Johns Hopkins Health Review

COVER: THE CULT OF BUSY
Learning to take back your time

UNDERSTANDING INFLAMMATION
What scientists really know about its effects on the body

A HUNGRY MIND
Fasting’s benefits for the brain

STAYING HOME
How to age in place
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British illustrator and visual artist Nathan Hackett draws inspiration for his work from literature, cinema, comic books, and the social critiques of George Orwell. His illustrations combine pencil with ink to create intricate compositions that border on the architectural.
Carlyn Kolker
Carlyn Kolker ("Staying Home") is a freelance writer based in Brooklyn, New York. A former reporter for Bloomberg News and Reuters, she is working on a book about speech and language development in young children. PAGE 60

Livia Cives
Originally from Italy, Livia Cives ("Time to Vaccinate") is an illustrator working in Stockholm. Her signature style combines traditional pen and ink with digital manipulation. An illustration that appeared in Johns Hopkins Magazine earned her a gold medal in the scientific category of the AI Annual Awards 2016. PAGE 39

Michael Anft
Formerly a senior writer for Johns Hopkins Magazine, Baltimore-based Michael Anft ("Understanding Inflammation") writes for publications such as AARP The Magazine and The Chronicle of Philanthropy. He is developing a TV drama based on human trafficking. PAGE 50

Jun Cen
Jun Cen ("Short-Sheeting Sleep") is a New York-based illustrator and animator. His work can be seen in The New York Times, The Washington Post, The Verge, and more. PAGE 14
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When we came up with the idea to report on what we were calling “the cult of busy,” we immediately knew this story had to be written.

Many of us are working parents; all of us juggle our jobs, our relationships, the running of our households, our hobbies and workout routines. None of us feels like we have enough time to do it all, or at least not well.

Editor Elizabeth Evitts Dickinson set out to find the perfect freelancer to report and write the story . . . only to be told, again and again, “Nope, sorry, too busy.” Of course. And so it felt slightly ironic that Elizabeth—a card-carrying member of the cult—would step up and volunteer to write the story herself.

Her cover story, “The Cult of Busy” [p. 26], does a wonderful job of pulling together a history of how we got to this point, an explanation of the toll such a hectic lifestyle takes on our health, and—most importantly—some guidance on how we might begin to slow things down a bit. I encourage you to find a comfy spot, sit down, breathe, and read her story.

While you’re at it, you can take a little more time to learn about how fasting might actually make our brains work better [“Expert Advice,” p. 8], get advice from a registered dietitian about how to pick a good cooking oil [“Survey,” p. 16], or learn about the fascinating work of neuroscientists who are trying to understand the brain’s role in creating our appreciation for art, music, and architecture [“The Biology of Beauty,” p. 70].

If you’re a member of the cult of busy, taking time to read this magazine and think about your health is a good first step. Enjoy the issue, and please send any comments to us via johnshopkinshealth.com.
Cutting your energy intake by fasting several days a week might help your brain ward off neurodegenerative diseases like Alzheimer’s and Parkinson’s while at the same time improving memory and mood.
Are There Any Proven Benefits to Fasting?

JOE SUGARMAN

You probably know that too many calories aren’t good for your waistline, but as it turns out, they aren’t good for your brain either.

According to research conducted by neuroscientist Mark Mattson and others, cutting your energy intake by fasting several days a week might help your brain ward off neurodegenerative diseases like Alzheimer’s and Parkinson’s while at the same time improving memory and mood.

Mattson’s studies have built on decades-old research establishing a connection between caloric intake and brain function. In laboratory experiments, Mattson and his colleagues have found that intermittent fasting—limiting caloric intake at least two days a week—can help improve neural connections in the hippocampus while protecting neurons against the accumulation of amyloid plaques, a protein prevalent in people with Alzheimer’s disease. “Fasting is a challenge to your brain, and we think that your brain reacts by activating adaptive stress responses that help it cope with disease,” says Mattson. “From an evolutionary perspective, it makes sense your brain should be functioning well when you haven’t been able to obtain food for a while.”

But why fasting? Wouldn’t just eating fewer potato chips a day have the same effect? Apparently not, says Mattson. He explains that every time you eat, glucose is stored in your liver as glycogen, which takes about 10 to 12 hours to be depleted. After the glycogen is used up, your body starts burning fats, which are converted to ketone bodies, acidic chemicals used by neurons as energy. Ketones promote positive changes in the structure of synapses important for learning, memory, and overall brain health. But if you eat three meals a day with snacks between, your body doesn’t have the chance to deplete the glycogen stores in your liver, and the ketones aren’t produced. Mattson says exercise can also get your body to lower its glycogen levels, and not coincidentally, exercise has been shown to have the same positive effects on brain health as fasting.

Mattson recommends people try one of two strategies for incorporating calorie restriction. The first is called the 5:2 diet, which has gained popularity in recent years, particularly in England after the BBC aired a 2012 documentary called Eat...
Fast and Live Longer in which Mattson was featured. That diet calls for limiting your caloric intake to 500 calories two nonconsecutive days per week while eating a healthy diet in the normal caloric range (2,000 for women; 2,500 for men) the rest of the week. Five hundred calories means maybe a fried egg for breakfast and a small serving of lean protein with vegetables for lunch or dinner.

Another strategy is a time-restricted diet in which you pack all your meals into one eight-hour period a day so your body has time to exhaust its supply of glycogen, start burning fat, and produce ketones. Mattson says animal studies have shown that the time-restricted diet has effects similar to those of intermittent fasting.

If you do decide to try fasting, don't dive in too quickly, Mattson advises. “The analogy with exercise applies here as well. If you’ve been sedentary and then all of a sudden you try to run five miles, it’s not very pleasant and you’ll likely get discouraged. It’s the same thing as if you’ve been eating three meals a day plus snacks, and then you’re not eating anything at all for two days; you’re not going to like it.”

Mattson suggests easing into the routine by starting with one day of moderate fasting per week and then building up to two. There will likely be a week or two of headaches, lightheadedness, and/or grouchiness, which are common side effects, but after the initial phase, experiments show that your mood should pick up.

Mattson collaborated on one six-month study of people practicing the 5:2 diet that demonstrated people’s well-being improved over time. Neurochemically, he says, when the brain is challenged by physical exertion, cognitive tasks, or caloric restriction, the body produces a protein called BDNF (brain-derived neurotrophic factor), which not only strengthens neural connections and increases the production of new neurons but can also have an antidepressive effect. In his experiments with mice, he’s found that those with exercise wheels in their cages have higher levels of BDNF and show fewer signs of depression. “Probably during evolution, BDNF evolved to play an important role in increasing neuroplasticity in the brain and forming new synapses crucial to learning and memory as well as mood and motivation.”

But like so many others, will the 5:2 diet and its ilk become just another diet du jour?

“I hope it’s not a fad,” says Mattson, who is currently working on a study involving obese subjects at risk for cognitive impairment and the effects of intermittent fasting. “There’s a lot of science behind it, and the science is only increasing.”
**10 Items to Safeguard Your Home**

**1 / Residential sprinklers**
Required in some new construction, but homes can be retrofitted. Costs are coming down each year, and insurance discounts are offered. You want sprinkler buds in every living space.

**2 / Smoke and carbon monoxide alarms**
Gold standard for each is hardwired, interconnected alarms—with battery backup. Device location is important, so follow manufacturer’s instructions.

**3 / Surge protectors**
Buy whole-house protectors (connected to the electrical panel) and devices with the “UL Listed” mark.

**4 / Handrails**
Falls are the most common household accident. Rails on both sides of stairs increase safety.

**5 / Shower grab bar**
Attach to studs, not drywall. Diagonally placed bars suit multiple heights.

**6 / Nonslip mats or decals**
Mats with suction cups are OK, but rubber-backed surfaces are best.

**7 / Furniture/appliance tie-downs**
Anything top-heavy (bookcases, TV) should be secured to the wall with metal L-brackets or furniture straps.

**8 / Adequate lighting**
Inside and outside. Place lighting fixture anywhere you need to see placement of feet.

**9 / Locks**
With kids, lock boxes/cabinets with items like guns, prescriptions, and chemicals. Lock windows starting at the second level to prevent falls.

**10 / Anti-scald faucets/shower heads**
Thermostatic mixing valves keep water in the safe 120 to 140 degree range. Cooler water risks Legionella bacteria; hotter water can scald.

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Unintentional home injuries have been a persistent public health problem for decades. In 2012, more than 19 million medically attended injuries and poisonings occurred in the home. Accidents come in the form of slips, falls, burns, poisonings (notably from drugs and household cleaners), drownings, and accidental suffocation, particularly in the case of infants and seniors. The right home modifications and safety devices—provided they are properly installed, maintained, and understood—can protect you and loved ones from harm, according to Eileen McDonald, co-creator of the Johns Hopkins Children’s Safety Center. She focuses on interventions to reduce unintentional injuries among children and older adults. “Many people think that injury prevention is just common sense, but it can’t be when safety recommendations are not common knowledge,” McDonald says.
I wish there were...

A pollution app for a smartphone that could “sniff” the air and record what you’re being exposed to and at what levels.

We’d like to think the air we breathe contains nothing but oxygen, nitrogen, and carbon dioxide in healthy, fixed ratios. In truth, outdoor air contains pollutants such as sulfur dioxide, fine particulates, ground-level ozone, and allergens that produce health consequences, from watery eyes to respiratory disease and cancer. Indoors, carbon monoxide is a common threat. A pollution app, says Ben Hobbs, could assess air quality in real time (is it worthy of an orange alert?). The app, and its associated sensors and software, would detect pollutants and then store and display the data on your phone. This information could also be uploaded to a database.

“This would be a terrifically useful research tool to better understand where air quality is a problem and, in particular, what we are exposed to,” Hobbs says. “Do you have unhealthy air in your kitchen that you need to fix? This app could tell you.”
Survey

**BODY/**

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**WORLD/**

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Short-Sheeting Sleep

Scientists have confirmed what insomniacs, on-call health care workers, and parents of newborn babies have suspected for years: Night after night of interrupted sleep makes people really grumpy.

In a study by the Johns Hopkins School of Medicine, 62 healthy men and women were randomly assigned to three consecutive nights of either forced awakenings, delayed bedtimes, or uninterrupted sleep. After the second night, those forced to awaken experienced a 31 percent drop in energy levels, sympathy, and friendliness; the delayed bedtime group showed a 12 percent decline. Patrick Finan, a Johns Hopkins psychologist, says the study shows that interrupted sleep can be cumulative.

The problem is that disrupted dreamers don’t get enough “slow-wave sleep” to feel refreshed. “Many individuals with insomnia achieve sleep in fits and starts throughout the night, and they don’t have the experience of restorative sleep,” Finan says.

To wake up happy, aim for quality over quantity, assuming you have a choice in the matter.

Beating Blood Clots

The most common and preventable cause of hospital-related death is blood clots. Clotting kills more than 100,000 people each year. But preventing deep vein thrombosis (a clot that forms in a deep vein) and pulmonary embolism (a clot that travels to the lungs) is tricky, according to experts at the Armstrong Institute for Patient Safety and Quality at Johns Hopkins. The common belief has been that ambulation, or movement, is key to preventing deadly blood clots when an individual is hospitalized. But that assertion is not supported by strong evidence. Johns Hopkins researchers have found that each patient, depending on his or her particular health realities, should have an individualized treatment plan, which could include a host of important lifesaving measures such as anticoagulant drugs or compression devices.
Picking a Cooking Oil

[nutrition]

Avocado and flaxseed. Sunflower and pumpkin seed. A dizzying array of oils have flooded the market recently, each rumored to carry health benefits. Coconut oil is billed as a treatment for everything from eczema to Alzheimer’s. Sunflower oil may strengthen the immune system. What's a health-conscious eater to do?

Take such claims with a grain of salt, says Linda Bunyard, a registered dietitian at the Johns Hopkins Weight Management Center. Data on the benefits of particular oils are still sparse, and “overall health is never just about one nutrient,” she says. Consumers should focus instead on what to avoid: saturated fats like butter and animal fat. (Bunyard includes coconut oil in this category, though some claim its health benefits outweigh the risks. “We don’t have enough data to say either way yet,” she says.)

For any oil, it's important to know its “smoke point,” the temperature at which it begins to break down and produce potentially toxic byproducts. Smoke points are often listed on the label. Above all, be moderate. “Just adding olive oil to the typical American intake will not make us healthier.”

Safety First

[supplements]

Herbal supplements are a $36.7 billion a year industry in the United States, yet federal law and oversight remain weak. The debate over these dietary supplements often centers on efficacy: Does that echinacea pill really shorten a common cold? Will glucosamine relieve your creaky knees?

The primary concern, argues Joshua M. Sharfstein, associate dean for public health practice and training at the Johns Hopkins Bloomberg School of Public Health and former principal deputy commissioner of the U.S. Food and Drug Administration, should be whether you're getting safe ingredients in the first place. The FDA recalls dietary supplements hundreds of times a year for hazardous ingredients, yet many facilities—and the products made inside—are never tested. Sharfstein argues that we should focus first on regulating what is a largely unregulated industry. “Can we ensure that dietary supplements are safe for consumers to take?” Sharfstein says.

Improving vitamins, minerals, and herbal extracts through better standards for identifying substances in products and a pre-market registration system is a good first step to a safer market for supplements, he says.
Go With the Vinyasa Flow

[EXERCISE]

Joint pain and stiffness can make it hard to get moving for the one in five adults living with arthritis. But a little namaste can go a long way to manage arthritis. A randomized trial led by Johns Hopkins researchers found that a program of gentle yoga modified for people with arthritis reduced pain while boosting energy and mood.

Neti Pot Primer

[ALLERGIES]

April showers bring May flowers, and for many of us, seasonal allergies. The Neti pot, a device for flushing the nasal cavity with saltwater, can provide relief. Douglas Reh, a sinus specialist in the Johns Hopkins Department of Otolaryngology, regularly prescribes nasal irrigation to patients suffering from hay fever. “There’s very good evidence that patients feel better when they do this,” he says.

But the Neti pot has become notorious in recent years following the deaths of several users who contracted brain-eating amoebas from contaminated water. Not to worry, Reh says. “Any water that’s distilled, boiled, or filtered is safe.”

Reh prefers a plastic irrigation bottle to the Neti pot. “It’s a little more high flow, you can direct it more, and it’s a little less messy,” he says. He advises users to wash out the device with dish soap a couple of times a week and keep it out of the dishwasher. And don’t wait for that first pollen-induced sneezing fit to fire up the nose-rinser. “You need to use it through the whole season,” Reh says. “It can be preventive.”

Music to Your Ears

[AUDIOLOGY]

Always plugged into an MP3 player? Inexpensive custom-molded earphones could protect your hearing. “One reason people turn the volume up to inappropriate levels is they are trying to hear over background noise,” says Hopkins audiologist Steve Bowditch. Basic earphones leave a space between the bud and your ear, causing noise to seep in. A shape tailor-made for you will block outside noise, cause less soreness, and improve the listening experience.
The Genetics of Nicotine Addiction

Whether your first cigarette is a one-off rite of passage or one of thousands you’ll smoke in your lifetime may depend on your genes.

By studying the earliest stages of nicotine dependence, researchers at the Johns Hopkins School of Medicine have determined that “there are definitely some people who are nicotine avoiders and others who are nicotine choosers,” says addiction researcher Roland Griffiths.

Genetic and metabolic vulnerabilities likely lead some people to become nicotine choosers, a finding based on the behavior of nonsmoking volunteers in a recent small study. Over time, the volunteers were able to distinguish between two seemingly identical pills—one with nicotine, one without—and then say which one they preferred and why.

Nicotine choosers cited improved concentration, alertness, stimulation, energy, and mood. Nicotine avoiders chose the placebo because the other pill made them feel lightheaded, dizzy, or sick. Knowing that this predisposed preference exists may lead to new preventive measures and smoking-cessation options.

A Boost for Aging Brains

Exercise energizes the brain, and understanding how this happens may lead to therapies for age-related neurological degeneration and diseases. As we age, our brain cells may stop producing enough energy to remain fully functional, and diseases like Alzheimer’s can complicate matters. A team of scientists at Johns Hopkins Medicine and the National Institute on Aging’s Intramural Research Program studied mice as they ran on wheels and found that the rodents had increased levels of a protective enzyme in their brains, which may subsequently boost energy levels in brain cells.
Your Evolving Relationship With Tech

[TECHNOLOGY]

We live in the heyday of “the Internet of Things,” where so many of our technological devices are connected and fueled by our personal preferences and data. Your phone talks to your car and plays a favorite song on the commute home; your home thermostat knows to set the A/C before you walk in the door. In the process of acting as hunter-gatherers and distributors of our personal data, our objects develop their own personal identity that is inextricably tied to us, according to J.R. Reagan, the global chief information security officer of Deloitte and a senior professional instructor at the Johns Hopkins Carey Business School.

Instead of being gateways to identity theft, our tech devices could one day join forces to use their intimate knowledge of us to make our lives better, Reagan says. The devices could communicate with each other to create a kind of cyber safety net. Users could effectively add to the chain cryptographically signed permission slips giving other users rights to access their stored data in particular ways. “Like an extended family, our Identified Things are not only taking care of us, they’re watching out for us, as well,” Reagan wrote in Fedscoop.com. “That’s cybersecurity.”

Monitoring Screen Time

[CHRONOBIOLOGY]

We may be enjoying longer days and brighter sunshine this time of year, but it’s not just seasonal weather changes—like shorter days in the winter—that can influence our moods, according to experts at the Johns Hopkins Brain Science Institute. To function at their best, your brain and body need to know when it’s day and when it’s night. Staring at tablets, TVs, and smartphones well into the evening floods your brain with too much light at the wrong time and can throw your internal biological system out of balance, leading to depression. Experts suggest powering down computers, TVs, and phones by early evening.
School meals may contain unsafe levels of bisphenol A (BPA), according to a new study co-led by the Johns Hopkins Center for a Livable Future. BPA—a chemical commonly found in canned goods and plastic packaging—can disrupt human hormones and has been linked to adverse health effects, including cancer. A student consuming pizza and milk with canned fruits and vegetables could take in anywhere from minimal levels to 1.19 micrograms of BPA per kilogram of body weight, or more than half the dose shown to be toxic in animal studies.

The study’s site visits, conducted in the San Francisco Bay Area, found that most school cafeteria food came from a can or plastic packaging and was precooked and preseasoned. The only items not packaged in plastic were oranges, apples, and bananas. The overuse of packaged goods is a result of efforts to streamline food preparation and meet federal nutrition standards while keeping costs low. Robert Lawrence, co-author of the study and director of the CLF, and lead author Jennifer Hartle, who spearheaded the work as part of her doctoral program at the Bloomberg School of Public Health, say the research shows we should take a precautionary approach and limit exposure to BPA by serving students more fresh fruits and vegetables in school meals.

Research shows we should take a precautionary approach and limit exposure to BPA in school meals by serving students more fresh fruits and vegetables.
The Family That Runs Together

[FITNESS]

Your decision to train for a marathon isn’t good just for you; it may also be good for your spouse. New research led by the Johns Hopkins Bloomberg School of Public Health finds that if one spouse improves his or her exercise regimen, the other spouse is significantly more likely to follow suit. “When it comes to physical fitness, the best peer pressure to get moving could be coming from the person who sits across from you at the breakfast table,” says Laura Cobb, co-author of the research. The study’s findings suggest a better approach to encourage physical activity might be to counsel married couples together instead of individually. The American Heart Association recommends that adults exercise at a moderate intensity for a minimum of 150 minutes per week, or at a vigorous intensity for at least 75 minutes per week.

The Great American Smokeout That Wasn’t

[DRUG USE]

The prediction that relaxing marijuana prohibition would produce legions of teenage tokers has gone up in smoke. Marijuana use among American high school students is significantly lower today than it was 15 years ago, despite marijuana being legalized in many states for medical and recreational uses and a move toward decriminalization of the drug, new research suggests.

Renee M. Johnson, an assistant professor in the Department of Mental Health at the Johns Hopkins Bloomberg School of Public Health, says marijuana trends could reverse course, so she and her colleagues will closely watch states where recreational marijuana use has been legalized to see if that leads to increased use among teens. To fend off a potential uptick, Johnson recommends instituting programs that educate high school students about the specific harms of marijuana use. The focus to date has been more on preventing teens from using tobacco and alcohol, an effort that has been largely successful.
Age-Appropriate Flu Protection

Those most vulnerable to influenza—seniors and children under 2—are also the toughest to protect. But new research suggests that existing vaccination methods can be tweaked to elicit an effective immune response in these populations.

People over 65 are most likely to get the flu and suffer serious complications, including prolonged symptoms and bacterial pneumonia, says Andrew Pekosz, a Johns Hopkins professor of molecular microbiology. Nasal spray flu vaccines, which contain a weakened strain of the virus, are less effective for older people who have been exposed to many strains of flu, since their built-up antibodies inhibit the vaccine from infecting and stimulating the immune response. Pekosz says that seniors should opt for a high-dose flu shot, which has twice the dose of the traditional vaccine. To protect infants and toddlers, he suggests that all members of the family get vaccinated. Anyone 6 months or older can get the trivalent flu vaccine, which protects against three viruses, says Pekosz, who is leading a study to develop a nasal spray flu vaccine for use in those over 49 and under 2.

The Booze Tube

Parents who recoil at the high volume of beer and bourbon ads on TV might have reason to cheer. A revised set of “no-buy list” criteria could help reduce underage viewers’ exposure to alcohol advertising on cable TV, a new Johns Hopkins study finds. “No-buy lists” refer to those television programs that advertisers choose to avoid in order to comply with self-regulatory marketing guidelines.

The report, published in the Journal of Studies on Alcohol and Drugs, found that from 2005 through 2012 youth were exposed more than 15 billion times to alcohol ads that were not in compliance with the alcohol industry’s existing guidelines. The paper recommends advertisers avoid programs that were previously noncompliant, and that they avoid times of day when audiences skew to teens, like late at night.
**Screening for a Deadly Foe**

*Lung cancer kills more Americans than colon, breast, and prostate cancers combined. In 2015, the disease claimed more than 150,000 lives in the United States alone. Why so lethal? Lung cancer is resistant to most therapies, and it’s typically diagnosed too late. Early detection could save your life—and there’s proof.*

Using low-dose CT scans to screen high-risk populations for lung cancer cuts the risk of death from the disease by 20 percent, according to an influential study that was published in *The New England Journal of Medicine*.

Lonny Yarmus, director of interventional pulmonology at Johns Hopkins Bayview Medical Center, says it’s not just current smokers ages 50+ who should be screened but anyone over the age of 50 with a history of heavy smoking and other risk factors, such as exposure to radon and a family history of lung cancer.

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**Treat an Infection, Widen a Waistline?**

*Antibiotics taken during childhood could have a lasting impact on weight, according to new research from the Johns Hopkins Bloomberg School of Public Health. The findings, published in the *International Journal of Obesity*, reveal that those who take antibiotics like penicillin numerous times during childhood are more likely to gain weight quickly than those who don’t.*

The study found that kids who took antibiotics gained weight, and the weight gain over time was greater among children with more lifetime courses. Research has shown that repeated use of antibiotics can forever change the microorganisms vital to gastrointestinal health, altering the way they break down food and increasing the calories of nutrients absorbed. The study’s researchers suggest that physicians be judicious in prescribing antibiotics and that parents resist the temptation to demand them every time a child gets sick. Systemic antibiotics should be avoided except when truly necessary.
Squandering Seafood

[FOOD CHAIN]

Almost half of this country’s edible seafood supply goes to waste every year. David Love and his fellow researchers at the Johns Hopkins Center for a Livable Future crunched the numbers and found that of the 2.3 billion pounds lost annually, some go to waste during distribution and retail, and some are lost through “bycatch,” when commercial fishermen catch the wrong species. But consumers are the biggest culprits, tossing a shocking 1.3 billion pounds into the trash. Meanwhile, consumers eat on average 3 ounces of seafood per week and the federal government’s latest dietary guidelines ask consumers to more than double that amount to 8 ounces a week. Given this advice and other stresses on global marine life—overfishing, pollution, climate change—reducing waste is “critical and urgent,” Love says.

Place, Not Race

[SOCIAL SCIENCE]

Lifestyle choices affect one’s health, and national studies indicate that behaviors affecting health often differ by race. But Johns Hopkins Bloomberg School of Public Health researcher Roland Thorpe Jr. says such studies are misleading. They confound social conditions like socioeconomics and residential segregation with race.

“The fact that economic disadvantage is so often a part of the experience of minorities in the U.S. has made it difficult to estimate the relative effects of race and socioeconomic status on behaviors that impact health,” he says.

So Thorpe and his team compared data from a national health survey of U.S. households with data from a survey of 628 African-American and white men in Baltimore. The Baltimore survey sampled from racially integrated communities where participants of both races had similar median incomes.

After controlling for factors like obesity and age, the national survey found that African-American men were more likely to be physically inactive and less likely to be current smokers or drinkers than white men. In the Baltimore survey, African-American and white men smoke, drank, and conducted physical activity at about the same rates. Social conditions, it seems, make all the difference.
Fracking May Harm Pregnant Women

[Women's Health]

Fracking is the gold rush of our time. But critics say the natural gas drilling technique and the chemical pollution, noise, and truck traffic that accompany it may endanger humans. Johns Hopkins researchers recently discovered that living near a fracking well may increase a pregnant woman's risk of giving birth prematurely. Environmental epidemiologist Brian Schwartz analyzed birth data from nearly 11,000 babies in 40 counties in Pennsylvania. He and fellow researchers compared that data with data on nearby fracking wells—there are more than 8,000 in the state. Living in the most active drilling regions was associated with a 40 percent increase in the likelihood of a pre-term birth and a 30 percent increase in the chance that the pregnancy was designated high-risk. (The researchers controlled for socioeconomic status.) “Now that we know this is happening we’d like to figure out why,” Schwartz says. “Is it air quality? Is it the stress? They’re the two leading candidates in our minds at this point.”

Gun Laws and Suicide

[Policy]

A new study suggests that if you make people get a license to own a handgun, they’re less likely to commit suicide using one. Likewise, when handgun restrictions are lifted, firearm suicides increase. Johns Hopkins injury epidemiologist Cassandra Crifasi led a team that examined the effects of changes in gun policy on suicide rates in Connecticut and Missouri. In 1995, Connecticut passed a law requiring citizens to undergo background checks and licensing before buying a handgun. Firearm suicides dropped by 15.4 percent. In 2007, on the other hand, Missouri repealed its handgun purchaser licensing law. Firearm suicides subsequently increased by 16.1 percent.

The researchers caution that these are only correlations. But a prior Hopkins study on how changes in gun policy in the two states correlated with homicide rates found even bigger effects. And, as Hopkins’ Daniel Webster, one of the suicide study’s authors, puts it: “Contrary to popular belief, suicidal thoughts are often transient, which is why delaying access to a firearm during a period of crisis could prevent suicide.”
There’s a global epidemic of overscheduling and it’s ruining our health. Here’s how to recalibrate your relationship with time and get your life back.

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Three years ago, physicists from the National Institute of Standards and Technology in Colorado announced that they had successfully invented the most accurate clock in the history of the world. Ten billion times more exact than a quartz wristwatch, their atomic clock used lasers and atoms to measure time with such incredible precision that it would lose a mere second over the next 50.8 billion years. Their invention was quickly lauded as the apex of a long-held human endeavor: mastering timekeeping.

That atomic clock may not lose a second in the foreseeable future, but we humans feel like we’re sloughing off seconds at an alarming clip. More than one-third of Americans say they don’t have enough time in their day to get things done. Work hours bleeding into home life and a prevailing belief that we need to do it all and do it well have created a feeling of constant activity. Gallup polls show that our hectic schedules correlate with a precipitous increase in anxiety. The majority of Americans who report not having enough spare time also say they battle stress. You likely don’t need studies and surveys to convince you we’re a time-starved culture. Simply ask someone how he or she is doing and the likely response is, “I’m busy.”

The frenetic pace of modern life has created what journalist and author Brigid Schulte calls “the overwhelm.” In her book Overwhelmed: Work, Love, and Play When No One Has the Time, Schulte examines how we’ve fractured our days toggling between work, family, housework, and other obligations and how this makes us feel constantly behind. We’re all a few steps out of pace, forever hurtling toward the next ping alert from our calendar. Schulte, a parent and spouse with a demanding career, was very much a victim of this time paucity. “At night, I often wake in a panic about all the things I need to do or didn’t get done,” Schulte writes. “I worry that I’ll face my death and realize that my life got lost in this frantic flotsam of daily stuff.”

Busyness is more than an annoying truth of modern life. It has emerged as a significant health concern. According to Joseph Bienvenu, a psychiatrist and director of the Anxiety Disorders Clinic at Johns Hopkins Hospital. He sees patients wound up from so much overscheduling
Humans enjoy being busy when a task is fulfilling but can feel weighted when a task feels obligatory or when they feel pulled in two directions. There’s a difference between want and should.

that they can’t sleep, think, or make time for important activities like exercise. “Emotional distress due to overbusyness manifests as difficulty focusing and concentrating, impatience and irritability, trouble getting adequate sleep, and mental and physical fatigue,” he says. “This is a vicious cycle, of course. Emotional distress leads to trouble with sleep and fatigue, and lack of sleep and exercise leads to more distress.”

A growing cadre of scientists, academicians, and health professionals are now studying our complex and evolving relationship with time and have found we are suffering from what they call “time poverty.” These experts are also learning, however, that there are ways to reverse that deficiency. Once you understand the root of our modern propensity for busyness—and our singular fealty to the ticking clock—you can wrest some control over your life again.

If you worry that you don’t even have the bandwidth to reset your relationship to time, take a moment to consider what busyness is doing to your health. Studies have found that habitual stress shrinks the brain’s gray matter. It also changes our epigenetic makeup over time. James Potash, the former director of research at the Johns Hopkins Mood Disorders Center, found in a 2010 study that chronic stress results in an overdose of cortisol, which can influence epigenetic markers. (If you think of your genes as a computer, then the epigenetic markers are like the software running those genes and telling them how to behave.) Cortisol is the steroid secreted in the body to instigate the “fight or flight” response to danger, a valuable asset when a tiger rounds the bend but not so valuable in today’s busyness culture. “You can’t fight or flee modern stressors like work deadlines,” Potash said. Consequently, the chronic release of cortisol could lead to depression or other mood disorders including anxiety, irritability, or insomnia.
Being pulled in too many directions can also strain relationships. When we don’t spend quality time with loved ones—and sacrifice social time for a harried to-do list—that can add to emotional unrest, according to Johns Hopkins cardiologist Erin Michos. “Many studies suggest that emotional stress is hard on your health—raising blood pressure and heart rate, for example,” she says.

When busyness and stress rob us of shut-eye, the ensuing exhaustion influences our judgment during our waking hours. Brian Gunia of the Johns Hopkins Carey Business School is a social psychologist with a doctorate in management. He studies behavior in the workplace, and his research has shown that a lack of sleep makes people less morally aware and ethical. “The stress of being busy compromises our sleep with downstream consequences,” Gunia says.

Poor quality sleep has a variety of detrimental effects on workplace behavior, Gunia explains, because people have less restraint and this can lead to their acting unethically or creating a climate that’s more hostile. “When people lack sleep, they have a lower moral awareness,” Gunia says. “Moral awareness is a precursor to moral decisions, and ethically fraught questions rely on that awareness.”

So why do we push ourselves to have it all and fill every minute with something productive, to the possible detriment of our health, our relationships, and our work? Answering that question starts with understanding our contemporary relationship to time and our cultural desire to be seen as productive and valuable.

“In our rush to make more money and to have the American Dream as it’s been defined to us, we ended up crowding out our opportunity to have more time.”
Humans have always needed to tell time, but the clock, as we know it, wasn’t always the measure. For 10,000 years, humans lived in an agrarian culture and understood time through nature: the seasons, the rise and fall of the sun, and the sow-and-reap rhythm of crops. Eventually humans invented simple devices to mark the hours within a day—sundials, hourglasses, and water clocks, which used the regulated flow of water to measure time.

The first mechanical clock wasn’t introduced until the 13th century. With the Age of Enlightenment centuries later, a scientific desire for more precision led to clocks becoming a valuable tool for framing the world. In her book A Sideways Look at Time, Jay Griffiths explains that during the 17th and 18th centuries, time moved from a fluid measure to become more “absolute and deterministic.”

“The increasing precision of clockwork (coupled with the increasing number of clocks and watches) meant time was chiseled to fit snug to the clock,” Griffiths writes. “Time must be predictable, knowable, and visible.”

With the Industrial Revolution, minutes and seconds became a pervasive measurement of time for the common person. The rise of manufacturing regimented time with worker output. Productivity was king, and time translated to money. Today—as the Industrial Revolution cedes to the tech revolution—timekeeping is even more meticulous. We know the exact time in every corner of the world. We leap between time zones and are experiencing for the first time in human history a thing called jet lag, where technology and speed outpace the body’s biological capacity to keep up.

When time became money, our relationship to relaxation also changed. It used to be that the mark of accumulated wealth was leisure—restorative moments away from the toils of labor to enjoy other pursuits. Today, productivity is our top priority. Even the wealthiest among us toil away, packing schedules and squeezing every ounce of value from every second. Bill Gates gave up his golf game in “retirement” to do humanitarian work around the world because, as he told Fortune magazine in 2010, golf “takes up too much time to get any good at it.” (Golf courses around the world are developing nine-hole fast-track courses because people have become too busy...
to play 18 holes.) As we compete to be productive, busyness is as much a status symbol as anything else.

Our national emphasis on productivity is backed by policy. American employers, compared to those in other countries, offer workers the least amount of paid time off, according to statistics from the Center for Economic and Policy Research, with nearly one in four Americans receiving no paid time off. Even when a company does offer vacation time, Americans aren’t taking it. According to a study last year by Oxford Economics, the number of annual vacation days used by employees has steadily declined over the past 20 years, with Americans taking an average of just 16 days a year, less than half of what people take in many European countries.

“Imagine if a colleague at work asks how you’re doing, and you tell them that you’re great because you’ve cut back on your workload to take more time for yourself. They might think you didn’t care,” says Erik Helzer, a social psychologist and assistant professor at the Carey Business School. Helzer researches what makes people feel satisfied and fulfilled at work and in their lives. “There is a norm toward being busy—and that busyness confers your value,” he says. “Your potential worth is somehow wrapped up in the perceived lack of time you have.”

Here’s a surprising truth: You are probably not as busy as you think you are. On average, Americans today have more free time than did previous generations. We’re also spending more time with our kids than did parents of 40 years ago, despite a prevailing sense that we’re dropping the ball on that front, too. So why doesn’t it feel that way?

The answer is in how we experience time in our minds. The pips of the clock and our consumer-based culture are not the only reason we feel time starved. Our perception of time is also to blame. Why does time fly when we’re having fun but feel interminable when we’re waiting on line at the DMV?

“There is a distinction between objective time, which you can measure, and subjective time, which is experiential,” explains philosopher Nils F. Schott, the James M. Motley Postdoctoral Fellow in the Humanities at Johns Hopkins University. Schott, who specializes in the philosophy of time, explains that humans enjoy being busy when a task is fulfilling but can feel weighted when
“You have to be intentional in carving out the time you want for the things that you want.”

a task feels obligatory or when they feel pulled in two directions. There’s a difference between want and should.

This pull can lead to what researchers call toxic time. We worry about what we should be doing for our kids while at work, or we worry about work while out on a date. We may want to exercise, or to stay late at work to complete a particularly fulfilling project, but we feel guilt over what else we should be doing. Time slips away in an unrelenting concern that we should be someplace else doing something more, or that we’re just not able to get to all of the things we hoped to. “We believe that we should be able to do and have everything,” Helzer says. “You’re going to be a great worker, a great partner, a great parent, a great child to your parents, and we’re forever trying to maximize our time.”

This is a big reason for our sense of overwhelm, according to Schulte. “We live under the crazy tyranny of our expectations—that we must be the ideal worker and put in endless hours at work and be the ideal parent and always be available to our children and always be busy and productive, yet doing enough cool stuff and working out and meditating so we’ll look good on our Facebook profile. These over-the-top expectations are actually driving what we think we can and should do in any given day,” she says. “If you are trying to cram a ton of stuff in your day, that creates an atmosphere where you’re breathless and stressed out and you feel powerless.”

Humans are also bad judges of how we actually spend our time. Helzer and colleague Shai Davidai, of Princeton’s Woodrow Wilson School of Public and International Affairs, have been studying people’s perceptions of how they use their time. In one study, they asked participants on a Friday how they would spend their weekend. On Monday, they followed up to see how that time was actually spent. Participants who said they were going to do restorative activities—like reading a book or hiking in the woods—actually did things like plopping in front of the television. This leads to an interesting twist in our perception: We think we don’t have free time when we actually do. We’re simply frittering it away with mindless versions of passive leisure that don’t register as restorative. (According to the latest American Time Use Survey, the average adult spends nearly three hours a day watching TV.)

“People use rest in two different ways,” Helzer says. “One is in an intentional and rejuvenating way, such as sitting and reading, versus the mindless rest where we end up binge watching TV shows and you get up and say, ‘I can’t believe I just wasted three hours.’ What we found is that people believed they
were going to have the more mindful kind of rest over the weekend, but when we interviewed them on Monday, they reported spending more time than they anticipated vegging out on the couch. So even though we have the time, we don’t tend to use it in a mindful way.”

In another study, Helzer and Davidai asked about personal development goals and found that people believed they would have more time in the future to pursue things that matter—like vacations, hobbies, or learning something new. Their research shows, however, that this magic time never materializes because humans continue to fill their days with other obligations once existing ones are complete. “The guiding force behind our findings is that if you wait for the opportune moment, it simply never comes,” Helzer says. “There’s no strong argument for delaying.

“If you look at the ingredients of a satisfying life, what our data show is that people are shortchanging themselves in the areas that may be most important,” Helzer adds. “The lesson is that you have to be intentional in carving out the time you want for the things that you want.”

“There is a simple way to take back your time: Do less.

And yet, those two words are perhaps the most challenging call to action. Doing less means understanding your priorities and constantly defending them against the encroachments of the status quo, which dictates that busyness—and material wealth and value—is best.

Tim Kasser, a psychologist and professor at Knox College in Illinois, researches how Americans spend their time, and he’s been studying the inverse of our busyness epidemic: time affluence. In the 1990s, Kasser conducted research that found a correlation between financial pursuits and wellness. When people said that pursuing financial success was important to them, they also reported lower well-being.

Today, there have been many additional studies on this phenomenon, and the relationship between materialism and negative well-being is well-
established, including studies that show the more people care about material things, the more they smoke and over-consume alcohol.

“In our rush to make more money and to have the American Dream as it’s been defined to us, we ended up crowding out our opportunity to have more time,” Kasser says. “Any social system wants to maintain itself—whether it’s a religion or an economic system—and under corporate capitalism, we’re required to maintain certain beliefs. It’s important to work hard, to demonstrate success, to make money. Not only is there a lack of laws that support vacation and family leave, but there’s a continual message encouraging people to work hard and spend more. We internalize those messages, and busyness becomes a badge of honor.”

Kasser started considering the alternatives. “Time affluence means becoming affluent from a time perspective, rather than from a money perspective,” he says. “When we’re time affluent, it allows us to pursue values and activities like personal growth, personal connections, and our relationship to our broader community. These values, in turn, do a good job of satisfying our psychological needs and promoting higher levels of well-being.”

Simply recognizing that you have the power to take back your time is in itself valuable. “There’s something about consciously choosing to focus on priorities that reduces emotional distress, but this requires time, which we should consider precious,” Bienvenu says.

So where do you start? Take a look at our sidebar for specific tips on building time affluence in your own life. And take a page from Schulte. After researching and writing *Overwhelmed*, Schulte made many changes at work and at home—and she made time for play. Rather than rushing headlong into the day, she pauses and considers what’s most important. She
says no when she's too busy, and she has given up trying to be the perfect mother/worker/housekeeper/daughter. She has learned to prioritize her day around her body's and her brain's natural rhythms, tackling important tasks in the morning, when she's most alert. These changes made her more productive even as the pace became more hectic in her previous job at The Washington Post, and she continues to practice these skills at New America, a nonpartisan think tank in Washington, D.C., where she is now the director of the work-life and gender equity program for an initiative called the Better Life Lab. “I recognize that time is a precious resource, and everything I do is a choice,” Schulte says. “I have done the research to convince me about how important it is to change and have seen that change is possible.

“Perhaps the important shift has happened in my head,” she adds. “I've become more mindful about time, I've given up on trying to be perfect. I try to do a handful of things well, not rush through 100 items scrawled on an endless to-do list, and it's allowed me to see that I do have some power over my day.”

Still, Schulte says she can fall prey to old habits and to the powerful pull of busyness. “I'm a recovering workaholic, a recovering helicopter parent, and I can still get easily lost in the digital world and fall down the rabbit hole—everybody else is doing it—even though I know better,” she says. “What's different now is that I can see more clearly the external pressures at work. I've learned to catch myself. Take a breath. And start over. My time just feels different and as a result, I feel hopeful.”

Take Back Your Time

1. Keep a Time Diary
Many, like Schulte, begin reforming their lives by keeping a time diary. Schulte recorded everything she did for a week and labeled each activity as work, housework, family, or leisure. Understanding how she spent her time allowed her to recognize where her time went and where she might adjust her expectations and activities. (Helzer equates it with keeping a food journal when you want to change how you eat.) “The exercise of tracking my time yielded interesting information,” Schulte says. “I couldn't believe that I spent so much time on ridiculous tasks, like perpetually tidying up.”

2. Prioritize What Matters
Examine what’s important to you and structure your life around those priorities. Kasser works a part-time schedule at the college where he teaches—sacrificing a higher salary—so that he can spend more time with his wife and two sons. “That decision comes at a financial cost to me and my family, but it’s left me with time for my kids, time to be in the garden and play piano, time to be an activist.”
3 / Do One Small Thing
Cultivating lasting change requires small steps. “The best advice I can give is to choose one thing—maybe it’s a commitment to leaving work right at 5 o’clock on Fridays—and get it integrated into your life so that it’s habitual,” Kasser says. “And then choose a second thing and get it integrated and habitual, and then a third thing. It’s difficult to totally revolutionize your life overnight.”

4 / Abandon Perfectionism
It’s a fact: You cannot be all things to all people, so set limits. “I was so guilty about being a working mother and I wanted to show myself—and the world—that I was a really good mother,” Schulte says. “So I would automatically say yes to everything without even thinking.” The next time your kid’s school hosts a potluck, consider signing up to bring the forks instead of baking homemade cupcakes. “If your priority is showing your kid that you love him or her, don’t stress out over baking cupcakes late at night. That might be more about you and your fears of measuring up. And if you scrimp on sleep to do it, as I did, you’ll often find yourself fried and yelling at the very child you swore you were baking the cupcakes to prove you loved. So maybe skip the cupcakes and sit on the floor and play a card game instead. But if baking gives you joy, even if you’re time starved, then do it.”

5 / Subtract, Don’t Add
The standard advice for being overwhelmed is to add something in order to relax. Sign up for a yoga retreat. Sacrifice even more sleep to go for an early-morning run. But these things can add to your time crunch and create additional financial strain. “We have a consumerist mentality when it comes to our time, and it’s always about adding something,” Helzer says. “It’s rarely about cutting something out or simply doing less.”

6 / Model It From the Top
Kasser and Schulte both model the behavior they hope to pass down to their children. “We prioritize vacation and took unpaid leave so that we could take our sons camping around the West,” Kasser says. And if you’re a boss or a manager, consider how your actions influence your co-workers. Brian Gunia conducted research with the U.S. military that shows when commanders prioritize a good night’s sleep, the entire unit does, too.

7 / Take That Vacation
Even if it’s just a simple, inexpensive trip away from work, don’t put off down time. Helzer recently ran into a colleague at Carey who said she and her husband wanted to take an exotic vacation but believed they should wait until they had more time and money. Helzer showed her his research about time perception. “She came by my office a few days later and told me that they had booked the trip,” Helzer says.
Johns Hopkins Bloomberg School of Public Health, thinks her vision could be the answer to solving a problem that has vexed her for months: In her native Pakistan, where preventable diseases like polio, pneumonia, measles, whooping cough, and meningitis claim more than 100,000 lives annually, how can you ensure children complete their vaccinations?

After months of design challenges and frustrations involving bureaucratic red tape and arcane banking laws, Rakhshani’s dream is that much closer to reality. In September 2015, she and her team wrapped up an 11-month study involving 346 Pakistani children who received what Rakhshani dubbed the vaccine indicator reminder band, a soft strip of plastic designed to be worn around an infant’s ankle and used to remind family members when inoculations are due. The study was funded with a $100,000 Grand Challenges Explorations grant from the Bill & Melinda Gates Foundation, which called the VIR band a “bold idea.”

The band employs something called a timestrip, a time-sensitive smart label often used in the food and pharmaceutical industries to indicate product shelf life, explains Rakhshani. After pinching an ink blister, a vegetable-based dye flows via capillary action along a membrane timed to signal when six, 10, and 14 weeks have passed—the intervals between an infant’s immunizations. (That design beat out another employing a blinking LED light, which anxious parents believed could target them for drone attacks.)

Traditionally, Pakistani mothers receive a vaccine record card after their baby’s first immunizations, but from her own experiences as a practicing physician before graduate school, Rakhshani knew that many women misplace the card. “Analysis of the Pakistan Demographic and Health Survey 2006–2007 data showed that only 13 percent of mothers were able to show the card to survey teams and that just 40 percent completed their children’s
vaccine cycles,” she says. “I just keep thinking, ‘How can we get families to remember?’”

It was a long journey for Rakhshani and members of her partner organization, Trust for Vaccines & Immunizations, a nongovernmental organization based in Karachi. She and her team had to overcome numerous barriers, including banking regulations that prohibited the transfer of money outside Pakistan; a fragmented, bureaucratic health care system that threatened to stop the study in the middle even after it was approved by the National Bioethics Board and the Expanded Program on Immunization; and the possibility of field workers being harassed or even killed by the Taliban, which has targeted polio vaccination teams after the CIA covertly used such organizations as a front to gather genetic information in the hunt for family members of Osama bin Laden.

And though Rakhshani is still crunching the data, she says initial reaction from mothers has been overwhelming. “Mothers have said to us, ‘We don’t understand the card, give us the band, it works for us.’ That has been a big encouragement.”

Noor Sabah Rakhshani’s vaccine reminder band uses a time-sensitive strip to signal when six, 10, and 14 weeks have passed, the intervals between an infant’s immunizations.
understand the card, give us the band, it works for us. That has been a big encouragement.”

Rakhshani has already been awarded a follow-up grant to expand the study to communities in rural Pakistan and additional funds to launch a “community acceptance study” in Nigeria. She says that while the VIR could help with immunization programs in other countries, researchers will first need to consider potential cultural differences. “We know enough from previous public health programs that an intervention that works in one place may or may not work in another place,” she says, noting that some cultures may not accept the practice of strapping an anklet on an infant. “It has to take in the local context.”

For now, Rakhshani has a new dream: “[I want] to create awareness in communities that vaccination should be seen as a fundamental child’s right and a parent’s responsibility. We need to build up societal accountability for childhood vaccinations. Twenty-five percent of infant mortality in Pakistan is attributable to vaccine-preventable illnesses. If we can reduce that 25 percent, that’s a huge achievement.”

From Repugnance to Tolerance

Economists speak of “repugnant markets,” areas of commerce that the public finds morally objectionable, at least for certain periods. Life insurance was widely disdained until the mid-1800s but has since become a global industry. Conversely, indentured servitude and child labor, once common and accepted practices, now seem beyond the pale.

Today, the sale of human organs is generally viewed with repugnance. The National Organ Transplant Act of 1984 banned such sales in the United States. However, a study by Mario Macis, an assistant professor at the Johns Hopkins Carey Business School, shows that people might abandon their moral objections to organ selling—and to other transactions in repugnant markets—when presented with information about the potential advantages of such sales.

“Some people’s ideas of what’s moral and acceptable may be changed by evidence once the costs associated with these moral positions are taken into account,” Macis says. “People may find the sale of organs less offensive after they have considered data about factors such as waiting lists, those who die while waiting for a transplant, and the savings in long-term medical care that can result from transplants.”

The paper addresses health care, economics, and ethics, Macis says. First, it calls attention to the desperate shortage of organs for transplant: More than 120,000 people in the United States are on waiting lists for organs (mainly kidneys), while each year only 29,000 procedures are performed and 10,000 people die or become too ill for a transplant. Second, the study asserts that individuals’ deeply held moral beliefs can be affected by rational calculations of cost benefits.

Macis and his co-authors—fellow economists Julio Elias of
Research shows that people might abandon their moral objection to selling human organs when presented with information about the potential advantages of such sales.

Universidad del CEMA in Buenos Aires, Argentina, and Nicola Lacetera of the University of Toronto—presented their findings at the annual meeting of the American Economic Association in January 2015. The paper, “Sacred Values? The Effect of Information on Attitudes Toward Payments for Human Organs,” was published last year in The American Economic Review.

For their study, the researchers conducted an online survey of about 3,400 U.S. residents and found that “some people’s moral beliefs can be changed by evidence,” Macis says. “Their attitudes don’t necessarily reflect immutable values.”

In the paper, the authors point to other researchers who have laid out some of the benefits of a payment system: Compensation of $15,000 to $30,000 per transaction would likely induce enough sales to bridge the current gap between the low supply of organs and the high demand for them. Additionally, a kidney transplant saves a patient about $250,000 in dialysis treatments that would otherwise be necessary.

“Among living donors, the vast majority of donations are by family members of the recipients,” Macis says. “But matches aren’t always possible, and the supply, as we’ve seen, is grossly inadequate. Having a system of

“People may find the sale of organs less offensive after they have considered data about factors such as waiting lists, those who die while waiting for a transplant, and the savings in long-term medical care that can result from transplants.”
payments for organs from unrelated people could dramatically increase the supply.”

How would such a market be organized? Macis, who earned his doctorate in economics from the University of Chicago, advises against private deals or negotiated prices. “The obvious way would be through a government agency, with firm regulations about price and other aspects of the transaction,” he says. “A wide-open market with buyers and sellers exchanging kidneys for cash is not how it should work.”

The research team plans at least two follow-up studies, Macis says. One would examine the effect that emotion and poignancy—as in, say, a video about a waiting transplant candidate or an impoverished person hoping to raise cash by selling a kidney—might have on those who find the sales objectionable. Another study would dig more deeply into why nearly 30 percent of the group in the first study continued to oppose the sales after reading the information about the impact of the organ shortage. // PATRICK ERCOLANO

**A kidney transplant saves a patient about $250,000 in dialysis treatments that would otherwise be necessary.**

**A Headband for Parkinson’s**

In summer 2014, Johns Hopkins University biomedical engineering graduate student David Blumenstyk observed deep brain stimulation surgery performed on a Parkinson’s patient at Johns Hopkins Hospital. Often a last resort for sufferers of the degenerative disorder, the procedure involves making a small hole in the skull to implant thin, insulated wires in the brain. The leads are connected to a pulse generator—a sort of brain pacemaker placed under the skin—that sends electrical signals to block abnormal firing of neurons and reduce the disorder’s trademark symptoms: tremors, rigidity, slowness of movement, gait, and balance issues. Blumenstyk and his student colleagues were at the hospital in search of a worthwhile medical design project. They were struck by the invasiveness of the DBS procedure, which can take five to 10 hours to complete and risks side effects ranging from infection and speech impairment to loss of some cognitive function. They wondered if there might be a safer, less invasive way to provide a similar level of treatment.

Johns Hopkins neurosurgeon William Anderson referred the students to Yousef Salimpour, now a research associate in the functional neurosurgery lab of the School of Medicine’s Neurosurgery Department. Salimpour has looked into noninvasive Parkinson’s therapies. One promising therapy is transcranial direct current stimulation, a painless treatment in which a low-level current is passed through two electrodes placed over the head to tweak the electrical activity in specific areas of the brain. The technique can be used to excite or inhibit cortical activities. “We know if we stimulate the deep structure of the brain, we can reduce Parkinson’s symptoms,” says Salimpour of the research work initiated in the lab of Reza Shadmehr, where he was a postdoctoral fellow. “But we also know the source of the symptoms is not the deep structure; it’s mostly in the motor cortex, the site of the...
A battery-powered, headband-shaped device dubbed STIMband could reduce the symptoms of Parkinson’s without medications or invasive surgery.

tremor. So the idea was: Why don’t we stimulate this part of the network? The motor cortex is more accessible than the deep structure, and the procedure [would be] less invasive.”

Reduce Parkinson’s symptoms without medications and without cracking a hole in the skull? That’s a therapy worth pursuing.

Transcranial direct current stimulation devices exist, but they are clunky rectangular boxes that need to be operated by trained technicians. The engineering student design team—Blumenstyk, Ian Graham, Melody Tan, Erin Reisfeld, and Shruthi Rajan—proposed to Salimpour an easy-to-use, home-based device and developed a prototype as part of a yearlong master’s project. The result was a battery-powered, headband-shaped device dubbed STIMband.

It features two spongy electrodes that deliver 2 milliamps of stimulation to regions of neural motor activity on the left and right sides of the brain. One electrode is positively charged and the other negatively charged in order to induce a change in the target cortex. The patient would activate treatment by touching a large “on” button, then undergo 20 to 30 minutes of stimulation, viewed as a safe window of exposure. “We wanted to make this therapy mobile,” says Graham, who has since graduated and is now working with St. Jude Medical, a medical device.
company. “The patients didn’t want to come in every day to get the treatment, and many don’t live in Baltimore. So we wanted to design something that could be used in a home setting for not just those who required [DBS] but those with moderate and early onset symptoms.”

Although the device has not yet been tested on humans, the functional part of the system is identical to the lab-based transcranial stimulation device. Why it is effective remains a mystery. “We don’t have a good reason why this technique works, and the same goes for the deep brain stimulation,” says Salim-pour. “But if it’s successful for the person with Parkinson’s, you don’t care. At this moment, we have no cure and we can’t stop the progression of the disease. So the point is, can we find ways to bring the quality of life back?” Salimpour says the next steps are optimization and long-term human studies, which the team hopes to begin soon.

They need to determine the optimal placement of the device, the current (intensity) level, and the right duration of stimulation. “Maybe we boost the power. Maybe they get stimulated for 40 minutes. We just don’t know,” he says. He’s optimistic about the device’s potential.

“This is not a miracle. This is not a solution for everything. But if we can improve this system and get it to market, I have faith that a patient’s quality of life can improve.” // GREG RIENZI

### Stopping on a Dime

You're squeezing your car into a tight parking space. As you inch backward, eyes trained on the rear window, a kid steps between your car and the one behind it. You slam on the brakes.

You may attribute that split-second reaction to reflex, impulse, or instinct. But the ability to cancel a planned action is the job of a specific group of nerve cells, according to Johns Hopkins University researchers, who, along with scientists at the National Institute on Aging, revealed the neurons’ role in the journal *Nature Neuroscience*. The discovery could lead to drug treatments for conditions that impair healthy stop-signal responses, including Alzheimer’s, attention deficit disorder, Parkinson’s disease, and even aging.

“If you know the population of neurons, you can look at why they aren’t operating as efficiently as they should and see if you can find therapeutic methods to remediate their function,” says Michela Gallagher, the study’s author and the Krieger-Eisenhower Professor of Psychology and Neuroscience at Johns Hopkins.

Gallagher is particularly interested in refreshing the cells in the human aging population, whose stop reactions tend to slow down. “You’re not stopping on a dime,” she says. “You’re stopping 15 seconds later,” and that delay can have disastrous consequences while driving. Some older people not only lack the ability to stop efficiently, they do the opposite in a moment of panic—hitting the gas pedal instead of the brake. “They know it’s an emergency and that they should do something to avert an accident,” Gallagher says, “but the appropriate reaction of stopping is not initiated.” Such incidents gained notoriety in 2013, when...
Researchers have identified a specific group of nerve cells that give us the ability to cancel a planned action. This discovery could lead to drug treatments for conditions that impair healthy stop-signal responses, such as Alzheimer’s, ADD, and Parkinson’s.

an 86-year-old man accelerated instead of braking, driving into an open-air market in Santa Monica, California, and killing 10 people.

According to the study, the critical neurons involved in stopping planned behavior are found in the basal forebrain, a part of the brain best known for regulating sleep. Gallagher and her team tested their theory on rats, who were trained to respond to a tone by scampering into a port, where they received a sugar-water treat. If a flash of light followed the sound, however, they had to stop—abort their planned behavior—in order to get their reward. While the rodents performed the tasks, the researchers monitored the neural activity in the rats’ basal forebrains: During a successful

Gallagher is particularly interested in refreshing the cells in the human aging population, whose stop reactions tend to slow down. “You’re not stopping on a dime,” she says. “You’re stopping 15 seconds later.”
stop-signal task, the neurons in the basal forebrain were silenced. The scientists also reproduced the halting effect of the light by inhibiting those same cells with a brief pulse of electricity.

Previously, scientists thought the ability to call off a planned action resided in the basal ganglia, which helps coordinate movement. The basal ganglia does play a role in the process, Gallagher says, but this discovery is a new piece in the stop-signal circuit: The basal forebrain initiates the signal, which is then transmitted through action in the basal ganglia. Now that the brain cells responsible for triggering that stop reaction have been correctly identified, there’s the potential to develop treatment that targets their chemistry. “Before this study, they really weren’t on the radar,” Gallagher says. // BELINDA LANKS

JEFFREY ROTHSTEIN is a professor of neurology and the director of the Brain Science Institute and the Robert Packard Center for ALS Research at the Johns Hopkins School of Medicine.

Demystifying Dementia

In 2011, a National Institutes of Health and Johns Hopkins researcher named Bryan Traynor, along with Mayo Clinic researcher Rosa Rademakers, made a landmark discovery. The team identified a common gene mutation shared by a significant percentage of patients suffering from Lou Gehrig’s disease, or ALS, as well as a prevalent form of dementia called frontotemporal dementia, or FTD.

“It was an earth-shattering change for the neurodegeneration field,” says Jeffrey Rothstein, a professor of neurology and director of the Brain Science Institute and the Robert Packard Center for ALS Research at the Johns Hopkins School of Medicine. “There are a number of ALS patients who also have dementia, and here was this bridge between these two clinically disparate diseases.”

In the ensuing years, researchers tried to understand what this mutation is actually doing to cause disease. Now, Rothstein and his colleague Thomas Lloyd, an associate professor of neurology, think they have an answer, and the discovery could lead to new therapies to treat these two maladies.

Both ALS and FTD are adult-onset conditions, characterized by nerve cell degeneration over time. FTD is the second most common form of dementia after Alzheimer’s, and it affects language and motor skills and can also lead to changes in personality. In ALS, nerve cells in the brain and spinal cord suffer damage as patients eventually lose control of their muscles. For more than a decade, researchers had noticed a connection between the two, but it wasn’t until Traynor and Rademakers’ discovery that scientists realized just how closely the diseases were related.

So what was going on?

In their respective labs, using human cells and fruit flies, Rothstein and Lloyd observed that the mutation appeared to
Using fruit flies and human cells, Jeffrey Rothstein and Thomas Lloyd are looking for ways to offset a mutation in RNA that could be the underlying cause of neurodegenerative diseases like ALS and FTD.

be creating abnormally long strands of ribonucleic acid that were clogging up the pores in the nuclear membranes of nerve cells, preventing the operation of an important nuclear pore protein.

“If you think of the nuclear membrane, it’s like looking at the skin of an orange and you can see all those little dimples,” Rothstein explains. “The mammalian nucleus has about 2,000 of these pores that let things in and out—RNA out, proteins in. What we learned is that this sticky mutant RNA is attaching itself to the nuclear pores and essentially jamming what goes through. What we could see is that the protein was all clumped up.”

The scientists were able to test the function of the pores and found that they were indeed slow in importing protein into the nucleus. “It’s a classic traffic problem,” says Rothstein. “There’s this constant influx and efflux in the nucleus, and if that’s disrupted, that’s when we think disease occurs.”

The next step was to try to see if they could correct the problem. Using an already developed drug known to effectively “coat” sticky RNA strands, Rothstein and Lloyd were able to successfully prevent the strands from clogging up the pores in both human and fly cells, allowing the protein and nuclear pores to function once again.

The hope is that a similar therapy could benefit patients suffering from ALS and/or FTD. “There’s a lot more we’d like to understand first,” says Rothstein, who has launched collaborations with two pharmaceutical companies to continue the research, “but we think we can very quickly move to patients. Doing these experiments in both fly models and human cells is a great platform to understand the mutation and then, hopefully, find drugs to help fix the diseases.” // JOE SUGARMAN
Protective Fashion

Creating one-of-a-kind wedding dresses is not all the Fashion Institute of Technology graduate and proprietor of Jill Andrews Gowns, a custom atelier in Baltimore, is known for. She’s also a member of the winning team that engineered a safer, more comfortable protective suit for physicians, nurses, and other health care workers on the front lines of Ebola treatment.

Working alongside a group of 80 Johns Hopkins researchers and students during a weekend hackathon in October 2014, Jill leveraged her patternmaking and garment construction skills to help create a suit that was cooler, easier to put on and take off, and had fewer points of potential exposure to the deadly virus. The hackathon was launched by the U.S. Agency for International Development, the lead organization coordinating the U.S. government’s Ebola response. The prototype beat out more than 1,500 entries and made its public debut on the runways of New York Fashion Week in 2015. DuPont is now manufacturing the suit with the intent of its hitting the marketplace this year.

Are there similarities in designing wedding dresses and an Ebola suit? More than one would think. Both have to fit. Both have to be comfortable. Both have to have some ventilation. And you have to be able to get it on and off easily. Finding solutions to these challenges is part of the design process, whether I’m designing a costume for an actress who has 15 seconds to change or, in this case, someone who wants to get out of a protective suit safely and as fast as possible.
Right away, you saw flaws in the protective suits currently worn by doctors and nurses treating patients with Ebola. Can you tell us more about them?

At the start of the hackathon they had a demonstration of what health care workers who wear the suits actually go through. As soon as I saw that demonstration, I could see problem number one, problem number two, problem number three, and so on.

One of the first things I saw is that they’re extremely hot—even in an air-conditioned auditorium, much less the hot and humid climates of West Africa. They overheat so quickly that you can really only wear them for a matter of minutes. This really limits the time health care workers can care for their patients.

I also saw that they provide poor visibility, making it hard for doctors to see their patients and scary for patients who cannot see the person trying to help them. And they have several coverage gaps, each of which can expose health care workers to the deadly virus.

But the biggest problem I saw right away is that it’s difficult to safely doff the suit. The way the current suits are designed, with the zipper in the front, means that to disrobe you have to pull the zippers from under your chin while still wearing rubber gloves; this really increases a person’s chances of coming into contact with infectious fluids.

Why is safe doffing so important? How a person removes their suit can be just as crucial as wearing it to prevent exposure. The process is a struggle that usually requires two people, takes up to 20 minutes, and requires extreme care not to touch any part of the suit that might have come into contact with bodily fluids that may carry Ebola. That’s really hard to do—particularly when workers are physically and emotionally exhausted after caring for patients.

Tell us a bit about the design process. Did you start from scratch or did you build upon the current design?

A big part of the challenge was getting a new and better design out there as fast as possible, so we tried to work within the parameters of what already exists. We stuck with Tyvek or Tychem material currently used to make the suits and then focused our efforts on how we could improve upon that with things like zippers and fasteners—how to get people in and out quickly—and other innovations, like an integrated hood and cooling features.

At first glance, your prototype may look similar to other Ebola suits. What are some of the main improvements in your suit? The biggest change is that we moved the zippers to the back of the suit so the workers are less likely to come into contact with infectious fluids. To take off the suit, you pull apart the tabs on the upper back, which releases a breakaway zipper. Then, you step on tabs on the sleeves and stand up, emerging in one clean motion. This reduces the steps of taking the suit off from 31 to 8, and the time of taking it off from about 20 minutes to 5, which significantly reduces the risk of infection.

We also made a number of other changes. We integrated the head onto the suit rather than its being a separate piece. We created a fingerless glove liner between the inner and the outer glove so that when you take the suit off, it automatically pulls off the outer glove while at the same time keeping the sleeves from riding up. We reworked the face shield; it’s extra large now to give patients a clear view of their doctor or nurse—and vice versa—and vents keep it from fogging up. And we added a small battery-powered cooling pack that straps on the worker’s belt, allowing them to work longer and more comfortably. // AIMEE SWARTZ
Understanding Inflammation

Inflammation has been found to be an underlying cause in many diseases, making it a hot topic in the health media. But what do we really know about chronic inflammation and its effects on the body?
As scientists have searched for the mysteries behind the diseases most likely to afflict us, they have alighted on one factor common to virtually all of them: inflammation. Chronic inflammation, headlines now regularly state, has a role in a host of common and often deadly diseases, including Alzheimer’s, arthritis, cancer, diabetes, heart disease, and possibly even depression.

Unsurprisingly, this news brings with it a raft of self-proclaimed remedies purporting to fight inflammation. Diets, herbs, supplements, and exercise regimens have flooded the market with promises to keep inflammation in check and improve overall health.

But is there evidence that over-the-counter products or sweeping lifestyle changes will reduce inflammation’s damaging effects? Scientists caution that despite its current high profile, inflammation remains a mystery. “Basic science hasn’t yet answered the major questions about inflammation,” says Michelle Petri, a rheumatologist and a director of the Johns Hopkins Lupus Center. Researchers like Petri have been studying low-level inflammation as a culprit in a number of diseases for decades. What they have discovered has led to an emerging understanding of how lifestyle choices—like diet, dental health, and exercise—may influence inflammation and its potentially damaging downsides.
Inflammation is a vital part of the human immune system. When harmful bacteria or viruses enter your body, when you scrape or twist your knee, the body’s defense system kicks into high gear. Chemicals ramp up the body to fight, bathing the damaged area with blood, fluid, and proteins; creating swelling and heat to protect and repair damaged tissue; and setting the stage for healing.

Sentinel cells first alert the immune system to the presence of invaders. Another set of cells releases chemicals that signal the capillaries to leak blood plasma, which surrounds and slows down trespassers. Another group of sentinels, called macrophages, releases cytokines, which are specialized germ fighters. Immunizing B- and T-cells join in, destroying both the pathogens and the tissues they have damaged. Finally, a last wave of cytokines is released to end the job and signal the immune system that its work is done. Its mission completed, the immune system calls off its dogs.

When our body’s powers of correction go wrong, however, they can work against us. Think of the acute heat and swelling that protect us during a normal immune response—a fever, or the redness and pain that surround a new injury, for example—and you can get a hint of what chronic inflammation is. Unlike the inflammation that follows a sudden infection or injury, the chronic kind produces a steady, low level of inflammation within the body that can contribute to the development of disease. It’s the result, in part, of an overfiring immune system. Low levels of inflammation can get triggered in the body even when there’s no disease to fight or injury to heal, and sometimes the system can’t shut itself off. Arteries and organs break down under the pressure, leading to other diseases, including cancer and diabetes.

Scientists don’t fully understand how the immune system becomes short-circuited, but they have long known that some diseases, such as lupus and rheumatoid arthritis, emerge after the immune system has gone awry and attacked healthy tissue. Increasingly, as Americans and other Westerners live longer and get larger (35 percent of Americans are obese), researchers have also found that low-level immune responses triggered by extra weight and a lack of exercise can contribute to the development of other illnesses.

“For a long time, we had the idea that inflammation was involved in certain autoimmune diseases, but now we’re seeing this lower level of inflammation in people who are obese and people who are sedentary,” says Kimberly Gudzune, a
“We see a link between obesity and some diagnostic markers for inflammation, but we don’t know what causes them. We worry that there’s something brewing for these people, that they are at higher risk for heart disease, cancer, and diabetes.”

physician at Johns Hopkins and a clinical researcher who focuses on obesity. “We see a link between obesity and some diagnostic markers for inflammation, but we don’t know what causes them. We worry that there’s something brewing for these people, that they are at higher risk for heart disease, cancer, and diabetes.”

Researchers have discovered that fat cells can trigger the release of a steady, low hum of cytokines that, in lieu of an invader to attack, go after healthy nerves, organs, or tissues. As we gain weight, the release becomes prolific, affecting our body’s ability to use insulin, sometimes leading to type 2 diabetes.

They have also learned that inflammatory cells can have an effect elsewhere in the body—for example, chronically infected and inflamed gums in the mouth can cause damage that leads to heart attack and stroke. And they know that inflammation contributes to congestive heart failure and uncontrolled hypertension, and that it somehow has a role in the tangled cells that are the hallmarks of Alzheimer’s disease.

Researchers continue to find answers about how inflammation contributes to cancer. Inflammatory cells produce free radicals that destroy genetic material, including DNA, leading to mutations that cause cells to endlessly grow and divide. More immune cells are then called in, creating inflammation that feeds the growth of tumors.

The link between inflammation and cancer can sometimes be direct. When too much stomach acid—a feature of the immune system that evolved to fight foodborne bacteria—creeps up the esophagus, it causes inflammation and chronic heartburn. Extended exposure to this acid changes the nature of the cells lining the esophagus, increasing the risk of cancer.

In colon cancer patients, certain communities of bacteria associated with diarrhea can create cancer with help from inflammatory cytokines. Cells protected by mucus can become inflamed when that mucus wall is breached by bacteria, says Cynthia Sears, a doctor who specializes in infectious disease research at Johns Hopkins. “The lining in the colon makes peptides”—short chains of amino acids that act to protect the lining of the organ—“to thwart bacteria. If there aren't enough peptides, bacteria can get a foothold, which means even more bacteria,” Sears says. As inflammation ramps up to fight it, so does the risk of cancer.
If inflammation is the behind-the-curtain factor in so many diseases, what can we do to keep it at bay? Researchers admit that they’re still figuring this out.

Petri has studied lupus for more than three decades and has been investigating the effects of chronic inflammation. “Lupus is basically friendly fire,” Petri explains. “We can’t get the immune system to calm itself down.”

Treating chronic inflammation, whether for lupus or other chronic ailments, is a challenge. Researchers have an idea that inflammation exists as part of a self-reinforcing loop system. If they could figure out how to interrupt or reverse one stage in that loop, then they might be able to develop drugs to stop it. But how do you tone down the immune response enough to control the inflammation but not so much that a body can’t fight disease? “We’ve done 20 to 25 years of clinical trials on lupus drugs,” Petri says, by way of example. “We’ve had maybe one success and 30 failures.”

Currently, there are no prescription drugs that specifically target chronic inflammation. (There are, of course, over-the-counter medications that treat the minor and temporary inflammation and accompanying pain caused by injuries or procedures, such as surgery. These are not meant to treat chronic inflammation.) Some drugs, such as hydroxychloroquine, once used to battle malaria, are useful in treating some lupus patients, but they don’t cure the disease. Aspirin and statins have shown promise in reducing inflammation in some people, but researchers aren’t sure how broadly useful such drugs are in that role. With the exception of far-from-perfect anti-inflammatory drugs, such as prednisone, a corticosteroid that brings with it a slew of side effects, scientists are still researching how best to contain inflammation. “We need something that can work broadly and quickly, and without a lot of side effects,” says Petri.

Finding a drug that both interrupts the immune cycle and maintains a healthy immune response is important not just for people battling illness but for all of us, because as we age, inflammation increases in the body. Scientists aren’t sure how and why, but interestingly, the study of HIV is offering some insight. HIV triggers chronic inflammation in the body, even after medications have
rendered levels of the virus undetectable in blood tests. Certain cytokines involved in that inflammation process can profoundly decrease testosterone levels, leading to muscle loss. “It’s possible that the chronic inflammation in people with HIV is similar to the chronic inflammation we see in aging,” says Todd Brown, an endocrinologist who researches the link between bodily markers for inflammation and chronic diseases found in people with HIV. If researchers can understand that process and create treatments to disrupt it in people with HIV, they could potentially translate their findings into treatments for similar muscle loss in aging.

Jeremy Walston is a Johns Hopkins geriatrician who investigates immune system response and muscle function in the elderly. He has been searching for markers that highlight the early signs of inflammation. Some blood tests for inflammation markers exist, but the researchers have uncovered two new markers that they believe may predict mortality and mark signs of late-in-life decline. “These are powerful inflammatory molecules that, when chronically expressed, lead to declines in stem cells and a remodulation of the immune system,” says Walston. “They also contribute to cell death,” particularly in the elderly, he says.

Finding a drug that both interrupts the immune cycle and maintains a healthy immune response is important not just for people battling illness but for all of us as we age.

As the quest for diagnostic measures and therapies continues, researchers point to simple lifestyle measures we can all take to help prevent chronic inflammation. Scientists are skeptical of cure-all claims found in the new crop of anti-inflammation diet books, but they do recommend dropping pounds (and the harmful fat cells that come with obesity) and avoiding the now common American diet high in fats and sugars.

“Losing weight can have profound effects on lowering inflammation,” says Brown, who adds that eating a diet rich
in fruits and vegetables and low in fats, processed foods, and sugars is generally a good idea, though more study needs to be done to determine how it might affect inflammation. Exercising, which causes an acute inflammatory response in the short term, but an anti-inflammatory one when we regularly get moving, is another strong step to take, he adds.

Other researchers advise getting plenty of sleep, lowering stress levels, and seeking out treatment for inflammation-inducing culprits, such as gum disease and high cholesterol levels. Avoid contact with heavy metals such as mercury, which is found in dangerous amounts in some large fish, and limit exposure to substances, such as diesel exhaust and cigarette smoke, that can set off the immune system. Additional studies by Brown and his colleagues have also shown some advantage in increasing our intake of omega-3 fatty acids and vitamin D, though more research is needed.

Walston and others caution against popping dietary supplements touted as anti-inflammatory cures. Some so-called remedies, such as turmeric, taken in large amounts, may actually be toxic to the liver and other organs.

For most of us, keeping inflammation in check comes down to common sense basics: eat well, don’t smoke, get moving, get more rest, and see your doctor for regular physicals, which could help stop chronic inflammation before it becomes rampant. “All of the things our grandmothers told us were good for us are actually good for us,” says Brown. “Until we have a more nuanced understanding of what inflammation does, that’s what we have to fall back on.”
What Do Surgical Masks Really Protect Against?

BY JOE SUGARMAN

Surgical masks have been part of a doctor’s wardrobe since the 1890s when French surgeon Paul Berger covered his mouth, nose, and prodigious mustache with a mask fashioned from six layers of gauze and secured it around the back of his head. But how effective are they?

“Have you ever seen slow-motion video or a photograph of someone sneezing?” asks epidemiologist Lisa Maragakis. “It’s really disgusting. The droplets go about 6 feet in the air and then start to fall.”

Surgical masks are designed to offer two-way protection, according to Maragakis: They provide a physical barrier for a health care worker’s nose and mouth from bacteria or virus-containing fluids expelled by a patient, and they safeguard the patient from fluids let out by the provider.

That 6 foot number is key when it comes to setting safeguards for wearing masks at a hospital like Johns Hopkins. Policy dictates that if a health care provider is within 2 yards of a “droplet precaution patient”—i.e., someone with an infectious disease—he or she must wear a mask, a small-particle filtering respirator, and eye protection.

Ensuring such safety measures falls under Maragakis’ role as senior director of Healthcare Epidemiology and Infection Control at the hospital. Maragakis and her staff are responsible for establishing—and monitoring—the hospital’s dress code, including in the operating room, where all personnel must wear surgical face masks, hair covers, and, if necessary, beard hoods. “We all shed small bits of skin and hair all the time, and that’s not something you want going into a wound,” she says.

Maragakis notes, however, that wearing surgical masks in the operating room is not without controversy. Despite masks being more than 100 years old, there remains a surprising lack of empirical evidence to prove their efficacy, and she says in Europe and other countries some doctors choose to forgo them. The few studies that have been done showed that wearing surgical masks had virtually no bearing on patient outcomes when surgeries were performed by healthy doctors in sanitary operating rooms.

Still, picturing a surgeon without a mask is like imagining a fireman without a helmet. “There are some things that we do that seem to be common sense, even if we don’t have a lot of randomized controlled data showing they actually play a significant role in preventing infections,” says Maragakis.

Berger would surely feel right at home sporting today’s surgical mask in the OR. The masks are constructed of several layers of cotton or synthetic fibers instead of gauze, but the general design hasn’t radically changed since he donned the first in an operating room more than a century ago.
staying home

From architectural interventions to new models of medical care, we’re finding ways to help keep people happy and healthy in their homes as they age.

CARLYN KOLKER
Illustration SHOUT
This year, the oldest of the baby boomers turns 70. America is swiftly graying, and by 2030 the U.S. population will include close to 73 million people over 65. This milestone shift ushers in a new chapter in American domestic life as a large number of older Americans are choosing to remain in their houses. “Most of my patients live in their homes,” says Samuel Durso, a geriatrician at Johns Hopkins Bayview Medical Center who gears part of his practice toward helping patients age healthfully at home. “It’s clearly a desire that people have now.”

It’s a desire that the AARP has heard from its members with growing resolve over the last few years. According to a 2014 study by AARP, 80 percent of people said that they planned or wanted to age in their homes rather than move to continued care or assisted living facilities. In fact, recent U.S. census data show the percentage of older Americans residing in skilled nursing facilities has dipped in recent years, along with the number of new nursing homes being built.

Unfortunately, our houses—and the cities and the suburbs around them—haven’t always been designed with the needs of older people, even those who are still relatively healthy, in mind. The lack of infrastructure and services available to support us as we age, whether it’s convenient public transportation or easily navigable sidewalks, has prompted organizations like AARP and the World Health Organization to make the design of age-friendly communities a priority, pushing cities in particular to improve everything from roadway design to health care policies.

In the meantime, if you’re one of the millions of people planning to stay in your home as you age—or if you’re helping a friend or family member who is—where do you begin? We asked health care professionals, some of whom are pioneering new programs for independent living, what people who are getting older (but who are still reasonably healthy) should be thinking about. They offered advice on the design of a home, how to function in it, and how to plan for care.

According to a 2014 study by AARP, 80 percent of people said that they planned or wanted to age in their homes rather than move to continued care or assisted living facilities.
When the AARP asked people why they wanted to age in place, nearly two-thirds cited community as their primary reason. They wanted to stay in a place that’s familiar, where they’ve already established relationships and services.

Unlike a retirement community, where the residents are of a similar age, neighborhoods have greater age diversity and that can enhance the experience of aging at home, says Durso. “Evidence supports that people who have social networks age better, and those who tend to be the most successful are those who have family and friends, including young friends, with whom they interact.”

New research from the Johns Hopkins Bloomberg School of Public Health supports the idea that civic engagement and interacting with younger people can help keep a brain healthier as it ages. The study, published last year, looked at people who volunteered as mentors to children through national programs like Experience Corps, which places retired seniors in schools. Principal investigator Michelle Carlson and her colleagues found that brain biomarkers of memory improved in volunteers, particularly in men, after participating in the program, suggesting that the social and mental stimulation of volunteering and engaging with younger people may actually reverse part of the brain’s aging process.

Alicia Arbaje, a geriatrician at Johns Hopkins Bayview, agrees that multigenerational interaction is one of the keys to healthy aging at home. Arbaje chose geriatric medicine in part because she grew up with her grandmother in her childhood home in Kansas. Now that generations don’t live together as they did in the past, intergenerational community connections can help replace those multigenerational homes of yore, she says. “Older adults are looking for more ways they can thrive at home and in their communities.”

Arbaje says doctors should help older patients think about how they use their home to support overall health. You may go to a hospital or doctor’s office to receive medical care, but your home

“Evidence supports that people who have social networks age better, and those who tend to be the most successful are those who have family and friends, including young friends, with whom they interact.”
You may go to a hospital or doctor’s office to receive medical care, but your home should be the epicenter of daily healthy living.

should be the epicenter of daily healthy living. “If you want to look at the top three things people can do to live in a healthy way as they age—socialization, adequate nutrition, and lifestyle, including exercise—all of those things have a significant component in the home,” she says. “The home is where the health care plan gets enacted.”

She warns, however, that while there are health benefits to aging in place, there are also hazards. Most homes were not designed with aging in mind. Staircases, hard-to-reach storage, and threshold levels that change from room to room are among the many standard features that can cause accidents. AARP is one of a growing number of organizations, along with some architecture and design professionals, advocating for new buildings and local building ordinances to follow the principles of universal design—the idea that everything from the building to the light switches should be created for all users, from the very young to the very old, the disabled to the able-bodied. A wide staircase, for example, can benefit a toddler as well as any person with mobility limitations. Easy-to-use door handles can be helpful for an older person with arthritis or a young person who is mastering fine-motor skills.

Few homes are currently outfitted with universal design, however, so in the meantime, you can make improvements that lessen the risks. “Better lighting is huge,” Arbaje says. Vision problems, such as cataracts, can predispose people to falls. Falls send more than 2.5 million older Americans to hospital emergency departments each year. Fall prevention and improving mobility in the home should be the twin goals of home improvement, she says. “People don’t move [around their homes] because they are scared [of falling]. Anything we can do to increase their ability to move is good.”

Johns Hopkins occupational therapist Ally Evelyn-Gustave, who specializes in helping people age in place, suggests a number of measures to age-proof a home. “If you can, do some preplanning and some prevention, like making changes and adaptations to your environment and lifestyle before you are forced to.”

She suggests contacting a professional occupational therapist, who can help a person understand how he or she uses a home and offer advice on better ways to make dinner, bathe, or do laundry. “We
focus on how people function,” Evelyn-Gustave says. Many of the changes she recommends to her patients cost nothing, like de-cluttering to create clear paths for walking. Others are inexpensive, like installing pull chain extenders to ceiling fans so they can be switched on and off easily. A slightly more costly improvement she often recommends is adding a second railing to a staircase to help with balance. She also suggests investing in adaptive equipment that can help with daily activities, such as a higher toilet seat that’s easier to sit on.

For larger renovations, Evelyn-Gustave recommends contacting a certified aging-in-place specialist—or CAPS—a certification developed by AARP and the National Association of Home Builders for designers and contractors who can help retrofit a home and make it safer.

Evelyn-Gustave has applied many of these fixes through a Johns Hopkins program called CAPABLE (Community Aging in Place, Advancing Better Living for Elders), which pairs nurses, occupational therapists, and handymen with older people living at home. The team helps identify daily functions that could stand improvement, then works with the person over four months to find the best ways to upgrade their home. A nurse helps patients identify the way that pain, mood, strength, balance, and medications might inhibit their activities; an occupational therapist works on the functional needs identified as problematic, like the best way to get up from a chair; and the home maintenance worker makes improvements, like adding guardrails or repairing unsteady flooring.

Instead of identifying and treating only a patient’s medical condition, CAPABLE looks at the person’s entire life.

Sarah Szanton, the nurse practitioner at Johns Hopkins School of Nursing who created the CAPABLE program, says that what sets it apart is its focus on quality of life and on nonmedical issues—regular activities like eating, going to the bathroom, and walking around the house. Instead of identifying and treating only a patient’s medical condition, CAPABLE looks at the person’s entire life. So it’s not just about how to treat arthritis with medication but also how to show a person with arthritis how to keep chopping vegetables. It’s a critical shift, says
As Americans’ lifespans increase, so do their health care challenges. About half of people over 65 have one or two chronic health conditions, such as diabetes or heart disease, and nearly 40 percent have some kind of a disability resulting in complications such as difficulty walking, according to a U.S. census report.

Receiving care at home may help people age in place longer, even as major medical concerns arise. “I think we are going to see more and more redefining of the home as a place where care is delivered by professionals,” says Arbaje.

The Johns Hopkins Elder House Call Program does just that by bringing doctors and other health care workers to the homes of people who may otherwise struggle or are simply unable to get to a medical office. “Home-based medical care still exists, and it is emerging as a really effective way of taking care of sick older people who have a hard time getting to the doctor,” says Jennifer Hayashi, a geriatrics specialist at Johns Hopkins Bayview and the program’s director.

“The philosophy of the program is that as people get older, if they also get sicker

As Americans’ lifespans increase, so do their health care challenges. About half of people over 65 have one or two chronic health conditions, such as diabetes or heart disease, and nearly 40 percent have some kind of a disability resulting in complications such as difficulty walking, according to a U.S. census report.

Receiving care at home may help people age in place longer, even as major medical concerns arise. “I think we are going to see more and more redefining of the home as a place where care is delivered by professionals,” says Arbaje.

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“The philosophy of the program is that as people get older, if they also get sicker
Receiving care at home may help people age in place longer, even as major medical concerns arise.

and more medically complicated, it gets harder and harder for them to go to the doctor. Delivering good primary care can keep them out of trouble.” House calls may sound quaint, she says, “but what we are doing is highly technical, home-based medical care.”

To find a similar program in another city, Hayashi recommends visiting the American Academy of Home Care Medicine’s website, which lists practices throughout the country that make home visits. She also recommends finding a practice that includes members from different disciplines, such as physical therapists and social workers. “We use an interdisciplinary team and community resources to help keep people at home,” she says.

Bringing health care to the home can also rewrite the script of how doctors and patients interact. Bruce Leff, a geriatrician at Johns Hopkins Bayview, has witnessed how health care delivery changes when it happens in the home. In the 1990s, Leff helped establish Hospital at Home, a program that sends doctors into the homes of people over 65 who face one of four acute health crises, such as pneumonia and a worsening of chronic heart disease, that would otherwise result in being admitted to the hospital. Hospital at Home focuses on delivering acute hospital-level care in a person’s home—using oxygen and X-ray machines for acute challenges—with doctors and nurses coming to the home for routine visits to administer intravenous medications, perform necessary tests, and provide proper supervision of care. The program is now being used by veterans hospitals across the country, and a related model is being piloted at Mount Sinai Hospital in New York City.

Leff says he has noticed a shift in the traditional doctor/patient relationship when health care happens outside the typical clinical setting. “When doctors see patients in the home, I think we act a little differently,” he says. “My observation is that it forces you to be a better doctor. It changes the power structure. I am a little bit more thoughtful about developing management plans that are truly patient-centered because I am in their home. I am also more successful in educating patients because I am a guest. I think it brings out the best in doctors and health care providers.”

Shifts in the way we traditionally design houses, cities, and health care are likely to continue at a rapid clip as America, and the world, continues to gray. A decade from now, the number of U.S. households headed by someone 70 years or older will have nearly doubled. This is going to offer challenges—and opportunities—for redefining what it means to live well, and age well, at home.
MedTech

TECHNOLOGY ROUNDUP
Apps, gadgets, and other innovations that are advancing health and health science.

1 / Wound analyzer

Health practitioners usually measure the size and shape of chronic wounds (bed sores, skin ulcers) with a ruler. Not an exact science. Tissue Analytics’ Mobile Wound app, available for iOS and Android devices, turns a phone into a medical imaging system. Snap a photo of the wound, and the app’s algorithm accurately measures its dimensions. The images are uploaded to a secure portal that can be accessed by physicians, who can track the wound. (PATIENT CARE)

2 / Handheld STD test

MobiNAAT (mobile nucleic acid amplification testing), designed by Johns Hopkins biomedical engineers, is a low-cost diagnostic tool to quickly detect chlamydia, an often symptomless sexually transmitted disease that, if untreated, can cause serious and permanent damage to a woman’s reproductive system. The 6-inch-tall, battery-powered prototype features a disposable cartridge for a genital swab and a heating unit to incubate the DNA sample. An associated mobile app processes test results within 30 minutes. (SEXUAL HEALTH)

3 / Social services finder

Designed by former Johns Hopkins students, Healthify is a subscription-based mobile platform to help health care staff locate social service agencies and connect patients to them. It’s basically Yelp for health. Instead of querying for restaurants or hotels, users search for nearby temporary housing, drug treatment centers, mental health counseling, and other services that can also be rated. (CONSUMER SERVICE)

4 / Before it kills

For a patient with sepsis—which kills more Americans every year than AIDS and breast and prostate cancer combined—hours can make the difference between life and death. Johns Hopkins researchers have developed a computer-based method called TREWScore that has correctly predicted septic shock in 85 percent of cases, a 60 percent improvement over existing screening methods. The time saved allows clinicians to intervene with antibiotics. Researchers want to program the algorithm into electronic health record systems to better alert doctors and nurses about a patient at risk of septic shock. (PATIENT SAFETY)
5 / Healing hearts

A sticky, protein-rich gel created by Johns Hopkins School of Medicine researchers appears to help stem cells adhere to hearts and survive long enough for them to improve cardiac function after a heart attack. The study, which used rats as models, showed that without the gel, most of the injected stem cells would die or be pushed out into the lungs by the force of heartbeats. The novel substance also rapidly restores metabolism of the encapsulated stem cells, thus increasing the number that survive transplantation. (CARDIOLOGY)

6 / Eye on stroke

ER patients who complain of dizziness often get evaluated for stroke, which involves expensive and time-consuming CT or MRI scans that don’t always accurately diagnose. Looking for a faster and better way to examine patients, a neurologist at Johns Hopkins University uses portable video-oculography to gauge eye movements. The device, which looks like high-tech swimming goggles, can track minute differences in eye movements that are hallmarks of a stroke, inner-ear problem, or other condition that requires further investigation. (NEUROLOGY)

7 / Wrist monitor

Johns Hopkins neurologists have introduced EpiWatch, an app designed to collect data from patients with epilepsy before, during, and after their seizures. The app, which runs on Apple Watch and iPhone, uses the open-source ResearchKit framework designed by Apple and the device’s built-in movement and heart rate sensors. The data gathered—including physiological changes and altered responsiveness—will be used by researchers to better understand and manage the disorder which afflicts more than 2.5 million people in the United States. (NEUROLOGY)
The Biology of Beauty

In a marriage of science and art, researchers at the Johns Hopkins Brain Science Institute are helping advance the study of neuroaesthetics, an emerging field that seeks to understand why we find meaning in art, dance, music, and architecture.

KRISTON CAPPS
Illustrations BRIAN STAUFFER
Three years ago, the Museum of Modern Art in New York assembled a show to reconsider the origins of modernism in visual art. *Inventing Abstraction: 1910–1925* was a blockbuster, one that traced the roots of the avant-garde through Paris, Berlin, Moscow, New York, and beyond. The exhibition promoted, among others, the work of Jean Arp, whose smooth, biomorphic sculptures had helped launch the Dada movement. Arp’s work gained new prominence in MoMA’s treatment, proving that the artist’s signature arcs and swooping curves still resonate with contemporary audiences.

A different kind of advance in the study of abstraction came a few years prior. In 2010, the Walters Art Museum in Baltimore and the Johns Hopkins Zanvyl Krieger Mind/Brain Institute announced a collaboration that would focus on Arp’s sculpture. MBI was founded in 1994 to study and understand neural activity in the brain and how it gives rise to mental phenomena. With this collaboration, the goal wasn’t just to confirm that Arp’s work appeals to people but rather to understand why.

In a two-part experiment, curators and neuroscientists set out to measure how subjects responded to different shapes, using Arp’s work as a model. The researchers created 3-D scans of Arp’s sculptures, which enabled them to enlarge and elongate the curves and shapes and create new “sculptures” for comparison. In the first experiment, subjects used 3-D glasses to view the images and pick their favorites. The second experiment asked a different set of participants to look at the same scans while in a functional magnetic resonance imaging scanner.

What the researchers learned was that people enjoyed Arp—no surprise there—but more to the point, they discovered that Arp’s sculpture uses surface curvature that people found especially pleasing. When exposed to the soft bends and arcs of Arp’s 1939 *Leaf of the Pyramids* ca. 5000, the subjects’ brains responded with more heightened activity in the lateral occipital complex, a region of the visual cortex where the brain processes shapes, than they did with scans of sharper shapes.
bends and arcs of Arp’s 1939 *Leaf of the Pyramids ca. 5000*, the subjects’ brains responded with more heightened activity in the lateral occipital complex, a region of the visual cortex where the brain processes shapes, than they did with scans of sharper shapes. Arp’s work was inspiring at the neural level.

“The things that people said they liked better visually were things that drove the most activity in the visual cortex. These are things that the visual cortex seems to have developed or evolved to process,” says Ed Connor, director of the Mind/Brain Institute, who led the study. Connor focuses on the visual cortex with the hope of better understanding the neural activity evoked when humans encounter a beautiful sculpture or painting.

Understanding the neurobiological foundations for aesthetic experience is at the root of a burgeoning discipline known as neuroaesthetics. The field applies cutting-edge science to age-old questions about our human interest in the arts, and it has emerged within the last 20 years as technological advances in imaging and noninvasive brain stimulation have made it easier to peer inside the human mind.

Why we appreciate the arts—and how that manifests inside the brain—
is now an interdisciplinary question that stretches across medicine and the humanities. “One of the great questions of philosophy is understanding the relationship between the mind and the body,” Connor says. “Aesthetics touches on the pinnacle of subjective experience, something that we have spent centuries trying to explain. Neuroscience may have something valuable to add to the discussion, since our aesthetic reaction originates in the brain.”

Advancing research in neuroaesthetics isn’t limited to the visual arts, according to Susan Magsamen, a senior adviser to the Johns Hopkins School of Medicine’s Brain Science Institute. BSi is a cross-disciplinary institute pulling expertise from medicine, science, and the humanities. In 2010, the institute convened a global summit called The Science of the Arts. They brought together neuroscientists, artists, musicians, architects, and more to share emerging research around the biological and neurobiological underpinnings for aesthetic experience. “The field of neuroaesthetics, depending on your interest and how you enter it, can go from studying love to studying film and architecture,” Magsamen explains.

The former director of BSi, the late John Griffin, conceived of the conference to help spark a dialogue about the myriad ways beauty informs human experience. “The artifacts of early man suggest that our ancestors were moved by images, forms, sounds, and movements, and in a world of subsistence, put effort and resources into their art,” Griffin said in 2010 when announcing the program. “For centuries, philosophers have speculated on the links between perception, beauty, creativity, and pleasure, and in recent years, scientists have learned a great deal about sensory systems.”

One participant in the conference was Charles Limb, then a Johns Hopkins otolaryngologist and surgeon who is also an accomplished saxophonist. Limb had become curious about what happens inside the minds of musicians when they play. How, for instance, did John Coltrane improvise for hours on stage? In 2008, Limb put jazz pianists on their backs in an fMRI and gave them a customized 35-key MIDI synthesizer to play. Limb then watched what happened in their brains as they jammed. When the jazz players improvised, Limb found that the activity
in the part of the prefrontal cortex associated with self-monitoring went down, while activity rose in the prefrontal cortex area associated with self-expression. Players lost their inhibitions and became more creative.

Learning how a jazz player’s mind works, or how much curvature is too much curvature in a modernist sculpture, offers a glimpse into what it means for our minds to take pleasure in art. It is an attempt to glean the biological and neurobiological foundations for a seemingly subjective experience.

In his research, which was funded by BSi, Connor hopes to help illuminate how our brain registers and understands objects. “One of the striking things about our visual capabilities is that we can see anything,” Connor says. “Not just familiar things but unfamiliar things. That’s a testament to a system that actually produces a meaningful geometric representation of anything we see, even if it’s very novel, even if it violates all our expectations based on previous experience.”

This work happens, Connor says, in the ventral pathway of the visual
cortex, the part of the brain that translates information received by the eye into objects perceived by the mind. That process is still mysterious, but scientists are piecing together information about how the brain does this work. How do neuron signals represent fragments of an object, and how does an ensemble of these signals result in a coherent image of an object? How do we see a white ball with black pentagons and register it in our mind as a soccer ball, for instance?

Johns Hopkins and the Walters chose Arp for their experiment because the artist's work is abstract. A representational image—say, a scan of that soccer ball—would not work in the same experiment, since distorting that image would violate the mind's rules about what a soccer ball is supposed to look like. Distorted scans of an abstract sculpture, on the other hand, can still look plausibly like abstract sculpture. What Connor and his team discovered is that different people tended to appreciate the same types of shapes. When measuring the brain responses of viewers under an fMRI as they looked at the images, they found that participants especially disliked those showing narrow cylinders or sharp points.

One of the big questions in neuroaesthetics concerns the way we understand art emotionally. Does the brain process painting, dance, music, and other aesthetic genres through the same rewards system, or do different domains generate their own rewards? Answers to how the brain builds images into an understanding of art are still emerging. The analytical methods for explaining neural phenomena are still being developed. Still, the ability to measure the human reaction to aesthetics and to map it in the brain may reveal quantifiable benefits for education, medicine, and therapy. This is why, in April of last year, BSi announced the launch of a new NeuroAesthetics Initiative, a global collaboration of scientists and organizations meant to support interdisciplinary research, with the goal of turning that research into real-world solutions. “We’re interested in the range of human emotion that falls under aesthetic experience, including beauty,” says Magsamen, who is the executive director of the initiative. Understanding the biology of aesthetics, she says, could have pragmatic applications for designing a classroom that encourages learning or a hospital.
“One of the striking things about our visual capabilities is that we can see anything. Not just familiar things but unfamiliar things. That’s a testament to a system that actually produces a meaningful geometric representation of anything we see, even if it’s very novel, even if it violates all our expectations based on previous experience.”

Neuroaesthetics currently faces the challenge of being a young field, and Magsamen says efforts are now being made to standardize the work that bridges the different practices and disciplines under its umbrella. Also, it isn’t currently recognized as a field for funding by the National Institutes of Health, a situation that Magsamen and her team hope to help change.

In the meantime, Connor and his team continue to research neuroaesthetics, this time with a study examining how the brain processes large-scale shapes in the environment, such as buildings. “We hope that the new work could lead toward exploring the neural basis of architectural aesthetics,” Connor says.

The goal of neuroaesthetic research is not to totally demystify the human aesthetic experience, according to Connor. He notes that people believe their relationship with art to be an intimate aspect of their identities, and some bristle at the idea that their taste in sculpture might be determined for them at the neurological level. The brain is ultimately so complex, Connor says, the mind so rich, for scientists ever to arrive at simple neurological prescriptions for what makes art matter—to eliminate subjectivity, as it were—is not the aim. “One of the ultimate goals of neuroscience is to understand the mind, understand the material basis of thought, of our sense of self. The basis for our consciousness,” Connor says. “I think of neuroaesthetics as adding more to neuroscience than it does to aesthetics. Aesthetics is just one of the most interesting and sublime aspects of conscious experience.”
“It’s crucial that we find out what people actually do as they invent things. What are they doing in their minds and with their hands? We need a new field of study—call it Inventology—to answer that question.”

**Inventology**

*From 2012 to 2013, Pagan Kennedy wrote about the people who dreamed up everyday objects such as lipstick, the universal product code, and the cellphone in her *New York Times Magazine*’s weekly *Who Made That?* column. The research exposed her to the plodding and often disorderly course of the inventing process. She was interested in whether patterns might emerge when comparing the act of invention through the eyes of scientists, doctors, ethnographers, engineers, and amateur inventors, each of whom begins by imagining the future and then goes about prototyping until they devise some new indispensable thing.*

*With *Inventology: How We Dream Up Things That Change the World* (Houghton Mifflin Harcourt), Kennedy, a 1988 graduate of Johns Hopkins Writing Seminars MA program, doesn’t pinpoint a single process people use to produce successful inventions; rather she identifies different paths for creative tinkering. The book spotlights user-inventors like Debra Latour, who was born with a right arm that ended just below the elbow. She developed a small plastic anchor that rests behind her shoulder blade to replace the typical prosthetic claw harness she grew up using.*

*Most appealing to Kennedy is the emergence of lower-cost entry to datasets, computational tools, and manufacturing resources that are democratizing the research and development process. In medical science and health care, for example, the more people are able to access this information, the more human innovation inches closer to the massive scale of nature. “Cancer cells defeat us simply with their numbers and the trial-and-error ingenuity with which they evolve,” she writes. “How to fight back? By recruiting millions of people to try billions of experiments and thus mount a random sweep through the unknown that might unlock the secrets of killer diseases.”* //BRET MCCABE
Why Can’t I Stop?
Jon Grant, Brian Odlaug, and Samuel Chamberlain
A trio of psychiatrists examines seven common addictions—gambling, eating, sex, stealing, Internet use, shopping, and hair pulling and skin picking—and how to break the cycle. The book, published by the Johns Hopkins University Press, blends research and case studies to describe addictions and how behaviors can be diagnosed and treated.

Operation Health: Surgical Care in the Developing World
Edited by Adam Kushner
The World Bank estimates that 11 percent of the global disease burden is treatable by surgery, yet more than a quarter of the world’s population lacks access to basic lifesaving medical procedures. Kushner, a Johns Hopkins general surgeon with extensive field experience, offers compelling justification for adding surgical care to the global health agenda.

Love and Forgiveness for a More Just World
Edited by Hent de Vries and Nils F. Schott
The book’s contributors inspire new applications for love and forgiveness in an increasingly globalized and no longer quite secular world. The essays, edited by a Hopkins humanities professor and a post-doctoral fellow, focus on the power of these two concepts to unite people. The authors argue: If we’re attentive to the needs of others, people will respond in kind.

Financial expert Yuval Bar-Or offers his top five books for fiscal health.

1 / (1998)
Against the Gods: The Remarkable Story of Risk
Peter L. Bernstein
John Wiley & Sons

2 / (2007)
The Little Book of Common Sense Investing
John C. Bogle
John Wiley & Sons

The Intelligent Investor
Benjamin Graham
HarperCollins

4 / (2007)
A Random Walk Down Wall Street: The Time-Tested Strategy for Successful Investing
Burton G. Malkiel
W.W. Norton & Co.

5 / (2009)
Too Big To Fail: The Inside Story of How Wall Street and Washington Fought to Save the Financial System—and Themselves
Andrew Ross Sorkin
Viking
**My worst day**

I felt helpless. I tried everything: diets, even acupuncture. Nothing worked for long. I would just gain and gain. I dreaded going to doctors and stepping on a scale. I thought, I work in the public health field; I need to walk the walk.

**What I did to get better**

I contacted surgeon Anne Lidor at the Johns Hopkins Center for Bariatric Surgery. She suggested a vertical sleeve gastrectomy procedure. Basically, I would have a large portion of my stomach removed, and it would restrict how much I could eat. A week before the surgery in early 2013, I still had doubts. Is this the right thing to do? What if this doesn’t work? In the end, I knew I had to get this done, but it was the hardest decision I ever made. After the surgery, I worked with a nutritional consultant to adjust my diet and my lifestyle. More fresh foods. Smaller meals. More exercise. I started with a Couch to 5K program. I didn’t take the easy way out. I had to work.

**Me now**

My recovery time was quick. I was back to work in three weeks. Overall, I feel great. I don’t worry about a seatbelt not fitting anymore, and for the first time I enjoy clothes shopping. I can even try on my sister’s clothes. My sister and I ran a half marathon a year after my surgery. Nine months later, I ran the Marine Corps Marathon. I weighed 175 pounds on race day. I was later diagnosed with stress fractures in my right foot, but I plan to continue running half marathons and I’m now toying with the idea of a triathlon. I like having a goal to strive for.
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