space.

EMPATICA. A watch that monitors the vitals of drivers with a history of epilepsy and predict an attack before it happens. GESTIGON. Software that interprets a multitude of driver movements and draws actionable insights.

OPTALERT. Glasses that use infra-red rays to monitor a driver's eyes to detect the onset of drowsiness.

SOBER STEERING. Sensors that can be embedded into the steering wheel to check if the driver is intoxicated and whether the alcohol level is within permissible limits.

VIGO. Smart headsets that monitor head movements to determine driver distraction, slouching and drowsiness.

human interaction and new value for customers". Chrysler's Portal concept features facial recognition and voice biometrics (see "Judging the mood", below).

Partnerships between companies who make cars and those who make wearables will speed up the implementation of automotive biometrics, says Frost & Sullivan Intelligent Mobility Industry Analyst Joe Praveen Vijayakumar. These partnerships will cut the costs of related research and development, while at the same time creating growth avenues for wearables companies. "New business models such as Device-as-a-Service (DaaS) and health as a service will also emerge."

The Biometrics in the Global Automotive Industry, 2016-2025 analysis, a part of Frost & Sullivan's Automotive & Transportation Growth Partnership Service programme, finds that OEMs and suppliers are investing in advanced biometrics based on human machine interaction (HMI) concepts such as natural language and gesture recognition. They are also vertically integrating and funding relevant start-ups to build a stronger portfolio.

Judging the mood

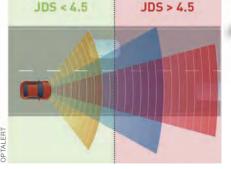
At CES, Honda presented its Co-operative Mobility Ecosystem concept, connecting the power of artificial intelligence, robotics and big data to transform the mobility experience of the future. The Honda concept envisages a future where vehicles will communicate with each other and infrastructure to mitigate traffic congestion and eliminate traffic fatalities, while increasing the pro-

ductivity of road users and delivering new types of in-vehicle entertainment experiences. Vehicles will create new value by providing services autonomously when not in use by their owners.

Honda's concept NeuV (new-v), which stands for New Electric Urban Vehicle, is based on

the fact that privately owned vehicles sit idle 96 per cent of the time. The NeuV explores the idea of how to create new value for its owner by functioning as an automated ride sharing vehicle, picking up and dropping off customers at local destinations when the owner is not using it.





Increase distance to next vehicle in radar cruise/autopilot mode

Opposite: German automotive technology specialists Continental are among those leading the way in applying biometric systems such as facial and fingerprint recognition to cars. Above: Chrysler's Portal marries millenial sensibilities with interpretive skills. Left: Optalert's in-vehicle telematics focus on both car and driver to enhance safety.



The NeuV can also sell energy back to the electric grid during times of high demand when it's not in use. These activities have the potential to create a new business model for enterprising customers.

The NeuV's AI assistant is based on an "emotion engine", an emerging technology developed by Honda and SoftBank (cocoro SB Corp.). Called HANA (Honda Automated Network Assistant), in its application in the NeuV, the emotion engine will learn from the driver by detecting the emotions behind the driver's judgments and then, based on the driver's past decisions, make new choices and recommendations. HANA can check on the driver's emotional wellbeing, make music recommendations based on mood, and support the owner's

daily driving routine.

A Honda technology being developed in collaboration with speech-activation specialists VocalZoom reads physical vibrations generated from the speaker's voice, and ascertains additional layers of voice data not attainable by traditional acoustic mics alone. This additional information significantly increases an on-board computer's understanding of voice commands, especially in harshnoise environments.

Chrysler's e-powered Portal also makes use of this idea of interactivity in what is styled "next-generation family transport". Besides the masses of clever drive-assist sensors built into the full-



Chrysler's Portal covders the millenial staples of IoT, social media, file sharing and environmental friendliness. Your smugness levels will be at an all-time high.

PUTTING THE BRAKES ON FULL AUTONOMY

Automatic emergency braking (AEB) has become such a lifesaver that it has the potential to hold back the adoption of fully automous driving, according to one prediction. Deloitte Africa predicts that, in the US alone, fatalities from motor vehicle accidents will have fallen by 6 000, a 16 per cent decline from 2017 – and says the greatest factor in this decline will likely be AEB. That nugget is contained in Deloitte Africa's 16th edition of *Technology, Media & Telecommunications Predictions*.

AEB will be so widely adopted, affordable and successful at helping to save lives, Deloittes says, that it may even slow down the movement towards full self-driving cars. But that won't slow our smart cars' relentless drive to improve their IQ, using machine learning.

The Deloittes report showcases how, increasingly, mobile devices

will be able to perform machine learning tasks, even without connectivity, which will significantly alter how humans interact with technology across every industry, market and society. We will soon see machine learning capabilities in everything from tablets to drones IoT devices and, of course, cars.

"Machine learning is fascinating, as it will revolutionise how we conduct simple tasks such as translating content, but it also has major security and health consequences that can improve societies around the world," says Mark Casey, Deloitte Global Media & Entertainment & TMT Africa Leader. "For example, mobile machine learning is a strong entry point to improve responses to disaster relief, help save lives with autonomous vehicles, and even turn the tide against the growing wave of cyberattacks."



autonomous-ready Portal are more than 20 technologies designed to "engage, inform and connect the driver and passengers". Chrysler says this adaptable and upgradable user experience anticipates needs and can evolve with lifestyle changes and technology advancements.

The future of driving is a place where you don't even own a car. You simply live.

Tech highlights include:

- Facial recognition and voice biometrics that recognise the user and are able to customise individual or family settings to provide a unique drive experience based on preferred features, such as lighting, favourite music, enhanced audio settings and favoured destination.
- \bullet Vehicle-to-X (V2X) communication with potential for intersection crash warning, traffic sign recognition and emergency vehicle alerts.
- Personal Zoned Audio keeps the driver aware of surroundings by enhancing sound and directionality in the event of approaching emergency vehicles.

Securing your ride

Innovations have transformed how we interact with our cars, but given their dependence on the cloud and data, there is a potentially huge downside: new security threats and vulnerabilities.

According to David Emm, principal security researcher at Kaspersky Lab, it's been found that connected cars can be hacked and controlled remotely; researchers achieved this by exploiting a zero-day vulnerability they found in the car's computer system. Further, manufacturers opting for a popular platform, such as Android, face the same security scenarios as mobile devices run on the same OS, such as malicious applications and perhaps even ransomware.

"And then, of course, the data gathered and communicated by connected vehicles could be intercepted to reveal private information about the vehicle and its occupants, all of which would increase physical vulnerability," Emm says.

"To reap the many future benefits of connected automotive systems and vehicles, it is critical that the industry is committed to embedding security-by-design from the very start of development. This should include installing the latest software in vehicular systems and updating it regularly."

There's no looking back, Frost & Sullivan's Praveen agrees. "Urbanisation will continue to fuel emphasis on biometrics-driven advanced driver assistance system (ADAS) features to navigate heavy traffic while ensuring safety and comfort. However, customer concerns surrounding the safety of the sensitive data collected through biometrics will compel suppliers to invest in cybersecurity measures to build credibility and increase growth."



TOMORROW LAND

WHAT CES TAUGHT US ABOUT THE FUTURE OF MOBILITY

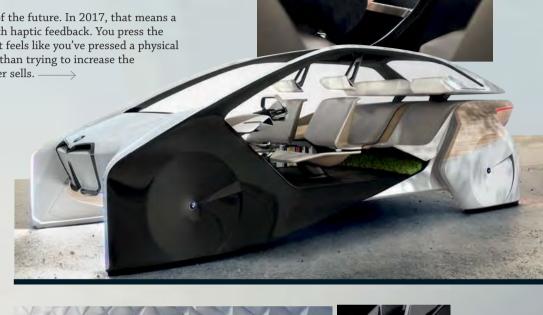
- LINDSEY SCHUTTERS

BMW I INSIDE FUTURE

What BMW does well is sell the idea of the future. In 2017, that means a touch-enabled holographic display with haptic feedback. You press the button displayed in front of you and it feels like you've pressed a physical button. It's unclear how this is better than trying to increase the operation range of the i3, but whatever sells.

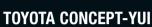
FARADAY FUTURE FF91

I didn't expect Faraday Future to ever demo a working model, to be honest. And boy, did they steal the self-driving show with a car that can seek out its own parking spot and respond to your call even if you're standing around a corner. How? Lidar. The Lidar unit lives in the bonnet, ready to deploy when the car needs full-powered computer vision. Oh, it will also be the world's fastest-accelerating production car, narrowly edging out Tesla's barnstorming offerings. And it's a crossover utility vehicle.









The Japanese manufacturer wants you to form an emotional bond with your car. They call this thing you will bond with Yui. Yui will constantly analyse your emotions to intervene on the whole driving thing as and when needed. You've got a friend in Yui.







VOLKSWAGEN ID BUZZ

Another year, another electric Kombi concept from Volkswagen. The promise of the ID product line is impressive range on the electric motors. Be warned, though: longrange batteries take an awfully long time to recharge.

DRIVING

CHRYSLER PORTAL

Autonomous? Check. Electric? Check. Bases covered. Then the clever folk at Chrysler designed an interior that will allow zoned audio output (like multi-zone climate control, but for music) and is inspired by architecture. Flexible seating options and light baths from all the glass are other notable standouts from this impressive people carrier.









HONDA NEUV

There's an odd relationship brewing between Japanese car manufacturers and emotions because the main concept behind the NeUV concept is that the car can display emotion. Short and tall (think Smart FourTwo), it's great for city driving, which this car will excel in when it reaches its full potential as a ride-sharing masterpiece.







NISSAN V-MOTION

This car represents the future design language for Nissan's upcoming models. Completely new graphical user interface, autonomous driving technology (ProPILOT) that works on urban roads with traffic lights and stop streets, and premium entertainment experiences like Bose UltraNearfield speakers that provide a 360° sound field around the driver.





MITSUBISHI TRITON

Picking a bakkie used to be about allegiance to a particular brand, probably the one your father owned. This puts a vehicle like the Triton at a disadvantage. Judged on its merits, the Triton double cab 4x4 I drove in Gauteng easily stands comparison with its competitors (single cabs are due later). It's priced well, has a supple, rattle-free ride even on horrendous surfaces and is nimble enough off-road to make you wonder if 4x4ing skill really is all it's cracked up to be. Both manual and auto box are great and the interior execution feels polished. As if to emphasise that the Triton is a rational purchase, its swoopy styling actually is functional. Like the J-Line design, for instance. First, it boosts cab space, particularly in the back, where it means room for tall people's legs - we checked - and a seatback that tilts more than the norm so you avoid the situp-and-beg position. Second, the curved cab allows the loadbox to slide under it in a rear-ender. Third, it allows for a shorter wheelbase, which equals better manoeuvrability. (It also helps that there's been a significant lowering in steering ratio and tightening of the turning circle.)

The flagship Triton is kitted out as well as any top-line SUV and has a lusty 133 kW turbodiesel with either six-speed manual or five-speed auto. On 4x4s, its version of Mitsubishi's Super Select II four-wheel drive is accessed via a handy rotary control on the centre console. – AD

From R479 900

VOLVO S90

One day, will all cars be made like this? In the quest for elegance, some have been sidetracked by excess. The elegant S90 takes understatement and turns it into an art form.

In the past, the Swedes have managed to make big Volvos that are great, but not necessarily big cars that are great. All the indications are – on first impressions, at least – that with the S90, Volvo has succeeded in making a seriously good big car. In terms of ultimate dynamics the S90 might be considered to concede those last few percentage points to the likes of BMW, but really that comes down to subjectivity. Whether you hustle the S90 or cruise in it, it never feels less than supremely poised.

Traditional luxury-sedan owners may not buy in to Volvo's four-cylinders-fits-all philosophy, but those who aren't bound by convention will approach it with an open mind. Between the two cars I drove, the D5 is my pick, but only just: its subdued growl and generous thrust feel more in tune with the S90's overall concept than the more urgent-feeling petrol version.

Initially the S90 will be offered here in a choice of either diesel D5 or T6 petrol, both with all-wheel drive. Expect D4 and T5 derivatives later this year, with frontwheel drive, followed much later by the range-topping T8 Twin Engine PHEV. Drive-E efficiency and semi-autonomous driving are standard. – AD

From (D5) R777 700.

ROLLS-ROYCE WRAITH BLACK BADGE

This hugely customisable Roller is described as "darker, more assertive, more confident and powerful, and more demanding". It's apparently an alter ego for what is usually an understated brand.

If you were expecting elaborate wings and pearlescent paint finishes, you could find it at the V&A Waterfront branch of Daytona Motors, but that was on a McLaren coming for a service. On the shop side of the room we were greeted by a black beauty. The RR badging inverts to silver on black and the chrome surfaces are darker thanks to the Physical Vapour Deposition technique. If you opt for a black car, it's apparently the deepest and most intense black ever seen on a production car.

The specially developed 21-inch alloy wheels are the real stars of the show. The rims feature 22 layers of carbon fibre laid in three axes and folded in on themselves at the edges. The 3D-forged aircraft grade aluminium hub is then bonded to the rim with aerospace-strength titanium fasteners.

The supreme 6,6 litre twin turbocharged V12 lays down rubber with the might of 870 N.m and 465 kW. This 8-speed automatic (ZF 8HP95) will also rev up to 6 000 r/min before switching cogs if the throttle is more than 75 per cent open. Air suspension has been tweaked and you get a lovely twinkling galaxy of stars on the interior roof lining. – LS

From R3 000 000.

BACK IN BUSINESS

ANATOMY OF A RACE TRACK REVIVAL: IN THE 21ST CENTURY, KYALAMI HAS TO BE ABOUT MORE THAN JUST RACING

The vultures were circling. Surely, it seemed, there was no going back. Inevitably, the run-down arena, the sinous sweeps of tarmac where the ghosts of hairy-chested Formula One legends in open-wheelers loomed over modern equivalents in sedans, was doomed to a future as a shopping mall or business park. The End.

Not quite...

With predators poised, you could almost hear the sudden flourish of trumpets and clatter of hooves as our hero galloped to the rescue on a white charger, or at any rate in a Porsche.

And thus, children, for the measly sum of R205 million, was saved for posterity a name that resonates down the corridors of South Africa's motor racing history: Kyalami.

"Oh, great," Andrew Baldwin said, turning to the successful bidder, Porsche South Africa boss Toby Venter. "What do we do now?" (We made that up. But that's more or less how things went down.)

Baldwin, a career Porsche man who bears the title of group properties manager, came to South Africa in 2006 to handle the company's rollout of its customer centres. His recounting of the Kyalami purchase does come across a little like a fairy tale, perhaps one written by the brothers Grimm.

Venter and Porsche snared Kyalami without really expecting to. The winning bid was one of just two. The lack of interest may have been a sign of the economic times, or of premonitions that nothing but trouble lurked beneath the tired, grubby surface of what had been South Africa's pre-eminent race circuit. But now Porsche had a racetrack.

Two years down the road, more or less, Kyalami is on the up and up. Racing is still what it does – it's never stopped – but forms part of the mix because sentiment has to take a back seat to commercial realities. This is not just a place where people race. It has to work for a living.

The Kyalami legend started in 1961 with a fast, sweeping, nine-turn, 4 km circuit on 72 hectares, mainly on the farm Bothasfontein in Midrand, north of Johannesburg. Racers and fans the world

over instantly admired, if not quite loved,





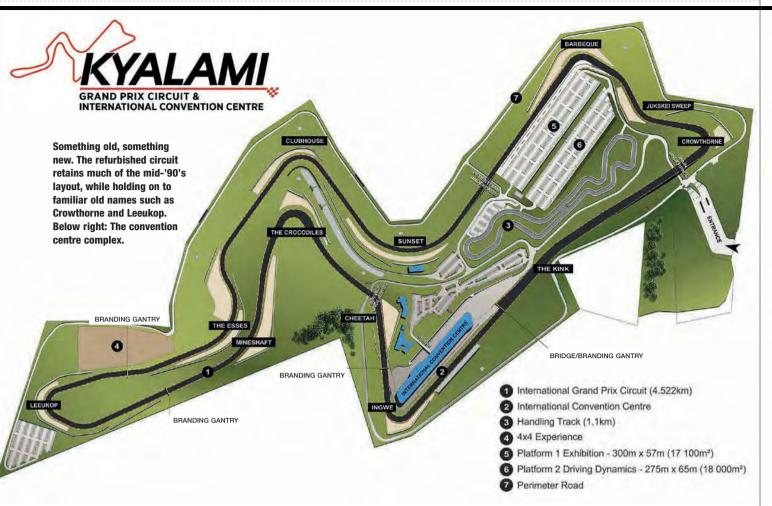
Before and after: Top, the circuit under reconstruction as viewed from Crowthorne. Above: The view from Ingwe down the start/finish straight.

Kyalami's blend of fear and exhilaration. It hosted 21 Formula One Grand Prix races, the last being in 1993.

Jim Clark broke Fangio's F1 victory tally there and Mansell, Prost and Senna were among the countless champions who mastered its challenges. It changed – for the worse, many would say – after the surrounding area became more built up.

A fast track that rewarded brave drivers and severely punished lesser ones became a slightly longer but twistier proposition. Rebuilt in the early 1990s as part of a commercial development, it was revised again after Formula One abandoned the rebuilt circuit in 1993.

Although the new owners clearly didn't have a master plan – Baldwin was bang in the middle of overseeing the R120 million Porsche Centre Pretoria at the time – an obvious starting point was to rip up and replace the track. Through their Porsche Centres they had a relationship with global construction company WSP, so that was



the roadworks taken care of. Renowned German engineer, racer and racetrack designer Herman Tilke was drafted to create a track that paid homage to the original, while being bang up to date.

As work on the circuit proceeded, it soon became apparent that this was a bigger job than everyone had expected. Further track-oriented upgrades entailed safety measures mandated by motorsport's governing body, the FIA. All of the debris fencing, safety barriers and tyre and belting safety systems were deemed inadequate and had to be replaced. New-spec debris fencing involved ordering in more than 60 kilometres of additional cable. All gravel in the arrestor beds was replaced. Tarred run-off areas were added at Sunset and Ingwe corners.

Sometimes, it seems, the ghosts of racers past had their say, too. "One day, standing on the track, looking down the main straight, Toby kind of wistfully wondered if we could recreate the old straight," Baldwin recalls. W-e-l-l... it wasn't exactly practical. But to give it the right feel, a longer straight would be nice. The pro-



posed alignment was discussed and decided on in the time-honoured fashion: "Sketched on a little piece of paper over lunch," says Baldwin.

The familiar old names of the corners have been retained. "But not the precise layout. Barbeque looks the same, but it is not the same."

The circuit now measures 4,522 kilometres and sports a specialised asphalt surface and substantial upgrades to driver, race official and spectator safety, in

accordance with its grading from motorsport's international governing body, the FIA. Two multifunctional outdoor exhibition platforms, with a combined area of 35 000 square metres, incorporate a dynamic driver training area with purposebuilt skid pan and a handling circuit. The 1,1-kilometre handling circuit can be split into two separate circuits that can be used independently, or connected, and feature irrigated wet-condition driver simulation.

The bulk of Kyalami's zoning allows for a variety of land uses and conditions, including private open space, motorsport and related purposes. Luckily for motorsport fans, there's a specific condition attached to part of the land: it has to be related, in some form or another, to the current use: that is, a racetrack. Besides this there is also provision for offices, and retail and commercial spaces, useful in the light of the commercial boom in the surrounding areas. One specific exclusion is residential development, with the exception of special approval from the local authority.

Getting to this point hasn't been only about finding financing. There were stormwater issues. Elevation issues. As the project developed, the scope of required municipal permissions broadened. "A lot of the bomas were decrepit. And a lot of rubbish was put into the ground in previous generations including rubble and bits of concrete." Then there was the business of procurement. "Where are you going to get 60 kilometres of rope for the debris fencing?" Behind it all, the inscrutable Venter. "He just wanted to do everything right. No compromise."

To date, the investment has totalled R500 million. This is big money, and Kyalami has to pay its way.

"Motor racing is a tiny part of Kyalami," says Baldwin. "It needs to be a complete business. The thinking was, if we are making this investment decision we need to develop a revenue generator, one not necessarily linked to motor racing.

"To be fair, we wanted an iconic building linked to the racetrack," he adds. And, without missing a beat, "Something to rival Sandton Convention Centre."

It was clear improvements were needed to the pit building, brand activation and conferencing facilities. "The pit building was a monster," says Baldwin. It took months of consulting industry experts before work even started on this R50-million upgrade. The result is a multi-function facility which can accommodate conferencing, activation and exhibitions. Everything from ablution facilities to food preparation areas upstairs has been upgraded to deal with big events.

The Kyalami Convention Centre incorporates the new Paddock Club: 2 770 square metres of air-conditioned, flexible event space with 9-metre ceilings. An 820-m² covered viewing deck looks out over the greater Johannesburg skyline.

When we spoke to Baldwin towards the end of 2016, the venue was quietly ticking over with half a dozen big Christmas par-





Top: The pit complex was comprehensively rebuilt at huge cost and is now able to host events and activations. Above: Among the first official motoring events to be held at the new circuit was the launch of Audi's latest R8.

ties, and the music and food fair Delicious is returning in August 2017 with five international acts.

Corporate events have been held and the owners are treading warily to avoid negative pushback. But motorsport is definitely high on the agenda, and not just local. "We are hoping to see the return of international motosport events," Baldwin says.

It's not all about the racers, either:

there's good news for spectators. "We are trying to get spectactor banks back," says Baldwin. "A major criticism of the old circuit was poor visibility and blocked views." That's been comprehensively remedied in the redesign.

And the owners want to create a place that is more than just a strip of tar. "We want to plant trees," says Baldwin. "We have hydro-seeding areas to try to create a green environment."

Access, long a bugbear, has been

improved radically. "We have a good flow. We have put a one-way system in place."

They're also keenly aware of maintaining good relationships with their neighbours. Kyalami once was out in the sticks, and now is being swallowed up by urban sprawl.

"Actually, we get on well with our neighbours," Baldwin says. "A lot of people are proud of (being close by)."

And for those times when events get a bit... er... loud, Baldwin hastened to reassure us that a noise specialist is kept on site to monitor big events.

There's a buzz about Kyalami that suggests even bigger things are in the offing. A return to Grand Prix racing? In terms of facilities, the circuit is effectively one rung below F1 level. Moving to the top step all comes down to money... lots of it.

In the meantime, racing will continue. Event organisers will soon find out about everything Kyalami has to offer. No question, it is back in business with a bang.



A CRUISER FOR A SUPERHERO

THE MOTO GUZZI FLYING FORTRESS LOOKS TOUGH ENOUGH TO FIGHT CRIME. BUT ONLY IN NICE WEATHER.

BY DAVID CURCURITO

There's an evolution to riding that I always thought went something like this: street bike to dual-sport, sport bike to sport cruiser, touring cruiser to some sort of silly trike, then perhaps you go back to a sport when you're in heaven. It's like the reverse ascent of man. Your riding position starts upright, then eventually turns to the same slouch when you're watching *Strictly Come Dancing* in your comfy chair. But I've never been a cruiser kind of guy. I can't see myself trading in my sport cruiser for a tugboat blaring Fleetwood Mac from its stereo, no matter what stage of life I'm in.

I've been riding a lot lately, having clocked more than 6 000 kilometres in two weeks, and, believe me, my shoulders and hips and butt are feeling a new kind of twinge. Suddenly the sloth-like cruisers that I cursed along the Blue Ridge Parkway a month ago looked like Swedish masseuses, so I thought a cruiser would provide a comfortable break. When you first see it, the Moto Guzzi MGX-21 Flying Fortress looks like something custom-made for Batman. It's black; blacker than black actually, with a matte-black exhaust, rims, and a bat-like front fairing. The only colour on this 2,4-metre-long bike is the brilliant red on the headers and Brembo brakes. Its fuel tank and enormous tapered hard cases are, no surprise, carbon fibre.

I couldn't wait to get the Fortress on the road. I decided to take it for a 1 000-kilometre ride to the Kancamagus Highway, stop for lunch in North Conway, New Hampshire, and head back. On a cruiser, I figured I could lay back and do a sudoku puzzle, listen to some music on the sound system and make some sandwiches, all while taking in the scenery. Wrong. The first day of the two-day trip was the worst weather; a hard rain with thick fog. The MGX-21, equipped with multiple driving modes – *veloce* (fast), *turismo* (touring), *pioggia* (rain), and *venti cappuccino* – handled the roads well, but

with a basically non-existent windshield, no lower fairing to protect my legs, and nothing but pegs protecting my feet, the elements really beat me up. In strong winds the bat-wing handlebar fairing and semi-enclosed carbon-fibre front wheel tossed me around like a kitten in a dryer. Ever had rain seep into a full-face helmet before? How about having the water go through your rain gear and straight up your leg to form a puddle in your crotch? It's a sick, sick form of torture.

Then the weather cleared up. The next day the Guzzi cornered through some beautiful stretches of the White Mountain National Forest with ease. The 71-kW. 1 400-cm³ V-twin has 120 N.m of massive torque that's ballsy and responsive. Even though the bike weighs 341 kilograms and can be hard work manoeuvring around the parking lot, once you get it up to speed, it scribes an arc like a compass. Solid and confident, the torque pulls you onto the straights with a heady surge of acceleration. It's a joy to drive; just check the weather first. I always used to wonder why guys had more than one bike. It seemed like a way to show people that you had too much money. But now I realise it was just a way to be able to ride whenever you want. No matter how many clouds are in the sky.

FROM PLAYSTATION TO THE PROS

DON'T KNOCK VIDEO GAMES.
THEY COULD OPEN THE DOOR
TO SUCCESS IN SOME REALLY
FAST COMPANY, LUMKA
NOFEMELE FINDS

When you're dicing wheel to wheel

with fierce rivals on legendary race circuits, you need massive reserves of skill, reflexes and commitment. You also need to stay focused in the face of increasingly vocal threats to, say, donate your ice-cold supper to the dog. There's no denying the fun you can have as a virtual racer in *Gran Turismo*, if you don't mind the trade-off against domestic harmony.

But racing in virtual reality was never really about fun for the supremely focused David Perel. Becoming a professional driver has been this 31-year-old Capetonian's goal since he was barely old enough to grasp the controls on his PlayStation handset.

Today, Perel drives for Kessel Ferrari in one of most competitive leagues in the world, the Blancpain GT Endurance Series. His story is one of drive, ambition and countless hours of gaming. And he credits his virtual success on his PlayStation with jumpstarting his real-life career.

"I learnt more on a PlayStation than I did in five years of real driving," says Perel.

The 31-year-old has just returned from another successful run with the Kessel Ferrari team in Europe and is living proof that video games can be good for you.

Real-life racing was always going to be Perel's thing. He started out in karting and, by age 15, was competing for the western province karting championship. By the age of 23 he had won five provincial and National Championship titles.

"Go-karting is a great way to start off your racing career," says Perel. But there are only so many tracks available. In the virtual world, though, things are very different.

"There was only one go-kart track for me to practise driving, but a video game has 120 race tracks. I literally used the PlayStation to learn how to drive."

Endless hours with Gran Turismo – solo and racing against others online – helped Perel hone his already considerable skills. Perel's racing community shared their video lap times and experiences so often that they inspired him to start his own website, called GT Playground, for gamers around the world to connect



David Perel credits years of playing video games for his success. Opposite: In his Cape Town beachfront flat, Perel explains the value of VR to writer Nofemele.

and share their scores.

Now knowing what he was up against, Perel decided to enter Gran Turismo's racing competition, the GT Academy. The GT Academy provides an alternative route into mainstream motorsport. The completion provides Gran Turismo gamers the chance to go from their PlayStation to a real-life professional racing career with Nissan.

Perel placed third in the competition and thought he was off to Europe to compete with other high placing racers from around the world. Unfortunately, South





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Africa was not one of the nations that were invited to contend for the title, so Perel's dreams were dashed, a feeling he had to get used to.

"Motorsport is obviously not big in SA. It takes time, money and energy to get to the level you need to be at to compete with European drivers who have had the resources and support most of their lives."

In 2009, at the age of 24, Perel progressed from go-karts to racing single-seaters on the bigger stage. However, midway through the season he was forced to stop racing due to a lack of funding. That's common in the world of racing, a more

expensive sporting pursuit than most.

Because he couldn't race anymore he decided to focus on growing his business.

He co-founded a web company with his brother, where he worked 20-hour days, seven days a week, for four years while living on his couch in the office, until he had saved up enough money for one more shot at GT.

"I was sleeping and breathing my business. I would watch racing on TV and wonder why I was not there."

When he saved enough money, he drew up a list of 50 teams he could potentially race for and called all of them. The response was blunt: no, no, and no. And then: "Believe it or not it was the last team on the list that gave me the response I was looking for."

Perel was offered the opportunity to drive the 2015 season with Lamborghini Bonaldi Motorsport in the Italian GT Championship. He was given just a week to prepare.

"That's a week to organise travel and accommodation. One professional race can cost a driver up to R200 000. I was only able to do it because I had been saving up for four years and I got a few sponsors to help me out."

Finances may have been an issue, but racing never was and he credits gaming for this. "Simulations are widely used in racing now. Through video games, I learnt my temperament, my peak, what happens when I don't eat, when I'm tired and my levels of endurance. I'm still using these techniques today."

The key: don't treat a video game like... a video game. "Every track in the game is the same in the real world. It felt like I had already been there. The mapping of tracks is exactly the same. Even the colour of the grass is replicated."

Risking it all and going to compete in the Italian GT series resulted in an incredibly successful season for Perel. He earned 2nd place in the championship and included







more wins, pole positions and fastest laps than any other driver in the field.

His performance in his first European season led to an offer from Kessel Racing Ferrari to try out at the Vallelunga racetrack in Italy. After the two-day test, David finished on the same pace as their factory drivers.

Last year, with the help of his manager, Alan Macdonald, Perel signed a three-year deal with Kessel Ferrari to represent them in the Blancpain Endurance Series. It has always been a dream of David's to compete in the series, but little did he know that it would happen in only his second year of GT Racing.

And he's under no illusions about what's needed to reach the top.

"Being a good driver is only 10 per cent. You need dedication, mental strength, the Top: Perel in full racing gear posing with a roadgoing Ferrari. He is currently getting ready for the next gruelling GT season.

Above right: Perel takes to the podium after Kessel Ferrari wins in Barcelona at the International GT Open last year.

ability to cope with adversity and you need to keep up your fitness.

"I always knew I could drive, and drive well, at that. Years of go-karting and gaming taught me that. It's the ability to preserve that that really makes a great driver."

So what games does Perel recommend for aspiring drivers?

"For PlayStation users, *Gran Turismo* has the better physics, while engineers say that *Project Cars* is the best simulation," says Perel.

"Forza on Xbox has great engine sounds.

If you are a PC gamer, you might want to try *R Factor* or *iRacing* – both of which are used quite often by professionals."

As a nation South Africa has shown it can take on the world on the track in terms of skills, Perel believes. The flipside is that we've been less successful at translating skills into long-term careers. "The finest gokarters in the world come from SA, yet we have so few professional drivers." It all comes down to investing in our talent, in his view. But there's no point in sitting around waiting to be recognised: the likes of Perel and our biggest current motorsport success story, MotoGP star Brad Binder, have had to learn to hustle on the track as well as off it. And don't leave it too late. "You have to be dedicated to racing and try to get sponsors. And the younger you are when you start, the better."

THE GUIDE TO CAR OPTIONS

A PRIMER ON SELF-RESTRAINT.

WITH EZRA DYER

If I can convince just one person to avoid the sunroof, then my career has had some value. Because the sunroof is nonsense. Let me give you the sales pitch: we, the manufacturer, will cut a hole in your car's roof and install a glass panel. When closed, solar gain will turn your interior into a sweat lodge. When open, a low-pressure zone will attempt to vacuum your otic ganglion out through your ears. Oh, and at some point, this thing is definitely going to leak. For all this, we'll charge you R15 000. Maybe more. Ready to sign up?

As a man whose overhead map lights fill up like miniature aquariums every time it rains, I've learnt that there are options you should always buy and others you should always decline. Choose wisely and your car will have everything you need for the lowest possible price. Go awry with extras and you'll saddle yourself with years of heartbreak and regret, all while undermining your car's resale value.

Let's start with fundamentals: colour and wheels. Yes, it's tempting to pay the extra for the Austin Yellow Metallic on your new BMW M4. You may want the 20-inch wheels, the primary draw of the Competition Package. And you may wish to swaddle yourself with the Sakhir Orange leather seats. BMW will be delighted. But you'll wind up rocking a colour scheme reminiscent of bad pea soup, riding on 30-profile tyres that will do precious little to shield those beautiful wheels from even the shortest of kerbs.

When it comes to colour, it's hard to go wrong with the no-cost choices. I assure you, your vehicle will include paint, regardless of whether you pay extra, and it's unlikely that the next owner will have a qualm with Alpine White. And for wheels, remember that each extra inch of diameter means a corresponding reduction in tyre sidewall height. If you have several to choose from – the -Jaguar F-Pace's wheels are available in four sizes, from 18 inches to 22 inches – go with the middle ground. Your car will look right, and you won't get body-slammed at every highway expansion joint.

Aesthetics and ride quality are, of course, subjective. Other decisions aren't. Like the sunroof, any navigation system is a waste. One former Apple engineer told me that, unlike swift tech companies, auto manufacturers can take up to five years to develop and finally deploy a new system in a car that should be on the road for a decade. "Imagine that in phone terms," he said. "Would you buy a new phone that was designed five years ago and then keep it for ten years after that?" No, you wouldn't. Which is why I use the Waze app, lest my car's useless navigation system – part of a R60 000 package when I bought it – attempts to use its outdated maps to take me west via the Oregon Trail.

This applies a thousandfold to DVD players. Example: the rear-seat Blu-Ray entertainment system in a 2017 Toyota Sequoia. Buy two 32-GB iPad Air 2s, hang them off the back of the seats, and save the 70 per cent premium.

Finally, there's the matter of performance. I'll never talk anybody out of buying the most powerful engine. But I might try to talk you out of all-wheel drive. A 2017 Mercedes C300 costs appreciably more with all-wheel drive and loses heavily in consumption on the highway. And for what? So you can drive up the side of the mountain in a snowstorm? You can do that anyway with the right set of winter tyres, which have the added benefit of helping you steer and stop. Besides, making your car lighter almost always costs money (a set of titanium Ferrari lug nuts can easily run into five figures), so think of your non-all-wheel-drive car as a bargain superleggera. Speaking of which, you know what else saves weight? Skipping the sunroof.



OPTIONS YOU DO WANT

ELECTRONIC SAFETY

Lane-keeping assist, automatic braking, adaptive cruise – these things will make your life easier. And possibly save it.

THE BIG STEREO

Digital source material is finally respectable enough to make a booming system worth it.

Bluetooth Apple Music sounds legit on a Bose, Bowers, Bang, or Burmester.

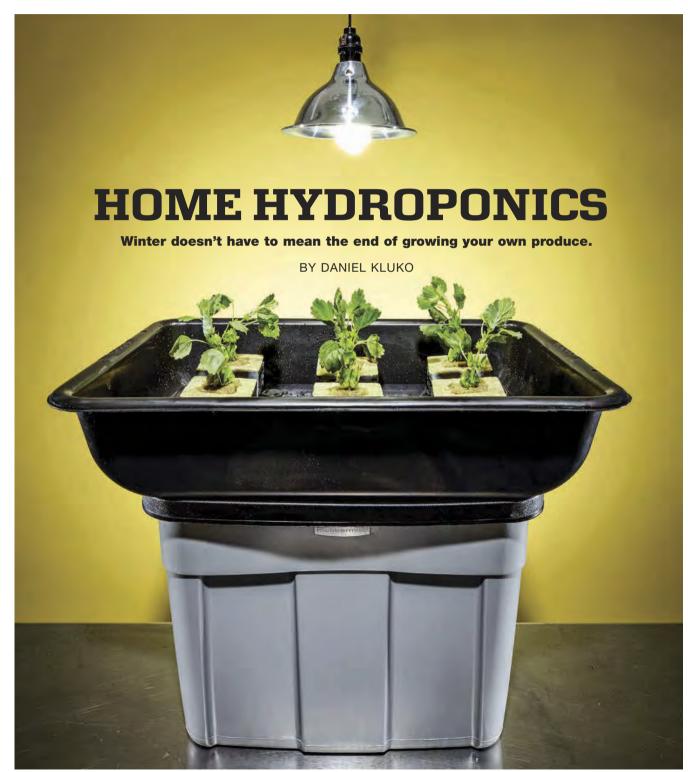
KEYLESS START

Not for the starting, but for the automatic unlocking.

THE HEATED STEERING WHEEL

The greatest option ever.

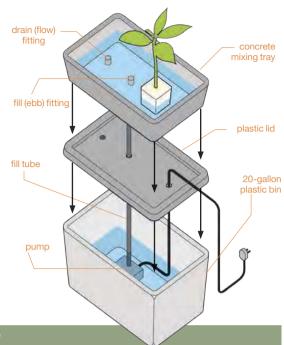
SKILLS



PHOTOGRAPH BY DEVON JARVIS

hen summer ends, a lot of our gardens close for the winter. But hydroponics keep your garden going year-round. Rather than counting on the soil to provide plants with nutrients, a hydroponic set-up gives them everything they need directly through the water. You don't even need natural light.

There are six basic types of systems: wick, deep-water culture (DWC), ebb-and-flow, drip method, nutrient-film technique (NFT), and aeroponics. At Green Spirit Farms, an indoor vertical-farming company that I run with my father in New Buffalo, Michigan, we use a combination of NFT and ebb-and-flow. [Editors' note: Read about Dan and his dad in "In the Light Fields", July 2016.] NFT is probably the most popular system for commercial growers. It's what most greenhouses use because of the low water requirements, and it's the most conservative you can be on your water and nutrients. But it's also prone to clogging and, if you don't pay attention, little issues can lead to crop loss. For home use I recommend an ebb-and-flow system like this one. There's little maintenance and fewer opportunities to kill your crops. The system is also relatively inexpensive and easy to build. You'll be eating homegrown rocket in as little as two to four weeks.



SYSTEM

MATERIALS LIST*

- 75-plus-litre sturdy plastic bin with lid, dark color (light promotes algae growth)
- Concrete mixing tray
- Ebb-and-flow kit (Botanicare Ebb and Flow Fitting Kit with two extensions)
- Oil-free pond pump, from 600 to 1 500 litres per hour
- 60 cm 12 mm black vinyl tubing
- 30-mm inch spade bit or holesaw

At two opposing sides of the concrete mixing tray, use a drill and a 30-mm spade bit or holesaw to create holes for the filling pipe (ebb) and drain (flow) from the ebb-and-flow kit. For a cleaner hole, put a piece of scrap wood beneath the tray to drill into.

Place the mixing tray on top of the plastic bin lid.

Mark the location of the holes in the mixing tray on the lid. Remove the mixing tray and drill holes in the lid with your spade bit or holesaw.

Near one edge of the bin lid, drill a 6-mm hole. Use a box cutter to make two 40-mm cuts in the shape of an X over the hole. This will be where the

pump cord leaves the plastic bin, vour reservoir.

Identify the flow fitting from the ebb-and-flow kit (Fig A). It has the larger nipple on the bottom. This will be the drain for your tray. Assemble the flow fitting by screwing a riser to the side opposite the nipple, then screwing the filter on above it. We added a riser because of the eventual height of our grow medium. You want the drain, excluding the filter, to be a quarter of the height of the medium you use. If you choose a shorter medium, don't worry about using the riser.

Insert both fittings in the holes in the tray (Fig B). Do not attach them to the reservoir lid. Make sure that the gaskets are

above the tray for a watertight seal, and that the nipples extrude beneath it. Secure the fittings by tightening the nuts beneath the tray.

Attach the 12-mm adaptor included with the pump to the pump's outflow and place it in the reservoir. Add the tubing to the pump and pull the power cord through the X cut in the reservoir lid.

Pass the tubing through one of the holes in the reservoir lid and attach it to the smaller ebb nipple below the mixing tray (Fig C)

Place the lid on the reservoir, align the fittings, and put the tray on top of the lid.







*Unless otherwise noted, all materials are available at your local hardware store or on Amazon.



PLANTS AND OPERATION

MATERIALS LIST

- pH/EC meter
- Two programmable electrical timers
- Full-spectrum LED or fluorescent light
- Plant nutrient
- Rocket seeds
- Rock wool starters and cubes

Ithough similar plants such as spinach and kale could probably be grown together, for best results, you should grow only one plant in a system at a time. I recommend starting with a leafy green such as rocket, which does not have a fruiting phase in which the plant

Before any plants go into the system, your seeds need to germinate. You'll need to choose a growing medium. This is what the plant will take hold in, and it can be a lot of things. The industry standard is rock wool, a material very similar to glass fibre that is extremely porous and holds 16 times its weight in water. It's the most widely used hydroponic medium in the world because it's completely inert. There's nothing in it, and that's exactly what you want; you can control your variables. You can also use regular soil, a foam medium called Oasis, clay pebbles, products made from the husks of coconuts, or crumpled coffee filters in plastic plant pots. As long as you have an inert material that can hold water and oxygen, you can use it as a medium. But we'll stick with rock wool.



Rinse the rock wool starter cubes (Fig D), then soak them in water with a pH of 5,5 for about an hour. Place a seed in the hole of each starter and moisten the cubes. Keep them moist, and in a few days a sprout should appear. Put it near a window for light, and in ten to 12 days – when you see sprouts several centimetres tall and roots going to the bottom of your rockwool starters – place the cubes in their larger rock wool blocks.

The most important consideration in hydroponics is consistency. If you have one, a basement is often a good place to put your system because of the even temperatures. (One easy way to tell if it's a good place to grow plants: Ask yourself if you're comfortable in that room. If you're not, your plants won't be either.) Place the growing medium in the mixing tray. Confirm that the risers for the drain fitting reach

only a quarter of the way up the medium.

makes seeds before harvest.

Plug the water pump into an electrical timer. For the majority of plants, setting your pump to run two to four times per day for 15 minutes will provide adequate water and nutrients. When the pump is on, water floods through the fill fitting and drains back into the reservoir when it reaches over the drain riser (Fig E). Once the pump shuts off, any leftover water drains back into the reservoir through the fill tube.

Hook your lights to a timer and fix them above your hydroponic system in a way that light hits all parts of the grow tray. The amount of light your plant requires depends on the

plant itself and the particular stage of the grow cycle. A good reference for light timing (and nearly everything else) is Howard M Resh's Hydroponic Food Production. For rocket, 12 hours a day will be enough for the plant to grow, but not flower.

Fill your reservoir with 60 litres of water and mark the water level with a pen so you don't have to measure the next time. Having a consistent amount of water is important for correct nutrient concentration.

Look up the produce you want to grow online on Cornell University's Controlled Environment Agriculture page to find a plant-specific nutrient base. I recommend a one-part mix that can all be added at

once, like 16-4-17 hydroponic fertiliser. Follow the instructions on the nutrient mix to add an appropriate amount to the water. Change the water and nutrient solution at least every two weeks.

Keep track of the pH and electrical conductivity (EC) of the water daily (Fig F). The pH should remain the same for all plants. The ideal is 5,8, but anywhere between 5,5 and 6,2 is acceptable. If your levels are off, you can adjust them with a kit bought from the pool section of a hardware store. The EC will vary based upon the plant you grow. As your plants feed, you want the EC to gradually rise. In order to lower the EC, you will add water to the reservoir. To increase the EC, add more nutrients to the system. The target EC level for rocket is 0,8 to 1,2.





HARVEST

Watch your plants as you would in a traditional garden. If a problem gets to the point that you can see it, the plant has been dealing with it for a week. Avoid tinkering with nutrients until you get a successful first run.

Harvest your crops at the same time you would in traditional gardening. Rocket should be ready to harvest after two weeks and should provide another harvest every week for another four or five weeks.

When a harvest is finished, replace the rock wool and clean the system's reservoir, pump and tubing with a 3 per cent hydrogen-peroxide solution.

THE SIX TYPES OF HYDROPONIC SYSTEMS



WICK SYSTEMS The simplest system. It can use soil as a grow medium with a wick line into a reservoir of plain water. Doesn't take much attention, but it's not going to have the best yield.



The medium is the water and the plants rest in it all the time. You need an air pump and an air stone to make sure that the plants get enough oxygen, though. You get great yields, but it's a lot harder without experience and you are more liable to get root rot.



EBB-AND-FLOW The best system for beginners, but it's used by many professionals as well. Provides good yields and uses very few mechanical parts. One drawback is that it requires large amounts of water to use.



DRIP METHOD The most sustainable approach to nutrient conservation. An emitter slowly drips nutrient water on the root system all day long. The problem comes when the small emitters clog. Which they are going to do. NASA experimented with this system on the International Space Station.



NUTRIENT-FILM TECHNIQUE A small film of nutrient is used like a small stream that is always flowing down along the roots and recirculating. As with the drip system, expect the emitters to clog.



The highest yields – if you can do it correctly. A mister sprays water and nutrients on the roots and gives them great oxygen flow. Again, beware clogged emitters.



Smooth operator

Quick, easy blade changeout and ergonomic design that allows optimal right- or left-handed operation are just two of the Bosch PHO 1500 Electric Planer's party tricks

IF YOUR GOAL is absolutely flat surfaces and precisely chamfered corners, with minimal effort, it's hard to beat the Bosch PHO 1500 Electric Planer. Design highlights include electronically balanced drum and tungsten carbide blades that are said to be sharper and last 30 per cent longer than conventional hardenedmetal equivalents.

"The PHO 1500 extends the functionality of the planer beyond the traditional woodworking tool," says Bosch Home and Garden Brand Manager Ninet Bosman.

Its patented Woodrazor blade system allows for quick and easy blade changeout and a combined guidance and cutting-depth adjustment handle ensures precision and secure guidance. Handle position has been optimised for both left- and right-handed users. An automatically extending parking rest prevents damage to the workpiece or blade when putting the planer down.

The powerful 550-W motor is well up to demanding applications, up to a cutting depth of 1,5 mm. The three integrated V-grooves are ideal for applications such as fitting a window or door, or planing the collar beams on a roof truss. Entire rebates are also easy to make: rebating depth is 8 mm and maximum planing width 82 mm. Removing coatings such as varnish should be effortless.

A chip-clearance blower prevents chip congestion, allowing uninterrupted work. The blower can be connected to a dust bag or vacuum cleaner.

SHOP NOTES

EASY WAYS TO DO HARD THINGS



Rubber tub captures sawdust

There are plenty of ready-made and DIY solutions for sawdust collection from a contractor's saw, but none as simple and cheap as that devised by reader Wayne Germain of San Tan Valley, Arizona. He purchased a plastic bin with a clamping lid, cut a hole in the lid to accommodate the saw's motor, then screwed it to the enclosure. When it's time to saw, he clamps the bin in place. Afterward he simply removes it and dumps the dust. Germain estimates he traps 80 per cent of the sawdust, and could easily capture more by adding some weather stripping.

Know your drill bits



TWIST General purpose for wood, metal and plastic



rate holes

in wood







HOLESAW Bores large holes: centering bit guides entry into

the surface



MASONRY SINK Often used Creates a with a pilot hole hammer drill: fluting for a screw and space off-loads to fasten it debris flush





STEP AND TILE Pyramid Carbide tip shape creates allows it to holes of many diameters in cut without causthin steel, ing cracks aluminium

Better measure of cell reception



If the cruel vicissitudes of cellular service have you suspecting the five bars at the top of your screen are not what they seem, prepare to be vindicated. Phones measure reception in decibel-milliwatts (dBm) on a scale from, roughly, minus 140 (no service) to minus 40. But there's no standard. Four bars on one phone may be equivalent in dBm to two bars on another. Luckily, most handsets allow you to display reception in dBm instead.

>> ON AN IPHONE, call *3001#12345#* to go into Field Test mode. The bars are replaced with a dBm reading. Hold the power button until "Slide to power off" appears, then hold the home button until Field Test guits. Now tapping the reception indicator switches from bars to dBm.

>> ON MOST ANDROID PHONES, you can view dBm reception through the "About Phone" menu.



Kettle grill makes perfect turntable for spray painting

When you've got something to spray paint from all sides, consider a kettle grill for your work surface. It's just the right height, and on many models the grill can be turned by hand. Just be sure to cover the grill with newspaper or drop cloths, lest your burgers taste like Rust-Oleum.

ILLUSTRATION BY MORNING BREATH



Getting started in...

FURNITURE BUILDING

It's going to be tough. Your first couple of chairs might be a little wobbly, and your bookshelves may crumble under anything more than a few paperbacks. But you'll get better. Eventually, what was a liability will become a money-saving source of pride. BY ROY BERENDSOHN



BUILDING YOUR OWN FURNITURE is a lot like growing your own vegetables or working on your car. On the one hand, you might ask yourself, Why bother? On the other, you might ask, Why not? On any given day, depending on how much time you have to spare, it's hard to say which answer will have the upper hand.

But there's nothing like building something and putting it to work in your life and in the lives of people around you. I've built very little that qualifies as fine furniture. Most of what I've built

is utilitarian: sawhorses, simple bookcases and shelves, that sort of thing. But there's a mahogany blanket chest from years ago, with dovetailed corners and a finish of countless layers of tung oil. I built it with hand tools and intended it to be a good fake of an antique. Guests at our home sometimes say, "Oh, what a lovely old chest." I get a kick out of that. When someone compliments a nice piece of furniture, and you're the guy who made it? That's a feeling you don't get many times in life. Unless you're a full-time furniture maker. Then you probably hear it a lot.



Find something to build

While you may eventually become skilled enough to design your own furniture, when you're starting out, you should always work from a model. One good way to learn is to find a piece of furniture you like and try to copy it.

Otherwise, here are a few good places to look:

niture you'll find projects to hone your skills, including a Shaker cabinet, a bookshelf, a kid's storage bench, a farmhouse table (right), and a sim-

ple bench (below).

Buildsomething.com offers a collection of user-generated designs for everything from workbenches to a TIE-fighter bookshelf. Nothing is vetted, but most of the projects we've seen look solid. And they'll definitely inspire you.







THE BEST BOOK ON FURNITURE BUILDING

If you buy only one book on the subject, make it Andy Rae's Complete Illustrated Guide to Furniture & Cabinet Construction.
There are tool tips and techniques, and more plans than you'll ever be able to work through.

Essential tools



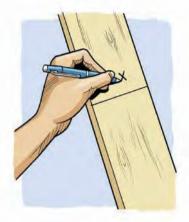
20mm WOOD CHISEL

KREG POCKET-HOLE JIG

MARKIN KNIFE ILLUSTRATIONS BY STEVE SANFORD



Basic tips



DESIGNATE THE SCRAP SIDE

After you measure and mark your cut line, place a small X on the scrap side. Always cut on that side of the line, otherwise you're liable to cut a piece too short by the width of the saw blade.



CUT PARTS EXACTLY THE SAME

Ensure that multiple parts are the same dimension by clamping and cutting all pieces at one time, or by using a fixed power tool, like a mitre saw with a stop block.



EXTEND YOUR MITRE SAW

You can greatly enlarge the capacity of your saw by building a base – essentially a platform with a gap in its centre for the saw. This enables you to more reliably and safely cut long pieces and to attach stop blocks.



GUIDE YOUR CUTS

Use a rip fence (a bar that runs parallel to the saw blade) or a square to direct your saw to ensure a completely straight cut.



WORK FROM A RELIABLE FACE

Lumber doesn't always come square from the factory, so you'll need to check it with your square tool and cut it square, if it's not already, to create a reference face. Measure all dimensions from that edge or face.



ALWAYS CHECK FOR SQUARE

Pressing a square into the corner of an assembly is a good way to check, obviously, but on larger projects you need to check diagonal measurements. The two measures from corner to corner should be the same.

A FEW PEOPLE TO INSPIRE YOU



BOB CLAGETT

Learn to make: floating desk, end table and foldable shop stool. youtube.com/ iliketomakestuff



MATTHIAS WANDEL

Learn to make: workbench on wheels, daybed and bookcase. youtube.com/ matthiaswandel



ALEX HARRIS

Learn to make: pedestal table, burl table and sled. youtube.com/ teenwoodworker

SQUARE

CLAMPS

CIRCULAR

TAPE MEASURI CORDLESS

STRAIGHT EDGE

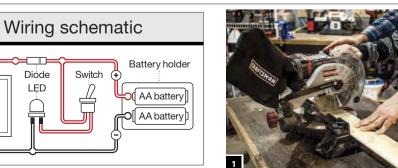


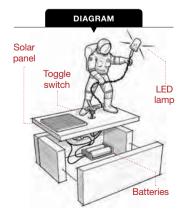
A SOLAR-POWERED night-light may sound counterintuitive, but when the night-light isn't in use during the day, it captures ambient light. Just leave it near a window and open the blinds. The two AA batteries hold enough power to keep the night-light running until the sun comes up, then the solar panel starts collecting again and the process begins all over.



SHOPPING LIST

QTY	DESCRIPTION
1	Action figure with open-grasp hand
	65 cm 22-AWG wire
1	1N914 diode
1	Small solar panel, 3,0-volt 70-milliamp with wires*
2	AA rechargeable batteries
1	10 mm LED lamp
1	AA battery holder
1	Toggle switch
20	25 mm 16-gauge finishing nails
1	No. 8 x 25 mm sheet metal screw
	6 x 100 x 600 mm board
	15 x 75 x 600 mm board
	Multipurpose adhesive
	Soldering gun or crimp connectors



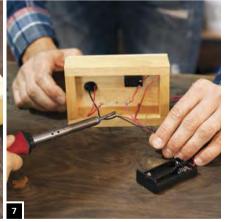
















INSTRUCTIONS

kid only



parent only



parent and kid

- 1. Crosscut the top panel from the 100 mm board. An 80 mm piece should accommodate most action figures.
- 2. Using twist-drill bits and a cordless drill, make a 5 mm hole for the LED wire and a 15 mm hole for the switch. Use a spade bit to make the 20 mm hole for the leads from the solar panel.
- 3. Crosscut the box ends and sides from the 75 mm board to accommodate the top panel. Use wood glue and finish nails to fasten the parts, and a nail set to countersink the nailheads.
- 4. Cut two 25 cm pieces of wire. Use wire strippers to remove 10 mm of insulation from all four ends. Take one end of each wire and solder it to the LED. Wrap connections with electrical tape. Twist these wires together and poke them down through the hole in the box cover.
- 5. Take the remaining 15 cm piece of wire and strip 6 mm off each end. Poke one end through a hole in a switch terminal and solder. Beneath the box top, attach the positive wire from the LED to the other terminal on the switch.
- 6. Feed the switch leads down through the box and hold the switch in place by tightening the nut from below. Drop the leads from the solar panel down into the box and glue the panel in place.
- 7. Use the schematic on opposite page to make the remaining connections. First, solder together the free LED wire and the negative wires from the solar cell and battery pack. On the other side of the solar cell, solder the positive wire to the diode. Diodes are directional, so make sure that the black band on the diode is on the side of the circuit nearer the battery holder. Solder the other side of the diode to the free wire on the switch and the positive wire from the battery.
- 8. Place two batteries in the holder and test the circuit. If it works, glue the holder to the inside of the box wall. If not, double-check the wiring against the schematic and be sure that you have the batteries in the holder correctly.
- 9. Attach the action figure by boring a pilot hole from the inside of the box using a 2 mm bit. Use the same bit to make a hole in the foot of the action figure. Mount the action figure on the box by driving the sheet-metal screw through the box and into the figure's foot, and place the LED in its hand.



THE SUBJECT:

Michael Parris

THE JOB:

Ski-maker and designer

LOCATION:

Jackson Hole, Wyoming

IN 1998, Parris left a career designing robots for Carnegie Mellon University. His new gig? The ski business. A friend who ran a ski company hired him as a designer - Parris has a degree in architecture - and today he owns Igneous Skis, handcrafting only 100 pairs each season, each of which sells for about R22 000. This giant green thing helps him do it.

"I interview each customer. Someone who wants to cruise with their kids? An ex-college racer bumming in Jackson Hole? I want to know why you ski."



/ WINTERSTEIGER **BELT SANDER AND** STONE GRINDER

A. I use the belt sander to shape the sidewalls of the ski and to shape out the band-saw cut, to bevel it, round it out at the top a little bit.

B. The other side is a round stone cylinder. A diamonddressing bit goes back and

forth along the stone to cut different patterns called structure. The base of a final ski has little grooves cut into it, like tyre treads. A structured base with microfine texture at the bottom dissipates water, making the ski go over the snow faster. I put the final edges in a crosshatch pattern with the stone.

2 / THE WOOD

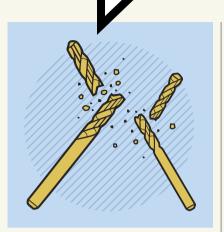
Maple is one of the harder woods to work with, but it has rebound strength, impact resistance, and a vibration transfer that gives a precise feel for the snow. Ash has a similar impact resistance, but slightly less rebound quickness. It mellows out the ride.

3 / HANDCRAFTED CORES

One of the unique things we do is build our own cores. Any one piece of wood might have some inconsistencies, but making a core out of a dozen strips creates a more homogeneous material. It's stronger and more stable than the wood was originally.

POPULAR MECHANICS' senior home editor solves your most pressing problems. BY ROY BERENDSOHN





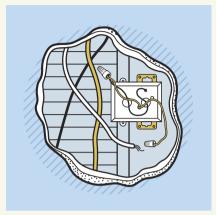
I broke two bits drilling holes in my garage floor with a rented hammer drill. What did I do wrong?

The most obvious possibility is that you hit a piece of rebar, or reinforcing steel. Or maybe you found a cast-iron drainpipe. If you see a pipe exiting the floor at any point, assume that that's what you're hitting and drill elsewhere.

You might think that a bit strong enough to drill through concrete could also handle steel, but a masonry bit's tip and flute geometry are completely different – thicker and blunter, meant to pulverise. Also, the hammer drill was probably in percussion mode, which simultaneously pounds and drills through concrete, stone or asphalt. That percussive action broke the bit when you hit steel. Even if you'd switched to rotary mode, it wouldn't have helped. The bit may not have broken, but it wouldn't have made any real progress through the steel.

First, determine whether you can move the hole to another location or drill a shallower hole. If neither is practical, switch to the next heavier rental drill, called a rotary hammer. Get a masonry bit and a rebar-cutting bit. When you hit steel, back out the masonry bit and install the rebar cutter. Switch the drill off hammer mode and into drilling mode; now drill through the rebar before backing the bit out and switching back to the masonry bit and hammer mode.

The other issue I didn't mention is age. Not yours – the concrete's. Concrete hardens as it ages. Take your time and let the drill do the work with as little muscle as possible on your part.



We're remodelling our old house and have found a lot of disconnected old wiring in the walls. Is it better to remove it or leave it alone?

Old, disconnected wiring is a common sight when you open the walls, floors and ceilings in an old house. It's a good idea to remove it for several reasons, but before I get into that, the most important thing to be sure of is that the wiring is truly dead. If you can't plainly see that the wiring is not connected to anything, you'll need an electrician to evaluate it. Even then, double-check all wiring with a non-contact voltage detector before you start messing with it.

Let's assume an electrician checks the old wiring and finds that it's kaput and safe to handle. Removing it is relatively easy, assuming it's in conduit as it should generally be. If your wiring is in drywall, you should use a fire-blocking foam to seal any holes where it travelled through the framing. Both the old wiring and its holes serve as a conduit for rodents. Those holes can also lead to cold drafts. More important, the holes form a ready path for hot combustion gases in the event of a fire. Which is why you filled them up with fire-blocking foam.



Is there a good way to make speaker holes in my ceiling? I've tried a cordless jigsaw and a drywall jab saw, but both look sloppy.

Your best bet is to invest in an inexpensive adjustable hole cutter. Typically these can cut holes from 50 to 125 mm in diameter. The cutter consists of two adjustable knife-like cutters affixed to a bar. These blades orbit a central pilot drill and the entire assembly is housed in a clear plastic dome that looks, surprisingly, like something you'd place over a cake. Chuck the drive end of the cutter into a cordless drill and you're in business. Almost. Don't forget to clamp on the drill's auxiliary handle. You're going to need that handle for extra support since you're working overhead, which requires more exertion. The handle helps offset some of the back force on

Lay out the centre of each speaker hole, and poke the pilot drill bit into the mark. Ease into the cut. Instead of getting all over you, most of the dust and debris falls down into the plastic dome, including the circle of board. A light touch and a firm grip on the drill is really all it takes.

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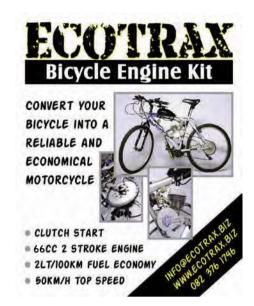


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WINNING TIP

BACKWASH BRAINWAVE

With summer here and accompanying strict water restrictions, it becomes difficult to backwash your pool filter properly. Here is a tip that works and saves water at the same time.

Backwash your pool into a wheelie bin and leave it overnight for sediment to settle. Next day, siphon clear water back into your pool with the garden hose. Clean the wheelie bin with half a bucket of your clear water.

You will have to modify your backwash outlet as in the photo and you could buy a dedicated bin (like I did) or use any large 200-litre drum. You could also put an outlet valve in the bottom (50 mm higher than the bottom) to make it easier to get the clean water back into your pool. Another option is to wheel the bin to one of your gutters (you will have to modify it) and collect water for your pool.

One storm should fill it up. Let's save water!

CHRISTOFF WOLMARANS ROOSEVELT PARK



SEEING RED OVER REMOTES

People often chuck away batteries when a TV remote doesn't work, but often the problem lies elsewhere and a pair of good batteries is wasted. To narrow the possible faults down a bit, there is an easy way to see if an infrared remote is functional. Most TV remotes use infrared, a wavelength of light that humans can't see with their bare eyes. However, cameras are sensitive to infrared light, unless they have an infrared filter in their lenses. If you look at the infrared emitter of a remote through the camera of your phone, you should see a purplish blink when you press any of the buttons on the remote. When you

see this blink, the batteries are still fine and the problem is further down the line. Note: iPhones have multiple infrared filters in their camera lenses, so you might not see the blink as clearly as with certain other phones.

> LOUIS BURGER OUDTSHOORN

SANDPAPER ON FILE

To keep different sheets of sandpaper flat and organised, punch small holes and file them according to grade in an A4 ring binder. Alternatively, use plastic envelopes in the binder. This will allow you to easily find the grade of paper you're looking for and to supplement sheets before you use the last one of a specific grade.

CLYDE SMIT MALMESBURY



SOCKET-SET STORAGE

One of your readers wrote in about a tray he had made for his socket set using plywood and nails. I have a Gedore socket set, which is about 25 years old. This came with the vacuum-formed plastic tray for the various bits. Needless to say, they don't last long. I had some 3M jointing resin, which is used for joining cables, etc. I filled the back of the form with this and discarded the plastic form. As you can see from the photo, this has stood the test of time and is still going strong.

WILLY PITTNER EDENVALE



KEEP OUT SCAVENGERS

Scavenging monkeys can be a real hassle in our area. Using a 60 mm shackle and a length of ski rope (large knots inside the bin) solved my problem; no more trash spilt.

GERALD LUCAS WESTVILLE



SEND US YOUR HINT - AND SCORE!

Send us your tip and you could win a **Master Lock hamper worth R1 500.** This great prize includes the 4-dial combination lock, Fusion padlock, weatherproof padlock and Excell square link chain.

The Master Lock No. 604EURD Set-Your-Own Combination Padlock embodies toughness, keyless convenience and good looks, with 40 mm wide solid aluminium body for durability, classy brass finish, intrusion-resistant chrome-plated steel shackle and 4-digit set-your-own combination allowing for thousands of possible combinations. The 6 mm diameter shackle – 26 mm long and made of chrome-plated steel – resists cutting and sawing.

The **Fusion padlock** is a 44 mm chromeplated zinc design with two-position adjustable steel shackle. There's also front access keyway convenience and a stylish matching key head.

The Master Lock Excell® No. M115-EURDLF Laminated Padlock features a 49 mm wide laminated steel body for maximum strength and reliability and is surrounded by a weatherproof covering. Its 8 mm diameter octagonal shackle is 38 mm long and made of Tough-CutTM boron-carbide, 50 per cent harden than hardened steel, offering maximum resistance to cutting and sawing. The four-pin cylinder prevents picking and the dual locking ball bearings provide maximum resistance against prying and hammering.

The Master Lock No. 8016EURD Chain is 1 metre long and features 8 mm diameter hardened steel links, offering extra resistance to cutting and sawing. The welded steel link design provides superior pry resistance and a vinyl sleeve protects against scratches.



Send your tips to:

PM Do It Your Way, Box 180, Howard Place 7450, or e-mail popularmechanics @ramsaymedia.co.za. Please include your name, address and contact number. Regrettably, only South African residents are eligible for the prize. Prizes not claimed within 60 days will be forfeited.

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