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THE POWER OF ALGORITHMS:

part 1

Учебное пособие

Саратов

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PREFACE

Настоящее учебное пособие включает актуальные тексты (2018-2019гг.) учебно-познавательной тематики для студентов механико-математического факультета (направления 02.03.01 «Математика и компьютерные науки», 01.03.02 «Прикладная математика и информатика», 38.03.05 «Бизнес-информатика»). Целью данного пособия является формирование навыка чтения и перевода научно-популярных текстов, а также развитие устной речи студентов (умение выразигь свою точку зрения, дать оценку обсуждаемой проблеме).

Пособие состоит из 5 разделов, рассматривающих значение информационных технологий в современном мире. Каждый из них содержит аутентичные материалы (источники: *Tech Crunch, Vox, The Atlantic, Medium, The Guardian*) и упражнения к ним.

Раздел “Supplementary reading“ служит материалом для расширения словарного запаса и дальнейшего закрепления навыков работы с текстами по специальности. Пособие может успешно использоваться как для аудиторных занятий, так и для внеаудиторной практики.

1. Searching For The Next Wave Of Education Innovation

Exercise I.

Say what Russian words help to guess the meaning of the following words: function, capitalists, course, guide, empirical, fundamental, internet, essays, ignored, aspects

Exercise II.

Make sure you know the following words and word combinations.

inkling, MOOC (Massive Open Online Courses), aftermath, endowment, intern, dispatch, intern, dispatch, rife, heatmap

Searching For The Next Wave Of Education Innovation

Few areas have been as hopeful and as disappointing as innovation in education.

Education is probably the single most important function in our society today, yet it remains one of the least understood, despite incredible levels of investment from venture capitalists and governments. Why do students continue to show up in a classroom or start an online course? How do we guide students to the right knowledge just as they need to learn it? We may have an empirical inkling and some hunches, but we still lack any fundamental insights. That's truly disappointing. With the rise of the internet, it seemed like education was on the cusp of a complete revolution. Today, though, you would be excused for not seeing much of a difference between the way we learn and how we did so twenty years ago.I have attempted to tease out these challenges in two previous essays on what the modern university still offers us and how we might learn in the

future. One thesis that becomes more clearer over time is simply that we have ignored the more human aspects of education, replacing it instead with a "give 'em tablets and they will learn" mentality. The next wave of education innovation won't come from dumping technology on the problem. Instead, it will come from deeply engaging with people and empowering them to make learning all their own. This past month, I talked to two individuals on opposite sides of improving education. Jodi Goldstein, who officially became head of Harvard's i-lab startup incubation center, discussed the opportunities and challenges of bringing an entrepreneurial mentality into America's oldest university. Mattan Griffel, founder of a subscription-based online education startup, is coming at the problem from the other direction, rethinking online education in the aftermath of the MOOC explosion. "Online education has kind of overstepped its current effectiveness," he argued, "and everyone is saying what is possible by painting this picture, but the tools haven't reached that point yet." Together, these two trailblazers and many others like them are starting to form the next wave of education innovation – and potentially transform our societies in the process.

One interesting change in mentality coming from this new wave is a more mature view about what to do with the infrastructure of learning we already have. While the end of universities has been proposed by people like Peter Thiel, the reality is that the combination of status and endowments will ensure that many universities will survive and even thrive in the online age. One interesting change coming to universities is simply that the timeframe of degree programs won't be as fixed as they are today. As we walked through the i-lab's new initiatives, Goldstein noted

that Harvard's Launch Lab, an incubator space for alumni teams, has already engaged with many students in just its first few months of operation. "There has been enormous interest and demand and we have seen such a strong community form with students leveraging each other," Goldstein said. Traditionally, students who graduated from the university would be forced to leave, but the Launch Lab ensures that they can maintain a connection to their alma matter. Griffel at One Month believes that large research universities won't change much in the near future from new online education initiatives. "The four year degree as we know it symbolically is going to change very little over the next ten years." Instead, he sees a larger cultural shift to the same sort of continuous education that the i-lab is trying to instill in its graduates. "We know that skills are changing faster and faster, so teaching people how to learn new skills is really important," Griffel said. That skills-based approach is also what he thinks One Month can do to help the current system. "We are not trying to replace the branding of Harvard. It is going to take a long time to see someone with One Month on a resume, which is why we are targeting more about the skills." One mistake that Griffel sees is in the extensive focus on students over teachers. While the language of education innovation often emphasizes students, empowering teachers may be as important or even more so for rethinking the way we learn. "We need to change the role of teachers. What kind of people do we consider teachers? How do we elevate teachers in society?" He thinks there is an opportunity to make them "rock stars" and bring new perspectives into the profession.

Few debates in education get teachers and students alike more worked up than the future of the humanities and the liberal arts. What use

is there to English or art in a world where a twelve-week programming class can dramatically change your employment and salary outcomes. Goldstein of the i-lab addressed that challenge of balancing the traditional role of the university with the more experiential programs of a startup incubator. “I’m glad that we are not trying to change the curriculum. Harvard is already really good at that, but we can sit along side that,” she said. Instead, Goldstein sees an opportunity to have students act as ambassadors, learning the trade of entrepreneurship and then bringing that mental model back to Harvard. Goldstein has made it a mission to seek ways of engaging non-traditional entrepreneurs. That’s why the i-lab has moved beyond just offering incubation space and startup events to creating what she called “structured entrepreneurship opportunities.” One example of this is a program run jointly with IDEO called the Future Lab, in which students go through a design-thinking curriculum developed by the design consulting firm while interning at startups and working on their challenges. Griffel at One Month is sanguine about the future of the liberal arts and believes that startups need to think deeply about how to foster critical thinking. “I think it is kind of like a fool’s choice,” he explained. “We are told that it is a spectrum: either vocational or deep critical thinking. But when you break down deep critical thinking, it is really just a set of skills that is taught.” Liberal arts provides a framework for handling the constant changes in skills required to survive in industry. “With the liberal arts approach, we don’t know what we need to train people toward because we don’t know the jobs of the future,” Griffel noted. However, that doesn’t mean universities shouldn’t change their approach. “This

becomes less relevant when education is a lifelong thing, rather than just a moment in college." Today, it seems clear that the fusion of online and offline learning is going to be at the core of improving education. Humans are social creatures, and placing them in front of a laptop and hoping that they are just going to soak up the knowledge is often asking too much. At the same time though, we need to be shifting our culture about what the ideal form of education might be. Academic knowledge needs to be complemented with practical learning, a mix that can be customized to each student's needs. Griffel believes that "We are trying to build this technology that highlights the best content and trying to shift, in the students' eyes and everyone's eyes, what is the role of education in your life?"Whether through experiential learning with startups or skills-based learning through an online subscription, this next generation of education might just work.

Adapted from Tech Crunch

4 crazy ideas from Stanford about the future of college

Recently student groups at the design school at Stanford University started to tackle an interesting question: what will an undergraduate education at Stanford look like at the turn of the 22nd century? They came up with 4 ideas, all of which look very different than the typical undergraduate experience today. Then they wrote and made videos framed as dispatches from the future, explaining what had happened in the past years to make college look like this in the year 2100. This is a thought experiment, and just the idea that college will look different at all a century from now is provocative. The basic format of college — earning a degree in four years — is centuries old, and classroom lectures dates back to the

12 century. Still, the thought experiment is interesting, in part because it reflects some trends that are already going on.

1) Replace four years of college with six years of education you can use whenever you want. Instead of going through college, students would get six years of education to use during their lifetimes. It might not be all at once: they could easily leave campus to take jobs or internships and then return. Students who had finished four years of education could come back later in their careers to teach a class on campus, or to take classes if they want to change careers. It's sort of an all-you-can-eat buffet — eat as much as you want, then go back if you feel like you need more. (It's not clear if graduation, or degrees at all, still exist in this futuristic universe, which focuses on how a college education can be more useful throughout your lifetime.) The idea that students can drop out to go work at a startup, then come back a few years later when changing careers, makes sense.

2) Replace a pre-major and major phase with a six-year "calibration, activation, elevation" journey. This idea is rife with technological jargon, but the basic concept is that instead of a four-year college experience, students would start out with short, introductory courses (less than a month long) in various fields of interest, a phase that could last up to 18 months. Then they would choose one area to focus on in depth. After that, they'd conduct research before leaving the university. In all, the three phases could take up to six years.

3) Focus on skills, rather than on knowledge. This idea is probably closest to becoming reality. It includes a reorganization of academic departments based on broad "competencies" — scientific analysis,

quantitative reasoning, communication effectiveness, and so on. Instead of transcripts with grades in specific classes, students would earn a "skill-print" — a sort of heat map showing what things they could do extraordinarily well and with depth and what skills they were still developing, all based on the work students did in class. There's a growing consensus that college should focus more on measuring "competencies" — not just what students know, but what they're able to do.Measuring what students can do is a way to make an education in something abstract translate into something that sounds valuable in the workplace.

4) Replace majors with 'missions. Instead of picking a broad area of study to major in, students would pick a problem they wanted to solve, and how they wanted to continue working on that issue as they started their careers. One mission, for example, could be to study agriculture and biology to end world hunger. Then they'd organize their college classes to support achieving that goal.This is another way to focus on the real-world impact of what students are studying, while still keeping to the general format of a four-year college education. As a result, it's probably the most likely to happen.

Adapted from Vox

Exercise III.

Fill in the gaps.

1) McCain is allright but he doesn't show any _____ that he understands economics.

2) The computer screen should be at eye level so you don't have to _____ to see it.

3) Fan and her colleagues used computer simulations to _____ what was going on.

4) An _____ spirit and ambition can completely change your earning power.

5) From the beginning, _____ providers have struggled with the issue of cheating.

6) Michael Jackson is not just the greatest entertainer ever, he was a _____.

7) In the past year, the university system paid out $39 million from its _____.

8) The _____ is appealing to people in well-established careers already.

9) We got rid of all the theory and settled on a completely _____ approach.

10) On the general test, taken by all candidates, there are questions to assess analytical, verbal and _____.

Exercise IV.

Make up sentences of your own with the following word combinations: to tease out, to work up, to show up, to start an online course, to be on the cusp of a complete revolution, online education startup, from the other direction, to focus on, to keep to the general format of , it's probably the most likely to happen

Exercise V.

Match the words to the definitions in the column on the right:

cusp	gradually but firmly establish (an idea or attitude, esp. a _

	desirable one) in a person's mind
to dump	a graduate or former student, esp. male, of a particular school, college, or university
trailblazer	begin to do or pursue (something) again after a pause or interruption
endowment	cheerfully optimistic
alumni	encourage or promote the development of (something, typically something regarded as good)
instill	deposit or dispose of (garbage, waste, or unwanted material), typically in a careless or hurried way
to resume	a quality or ability possessed or inherited by someone
sanguine	a pointed end where two curves meet, in particular
to foster	a person who makes a new track through wild country
to customize	modify (something) to suit a particular individual or task

Exercise VI.

Identify the part of speech the words belong to:

entrepreneurial, experiential, curriculum, vocational, fusion, leverage, education, innovation, hopeful, incredible

Exercise VII.

Match the words to make word combinations:

quantitative	technology
degree	course
alma	innovation

venture	reasoning
dumping	sides
opposite	program
human	inkling
online	mater
empirical	aspects
education	capitalists

Exercise VIII.

Summarize the article “Searching For The Next Wave Of Education Innovation”.

2. A World without Work

Exercise I.

Say what Russian words help to guess the meaning of the following words: concept, moment, residents, model, manufacturing, regional, depression, economic, psychological, cultural

Exercise II.

Make sure you know the following words and word combinations.

caseload, spreadsheet, heyday, cashier, moat, murky, to conflate, to persevere, doomsayer, to adjunct

A World without Work

For centuries, experts have predicted that machines would make workers obsolete. That moment may finally be arriving. Could that be a good thing?

The end of work is still just a futuristic concept for most of the United States, but it is something like a moment in history for Youngstown, Ohio, one its residents can cite with precision: September 19, 1977. For much of the 20th century, Youngstown's steel mills delivered such great prosperity that the city was a model of the American dream, boasting a median income and a homeownership rate that were among the nation's highest. But as manufacturing shifted abroad after World War II, Youngstown steel suffered, and on that gray September afternoon in 1977, Youngstown Sheet and Tube announced the shuttering of its mill. Within five years, the city lost 50,000 jobs and $1.3 billion in manufacturing wages. The effect was so severe that a term was coined to describe the fallout: *regional depression*. Youngstown was transformed

not only by an economic disruption but also by a psychological and cultural breakdown. Depression, spousal abuse, and suicide all became much more prevalent; the caseload of the area's mental-health center tripled within a decade. The city built four prisons in the mid-1990s. This winter, I traveled to Ohio to consider what would happen if technology permanently replaced a great deal of human work. I wasn't seeking a tour of our automated future. I went there because Youngstown has become a national metaphor for the decline of labor, a place where the middle class of the 20th century has become a museum exhibit."Youngstown's story is America's story, because it shows that when jobs go away, the cultural cohesion of a place is destroyed," says John Russo, a professor of labor studies at Youngstown State University. "The cultural breakdown matters even more than the economic breakdown."

In the past few years, even as the United States has pulled itself partway out of the jobs hole created by the Great Recession, some economists and technologists have warned that the economy is near a tipping point. When they peer deeply into labor-market data, they see troubling signs, masked for now by a cyclical recovery. And when they look up from their spreadsheets, they see automation high and low—robots in the operating room and behind the fast-food counter. They imagine self-driving cars snaking through the streets and Amazon drones dotting the sky, replacing millions of drivers and retail workers. They observe that the capabilities of machines—already formidable—continue to expand exponentially, while our own remain the same. And they wonder: *Is any job truly safe?* Futurists and science-fiction writers have at times looked forward to machines' workplace takeover with a kind of giddy excitement,

imagining the banishment of drudgery and its replacement by almost limitless personal freedom. And make no mistake: if the capabilities of computers continue to multiply while the price of computing continues to decline, that will mean a great many of life's necessities and luxuries will become ever cheaper, and it will mean great wealth—at least when aggregated up to the level of the national economy. But even leaving aside questions of how to distribute that wealth, the widespread disappearance of work would usher in a social transformation unlike any we've seen. If John Russo is right, then saving work is more important than saving any particular job. It has served as America's unofficial religion since its founding. The sanctity and preeminence of work lie at the heart of the country's politics, economics, and social interactions. What might happen if work goes away? The U.S. labor force has been shaped by millennia of technological progress. Agricultural technology birthed the farming industry, the industrial revolution moved people into factories, and then globalization and automation moved them back out, giving rise to a nation of services. But throughout these reshufflings, the total number of jobs has always increased. What may be looming is something different: an era of technological unemployment, in which computer scientists and software engineers essentially invent us out of work, and the total number of jobs declines steadily and permanently. This fear is not new. The hope that machines might free us from toil has always been intertwined with the fear that they will rob us of our agency. In the midst of the Great Depression, the economist John Maynard Keynes forecast that technological progress might allow a 15-hour workweek, and abundant leisure, by 2030. But

around the same time, President received a letter warning that industrial technology was a “Frankenstein monster” that threatened to upend manufacturing, “devouring our civilization.” In 1962, President said, “If men have the talent to invent new machines that put men out of work, they have the talent to put those men back to work.” But two years later, a committee of scientists and social activists sent an open letter to President arguing that “the cybernation revolution” would create “a separate nation of the poor, the unskilled, the jobless,” who would be unable either to find work or to afford life’s necessities.The job market defied doomsayers in those earlier times, and according to the most frequently reported jobs numbers, it has so far done the same in our own time. Unemployment is currently just over 5 percent. One could be forgiven for saying that recent predictions about technological job displacement are merely forming the latest chapter in a long story called *The Boys Who Cried Robot*—one in which the robot, unlike the wolf, never arrives in the end. But some of the most sober economists are beginning to worry.

What does the “end of work” mean, exactly? It does not mean the imminence of total unemployment, nor is the United States remotely likely to face, say, 30 or 50 percent unemployment within the next decade. Rather, technology could exert a slow but continual downward pressure on the value and availability of work—that is, on wages and on the share of prime-age workers with full-time jobs. Eventually that could create a new world, where the expectation that work will be a central feature of adult life dissipates for a significant portion of society. After 300 years of people crying wolf, there are now three broad reasons to take seriously the argument that the beast is at the door: the ongoing triumph of capital over

labor, the quiet demise of the working man, and the impressive dexterity of information technology. ***Labor's losses.*** One of the first things we might expect to see in a period of technological displacement is the diminishment of human labor as a driver of economic growth. In fact, signs that this is happening have been present for quite some time. A number of theories have been advanced to explain this phenomenon, including globalization and its accompanying loss of bargaining power for some workers. But Loukas Karabarbounis and Brent Neiman, economists at the University of Chicago, have estimated that almost half of the decline is the result of businesses' replacing workers with computers and software. In 1964, the nation's most valuable company, AT&T, was worth $267 billion in today's dollars and employed 758,611 people. Today's telecommunications giant, Google, is worth $370 billion but has only about 55,000 employees—less than a tenth the size of AT&T's workforce in its heyday. ***The spread of nonworking men and underemployed youth.*** The share of prime-age Americans (25 to 54 years old) who are working has been trending down since 2000. All in all, about one in six prime-age men today are either unemployed or out of the workforce altogether. This is what the economist Tyler Cowen calls "the key statistic" for understanding the spreading rot in the American workforce. Conventional wisdom has long held that under normal economic conditions, men in this age group—at the peak of their abilities and less likely than women to be primary caregivers for children—should almost all be working. Yet fewer and fewer are. Economists cannot say for certain why men are turning away from work, but one explanation is that technological change has

helped eliminate the jobs for which many are best suited. Since 2000, the number of manufacturing jobs has fallen by almost 5 million, or about 30 percent. Young people just coming onto the job market are also struggling —and by many measures have been for years.The share of recent college grads who are "underemployed" (in jobs that historically haven't required a degree) is still higher than it was in 2007—or, for that matter, 2000. And the supply of these "non-college jobs" is shifting away from high-paying occupations, such as electrician, toward low-wage service jobs, such as waiter. More people are pursuing higher education, but the real wages of recent college graduates have fallen by 7.7 percent since 2000. In the biggest picture, the job market appears to be requiring more and more preparation for a lower and lower starting wage. These facts do not seem to speak encouragingly about the future of work. ***The shrewdness of software.*** One common objection to the idea that technology will permanently displace huge numbers of workers is that new gadgets, like self-checkout kiosks at drugstores, have failed to fully displace their human counterparts, like cashiers. But employers typically take years to embrace new machines at the expense of workers. "The personal computer existed in the '80s," says Henry Siu, an economist at the University of British Columbia, "but you don't see any effect on jobs until the 1990s, and then suddenly, in the last recession, it's huge. So today you've got checkout screens and the promise of driverless cars, flying drones and robots. We know that these tasks can be done by machines rather than people. But we may not see the effect until the next recession."

Some observers say our humanity is a moat that machines cannot cross. They believe people's capacity for compassion, deep understanding,

and creativity are inimitable. But as Erik Brynjolfsson and Andrew McAfee have argued in their book, computers are so dexterous that predicting their application 10 years from now is almost impossible. For example, the authors named psychologist as one of the occupations least likely to be “computerisable.” But some research suggests that people are more honest in therapy sessions when they believe they are confessing their troubles to a computer, because a machine can’t pass moral judgment. It shows how easily computers can encroach on areas previously considered “for humans only.” Technology creates some jobs too, but nine out of 10 workers today are in occupations that existed 100 years ago, and just 5 percent of the jobs generated between 1993 and 2013 came from “high tech” sectors like computing, software, and telecommunications. Our newest industries tend to be the most labor-efficient: they just don’t require many people. It is for precisely this reason that the economic historian Robert Skidelsky, comparing the exponential growth in computing power with growth in job complexity, has said, “Sooner or later, we will run out of jobs.”Is that certain—or certainly imminent? No. The signs so far are murky and suggestive. But the possibility seems significant enough—and the consequences disruptive enough—that we owe it to ourselves to start thinking about what society could look like without universal work, in an effort to begin nudging it toward the better outcomes and away from the worse ones. Some people displaced from the formal workforce will devote their freedom to simple leisure; some will seek to build productive communities outside the workplace; and others will fight, passionately and in many cases

fruitlessly, to reclaim their productivity. Work is really three things, says Peter Frase, the author of *Four Futures*, a book about how automation will change America: the means by which the economy produces goods, the means by which people earn income, and an activity that lends meaning or purpose to many people's lives. "We tend to conflate these things," he told me, "but in a future of abundance, we wouldn't, and we ought to think about ways to make it easier and better to not be employed." Frase belongs to a small group of writers, academics, and economists—they have been called "post-workists"—who welcome the end of labor. American society has "an irrational belief in work for work's sake," says Benjamin Hunnicutt, another post-workist and a historian at the University of Iowa, even though most jobs aren't so uplifting. A Gallup report of worker satisfaction found that as many as 70 percent of Americans don't feel engaged by their current job. Purpose, meaning, identity, fulfillment, creativity, autonomy—all these things that positive psychology has shown us to be necessary for well-being are absent in the average job.The post-workists are certainly right about some important things. In a post-work society, Hunnicutt said, people might spend more time caring for their families and neighbors; pride could come from our relationships rather than from our careers. The post-work proponents acknowledge that, even in the best post-work scenarios, pride and jealousy will persevere, because reputation will always be scarce, even in an economy of abundance. But with the right government provisions, they believe, the end of wage labor will allow for a golden age of well-being. Hunnicutt said he thinks colleges could reemerge as cultural centers rather than job-prep

institutions. The word *school*, he pointed out, comes from the Greek word for "leisure." "We used to teach people to be free," he said. "Now we teach them to work."Hunnicutt's vision rests on certain assumptions about taxation and redistribution that might not be congenial to many Americans today. But even leaving that aside for the moment, this vision is problematic: it doesn't resemble the world as it is currently experienced by most jobless people. By and large, the jobless don't spend their downtime socializing with friends or taking up new hobbies. Instead, they watch TV or sleep. Time-use surveys show that jobless prime-age people dedicate some of the time once spent working to cleaning and childcare. But men in particular devote most of their free time to leisure, the lion's share of which is spent watching television, browsing the Internet, and sleeping. Retired seniors watch about 50 hours of television a week. That means they spend a majority of their lives either sleeping or sitting on the sofa looking at a flatscreen. The unemployed theoretically have the most time to socialize, and yet studies have shown that they feel the most social isolation.

Most people want to work, and are miserable when they cannot. The ills of unemployment go well beyond the loss of income; people who lose their job are more likely to suffer from mental and physical disorders. Research has shown that it is harder to recover from a long bout of joblessness than from losing a loved one or suffering a life-altering injury. The very things that help many people recover from other emotional traumas—a routine, an absorbing distraction, a daily purpose—are not readily available to the unemployed. The transition from labor force to

leisure force would likely be particularly hard on Americans, the worker bees of the rich world. Richer, college-educated Americans are working *more* than they did 30 years ago, particularly when you count time working and answering e-mail at home. In 1989, the psychologists Mihaly Csikszentmihalyi and Judith LeFevre conducted a famous study of Chicago workers that found people at work often wished they were somewhere else. But in questionnaires, these same workers reported feeling better and less anxious in the office or at the plant than they did elsewhere. The two psychologists called this "the paradox of work": many people are happier complaining about jobs than they are luxuriating in too much leisure. Other researchers have used the term *guilty couch potato* to describe people who use media to relax but often feel worthless when they reflect on their unproductive downtime. The post-workists argue that Americans work so hard because their culture has conditioned them to feel guilty when they are not being productive, and that this guilt will fade as work ceases to be the norm. This might prove true, but it's an untestable hypothesis. When I asked Hunnicutt what sort of modern community most resembles his ideal of a post-work society, he admitted, "I'm not sure that such a place exists." Less passive forms of mass leisure could develop. And they already are developing. The Internet, social media, and gaming offer entertainments that are as easy to slip into as is watching TV, but all are more purposeful and often less isolating. Video games, despite the derision aimed at them, are vehicles for achievement of a sort. Jeremy Bailenson, a communications professor at Stanford, says that as virtual-reality technology improves, people's "cyber-existence" will become as

rich and social as their “real” life. But it’s hard to imagine that leisure could ever entirely fill the vacuum of accomplishment left by the demise of labor. Most people do need to achieve things through, yes, *work* to feel a lasting sense of purpose. To envision a future that offers more than minute-to-minute satisfaction, we have to imagine how millions of people might find meaningful work without formal wages. It’s possible that information technology and robots eliminate traditional jobs and make possible a new economy geared around self-expression, where people would do artistic things with their time.”In other words, it would be a future not of consumption but of creativity. The Internet and the cheap availability of artistic tools have already empowered millions of people to produce culture from their living rooms. People upload more than 400,000 hours of YouTube videos and 350 million new Facebook photos every day. The demise of the formal economy could free many would-be artists, writers, and craftspeople to dedicate their time to creative interests—to live as cultural producers. Such activities offer virtues that many psychologists consider central to satisfaction at work: independence, the chance to develop mastery, and a sense of purpose. John Russo, the Youngstown State professor, sees Youngstown as the leading edge of a larger trend toward the development of what he calls the “precariat”—a working class that swings from task to task in order to make ends meet. Karen Schubert, a 54-year-old writer with two master’s degrees, accepted a part-time job as a hostess at a café in Youngstown early this year, after spending months searching for full-time work. Schubert, who has two grown children and an infant grandson, said she’d loved teaching writing

and literature at the local university. But many colleges have replaced full-time professors with part-time adjuncts in order to control costs, and she'd found that with the hours she could get, adjunct teaching didn't pay a living wage, so she'd stopped. "I think I would feel like a personal failure if I didn't know that so many Americans have their leg caught in the same trap," she said. "There are young people working part-time in the new economy who feel independent and say they like it like this—to have short hours so they have time to focus on their passions," Russo said. Schubert's wages at the café are not enough to live on, and in her spare time, she sells books of her poetry at readings and organizes gatherings of the literary-arts community in Youngstown, where other writers (many of them also underemployed) share their prose. The evaporation of work has deepened the local arts and music scene, several residents told me, because people who are inclined toward the arts have so much time to spend with one another. Today the norm is to think about employment and unemployment as a black-and-white binary, rather than two points at opposite ends of a wide spectrum of working arrangements. We're pretty good at noticing the immediate effects of technology's substituting for workers, such as fewer people on the factory floor. What's harder is anticipating the second-order effects of this transformation, such as what happens to the consumer economy when you take away the consumers. Deciding how to tax profits and distribute income could become the most significant economic-policy debate in American history. One way of doing that would be to more heavily tax the growing share of income going to the owners of capital, and use the money to cut checks to all adults. The rich could say, with

some accuracy, that their hard work was subsidizing the idleness of millions of “takers.” What’s more, although a universal income might replace lost wages, it would do little to preserve the social benefits of work. The most direct solution to the latter problem would be for the government to pay people to do something, rather than nothing. The simplest way to help everybody stay busy might be government sponsorship of a national online marketplace of work (or, alternatively, a series of local ones, sponsored by local governments). Individuals could browse for large long-term projects, like cleaning up after a natural disaster, or small short-term ones: an hour of tutoring or an evening of entertainment. The requests could come from local governments or community associations or nonprofit groups; from rich families seeking nannies or tutors; or from other individuals given some number of credits to “spend” on the site each year. In a post-work society, the financial rewards of education and training won’t be as obvious. This is a challenge of imagining a flourishing post-work society: How will people discover their talents, or the rewards that come from expertise, if they don’t see much incentive to develop either? Modest payments to young people for attending and completing college, skills-training programs, or community-center workshops might eventually be worth considering. One theory of work holds that people tend to see themselves in jobs, careers, or callings. Individuals who say their work is “just a job” emphasize that they are working for money rather than aligning themselves with any higher purpose. But one pursues a calling not only for pay or status, but also for the intrinsic fulfillment of the work itself.When I think about the role that

work plays in people's self-esteem—particularly in America—the prospect of a *no-work* future seems hopeless. But a future of *less work* still holds a glint of hope, because the necessity of jobs now prevents so many from seeking immersive activities that they enjoy.

Adapted from The Atlantic

Exercise III.

Fill in the gaps.

1) Whatever was committed to paper just six months ago is probably _____ by now.

2) Rushing breakfast, naturally, also is much more _____ among people who work.

3) It is heavy work, covering six counties, 44 people per _____, but he loves it.

4) He showed almost superhuman courage and was, in many respects, a _____ man.

5) Maybe that was the name that pushed the nation to the brink of _____.

6) A person's job might be _____, but it could now also be a career, a vocation.

7) On the one hand, I still do believe in the _____ and seriousness of marriage.

8) Only yesterday, we Americans could afford to feel smug about our _____.

9) Perhaps the sorriest aspect of this general slide is the _____ of surprise.

10) You go to _____ in its old-school resorts and daydream on its un-peopled beaches.

Exercise IV.

Make up sentences of your own with the following word combinations:

prime-age, by any large, make no mistake, to expand, to loom, to intertwine, to devour, to defy, to exert, to dissipate

Exercise V.

Match the words to the definitions in the column on the right:

obsolete	widespread in a particular area at a particular time
median	lift (something) up; raise
glint	accept or admit the existence or truth of
prevalent	an illness, typically a minor one
vehicle	no longer produced or used; out of date
derision	time during which a machine, esp. a computer, is out of action or unavailable for use
ailment	situated in the middle, esp. of the body
downtime	a small flash of light, esp. as reflected from a shiny surface
to acknowledge	a thing used for transporting people or goods, esp. on land, such as a car, truck, or cart
uplift	contemptuous ridicule or mockery

Exercise VI.

Identify the part of speech the words belong to.

formidable, inimitable, dexterous, consumption, contingency, imminent, banishment, diminishment, provision, precarious,
idleness, shrewdness

Exercise VII.

Match the words to make word combinations:

manufacturing	depression
regional	income
regional	disruption
economic	wages
median	depression
American	concept
steel	rate
United	dream
futuristic	mills
homeownership	States

Exercise VIII.

Summarize the article “A World without Work”.

3. The myth of ‘mad’ genius

Exercise I.

Say what Russian words help to guess the meaning of the following words: stereotype, mental, idea, reason, illustrates, person, popular, media, poetry, correlation.

Exercise II

Make sure you know the following words and word combinations.

inference, distinct, erroneous, fallacy, inverse, divergent, tally, proxy, hurdle, to disparage

The myth of ‘mad’ genius

The Romantic stereotype that creativity is enhanced by a mood disorder is dangerous, and dissolves under careful scrutiny

Is creativity inherently related to mood disorders? It’s a common belief today that there exists some intimate relationship between the two. Consider common paragons of creativity: Vincent van Gogh, Sylvia Plath, Virginia Woolf, Ezra Pound, Anne Sexton (and countless others), all reaching new creative heights while struggling with a terrible mental disorder of some kind. This idea of a connection between the two stems from the Romantic Era, when mental disorder was thought to be a sign of creativity – an idea that remains remarkably tenacious today. But is there any scientific reason to believe in a connection? Trying to answer this question illustrates how difficult it is to address knotty, multi-layered problems like this with research. It is not as straightforward as just seeing if ‘creativity’ is correlated with ‘mood disorder’. We’ve got to dig deeper.

The relationship is deeply enmeshed in the public mind for a couple of reasons. For many, the idea of the ‘creative person’ comes from popular media, which inundates us with news stories and movie portrayals of the suffering artist and the mad genius. And there are anecdotal accounts closer to our real lives: many of us have heard stories about someone who suffers from a deep depression – but also creates beautiful poetry. Repeatedly hearing these accounts fuels a stereotype. When we frequently see two unique things (eg, extraordinary creativity and mood disorders) occur together, they become paired in our minds, creating what is termed anillusory correlation.

This effect is compounded by the availability heuristic, wherein we judge how common something is by how easily it comes to mind. If our mental representation of a creative person is based on this notion of genius and disorder, it will be easier to remember creative people who have a disorder, rather than those that don’t. This makes the connection seem more common. These two types of biases occur unconsciously and are often beyond our control. It is only by studying the issue scientifically, limiting our bias to the greatest extent possible, that we can we truly understand if creativity is related to mood disorders.

The scientific study of creativity and mood disorders is limited. There are vastly more reviews and commentaries discussing why and how a relationship might exist than there are studies examining if there is a relationship at all. And the studies that do ask this fundamental question are frequently plagued by methodological issues that introduce bias, in part stemming from the available methods for measuring creativity and mood disorders, and the ambiguities inherent in the concepts themselves. It is

important to understand just how difficult it is to establish a connection with scientific precision.

Creativity researchers commonly define ‘creativity’ as novel (original or unique) and useful (appropriate). Therefore, a creative person is one with the aptitude to create novel and useful products or ideas, and the creative processis the mental processes by which creative products or ideas are formed. However, because neither of these concepts is directly measurable, researchers must come up with indicators of creativity to infer whether or not a person is creative or engaged in a creative process. It’s a particularly slippery thing to study. Creativity is complex, and assessments are limited. They typically measure one indicator of creativity (such as personality characteristics typical of creative people or the subjectively rated creativity of a product, such as a poem), and only in one domain (such as science versus art). If we measure a person’s creativity by asking them to write a poem, inferences shouldn’t then be made about that person’s creative ability in science. The method of assessing creativity has to be carefully considered, as some types of mood disorder might be related to some types of creativity, but not others.

Also, a mood disorder is not directly measurable. It must be diagnosed based on a series of behaviours and symptoms, which themselves can be difficult to identify. Mood disorders are characterised by specific patterns of mood episodes: depressive, hypomanic, and/or manic. Depressive episodes can be identified by things like decreased pleasure in usual activities, fatigue, and a diminished ability to concentrate. Meanwhile, someone in the throes of a hypomanic episode will have an unusually elevated or irritable mood, increased energy,

inflated self-esteem, and racing thoughts. Manic episodes are similar, but last longer and are more severe, sometimes even requiring hospitalisation. An overly simplified explanation of this is that a person who experiences a depressive episode might be diagnosed with Major Depressive Disorder, while a person who grapples with a depressive episode and a hypomanic episode might be diagnosed with Bipolar II Disorder. Someone who endures manic episodes (and can also experience depressive episodes) could be diagnosed with Bipolar I Disorder. Each type of disorder might – or might not – be related to a specific kind of creativity.

Research into the creativity/mood disorder link falls into three distinct categories. The first compares the instances of mood disorders exhibited by creative people and by less-creative people; the second compares the creativity of people with mood disorders and those without; and the third examines whether or not the symptoms of mood disorders are correlated with creativity (usually in the general population or students). Each approach is able to answer a different question. For instance, the question: Do creative individuals have more mood disorders? is distinct from: Do individuals with mood disorders have more creativity? Erroneously drawing conclusions about the answer to one from evidence for or against the other is known as the fallacy of the inverse, which is very common in this line of research. This explains, in part, why this research area is so muddied.

To get some clarity on the relationship, I conducted three meta-analyses (that is, an analysis of the studies that have already been conducted), one for each of the three research approaches above. This tactic combined the effect sizes of all of the relevant studies. As expected,

the results were different for the analysis of studies comparing mood disorders in creative and less-creative people than they were for the analysis comparing creativity in people with a mood disorder and those without. Although creative peopledo exhibit a greater instance of all types of mood disorders when compared with less-creative people (except for dysthymia, a chronic and less severe depressive disorder), the analysis comparing the creativity of individuals with a mood disorder to those with no mental disorder was more nuanced. The creativity of people with a mood disorder did not differ from those without. However, there were differences in some domains of creativity (people with a mood disorder were more creative in verbal and performance creativity) and for specific disorders (cyclothymic disorder and unspecified bipolar disorder). But of course, meta-analyses by nature inherit the methodological limitations of the studies they analyse. So if the studies that go into the meta-analysis are biased, then the conclusions of the meta-analysis might themselves suffer from bias. Therefore it is vitally important to understand the context of each analysis – and by that route we get closer to understanding the psychological relationship.

Does having a mood disorder make you more creative? That's the most frequent question I hear about the relationship. But because we cannot control the instance of a mood disorder (that is, we can't turn it on and off, and measure that person's creativity under both conditions), the question should really be: Do individuals with a mood disorder exhibit greater creativity than those without? Studies that attempt to answer this

question by comparing the creativity of individuals with a mood disorder against those without have been, well, mixed.

Studies that ask participants to complete surveys of creative personality, behaviour or accomplishment, or to complete divergent thinking measures (where they are asked to generate lots of ideas) often find that individuals with mood disorders do not differ from those without. However, studies using “creative occupation” as an indicator of creativity (based on the assumption that those employed in these occupations are relatively more creative than others) have found that people with bipolar disorders are overrepresented in these occupations. These studies do not measure the creativity of participants directly, rather they use external records (such as censuses and medical registries) to tally the number of people with a history of mood disorders (compared with those without) who report being employed in a creative occupation at some time. These studies incorporate an enormous number of people and provide solid evidence that people who have sought treatment for mood disorders are engaged in creative occupations to a greater extent than those who have not. But can creativeoccupations serve as a proxy for creative ability?

The creative occupations considered in these studies are overwhelmingly in the arts, which frequently provide greater autonomy and less rigid structure than the average nine-to-five job. This makes these jobs more conducive to the success of individuals who struggle with performance consistency as the result of a mood disorder. The American psychiatrist Arnold Ludwig has suggested that the level of emotional expressiveness required to be successful in various occupations creates an occupational drift, and demonstrated that the pattern of expressive

occupations being associated with a greater incidence of psychopathology is a self-repeating pattern. For example, professions in the creative arts are associated with greater psychopathology than professions in the sciences whereas, within creative arts professions, architects exhibit a lower lifetime prevalence rate of psychopathology than visual artists and, within the visual arts, abstract artists exhibit lower rates of psychopathology than expressive artists. Therefore, it is possible that many people who suffer from mood disorders gravitate towards these types of professions, regardless of creative ability or inclination.

Do creative people have more mood disorders? To answer this question, researchers have to compare the instance or rate of mood disorders in creative people to people they consider less creative. Even though these kinds of studies appear to provide fairly consistent support for the creativity-mood disorder link, they are in fact highly controversial among creativity researchers.

Consider the method called autopsy diagnosis. Here researchers examine biographical and historical records to provide a post-mortem diagnosis for eminently creative people. But establishing the presence of a mental disorder for someone who is long-deceased is fraught with uncertainty at every step of the process. To be labelled a creative genius, a person must have creativity and the characteristics that we associate with creativity at that time. So the historical context is crucial. For instance, there are certain time periods for which being moody and irrational was seen as positive evidence of genius itself, particularly for those in the arts. Writers during the Romantic Era sometimes cultivated an ‘aura of mania’ in order to appear possessed of extraordinary ability. These artists were

more likely to be recognised for profound creativity, and therefore recorded in the sources that many researchers use today. But there's no way for us to tell whether that artist was actually suffering from a mood disorder. So whether the characteristics of a creative person just happen to fit the ideology of genius during that time, or whether, as some researchers have suggested, these characteristics are exhibited purposefully to make an impression, they might be more likely to be represented in historical records than someone with equivalent talent and creativity who does not fit this image.

There are more problems with the autopsy approach. The historically creative people included in today's studies must have had a sufficient amount written about them to establish a diagnostic status, and, naturally, people with more sensational lives have had more written about them. Staid lives don't sell. Judith Schlesinger, in her book The Insanity Hoax, illustrates the point: multiple biographers abandoned projects about the American saxophonist Bud Shank because they were unable to uncover any salacious details about his life. Plus, biographers need to tell a story, so they inevitably emphasise and distort the details of their subject's lives in order to engage their readers (or perhaps to adhere to their own romantic conceptions of what creativity is).

Finally, diagnostic reliability – the extent to which different clinicians and researchers agree on a diagnosis – is elusive with living patients, let alone those who have been dead for centuries. Many researchers believe that Van Gogh suffered from bipolar disorder, but a sizeable number vehemently insist that he actually suffered from schizophrenia, temporal lobe epilepsy, syphilis, Ménière's disease, or

absinthe or lead poisoning. Indeed, just last year at an event sponsored by the Van Gogh Museum in Amsterdam, a room full of doctors and art historians could not reach a consensus as to what caused the artist's suffering. (It's also worth noting that the American Psychiatric Association's Goldwater rule suggests that diagnoses should never be provided for people whom the psychiatrist has not examined in person.) Looking to the past to establish a connection between creativity and mood disorder is, if anything, more difficult than examining the present.

And what of the studies that use in-person diagnoses to report that creative people exhibit greater instances of mood disorders than less-creative people? They might be vulnerable to bias as well, since these studies frequently lack random sampling and/or experimenter-blind procedures. Although psychological researchers are often able only to approximate random sampling, the goal is to ensure that every person within a specified population has an equal chance of being chosen to participate in the study, which is not what happens. Most people chosen to be included in the creative groups are successful writers or artists, while those in the less-creative group are typically average people living nearby to wherever the study is taking place. This is a problem since there are differences that might vary systematically between the groups: for instance, people who have achieved real creative success typically face the stress of being in the public eye, while the average person does not. Just that component could account for any number of differences in the instance of mood disorder, given that stress is a major cause for the onset of mood disorders.

Additionally, diagnostic status is determined by lifetime prevalence, or if a person has ever experienced the symptoms associated with a disorder. One issue that researchers conducting diagnostic interviews face when asking people to remember their symptoms is recall bias, which means that when creative people are asked to recall if they have experienced mood-disorder symptoms, they are more likely to remember symptoms they view as influencing their creativity, whereas people in a 'less-creative' comparison group would have more trouble remembering past symptoms.

This leads us to the single greatest hurdle to studying a potential relationship between creativity and mood disorders. Because there is no agreed-upon objective way of measuring either one, the conclusions regarding their relationship end up being based on symptoms. Consider how this is a problem: increased energy, ideational fluency, reduced need for food or sleep and extreme task-absorption can accurately describe intense creative activity – or a (hypo)manic episode. Which one? Researchers have difficulty telling.

Indeed, one study found that 89 per cent of a sample of creative writers and artists suggested that they experienced symptoms indicative of both (hypo)manic episodes and creative activity (such as ideational fluency), but only 10 per cent suggested that they experienced episodes of excessive and impulsive spending – which is characteristic of a (hypo)manic episode, but not creative activity. Increased creative thinking has also been included as a symptom of hypomania itself, for instance in the 3rd edition of theDiagnostic and Statistical Manual for Mental Disorders (1980). It's true that this overlap in symptoms might itself

reflect a shared underlying cause, but this is difficult to test since it is quite possible to experience similar symptoms due to completely distinct underlying causes. No one would suggest that the flu is somehow linked to pregnancy, yet they can both cause fatigue, headaches and nausea.

I don't mean to merely disparage others' work. Psychological research requires a great deal of time and resources, and no study is perfect. But it crucial to understand how the difficulties of studying this subject with scientific precision can affect conclusions. If the meta-analytic finding that creative people suffer from most types of mood disorder at a heightened rate reflects a true real-world phenomenon, it might indicate that people engaged in creative pursuits are not receiving adequate support and resources to maintain good mental health. If the finding simply reflects our own biases and romantic conceptions of creativity and mood disorders, this needs to be demonstrated with methodologically sound research. In either case, the stereotype that creativity is somehow enhanced by a mood disorder is dangerous, both for those with mood disorders and for those pursuing creativity.

Believing that creativity is due to some underlying, uncontrollable factor reinforces the idea that few people are capable of true creativity, which prevents many from realising their own potential. It also undermines the skill and effort that creative endeavours require, if we can simply chalk it up to the consequence of a disorder. And the connection between mood disorders and creativity influences the very way we view the creative work of others: university students who were told the story of Van Gogh cutting off his ear before they examined his painting Sunflowers (1888) took a more favourable view of it than those who

weren't told the story. Similarly, students priced a piece of artwork higher when a fictitious artist's biography briefly mentioned that he was 'often described as very eccentric'.

This is a dangerous message for those engaged in creative pursuits – and for those creators who do suffer from a mood disorder: it could keep them from seeking treatment if they believe treatment would diminish their creative ability. This is why a meticulous and bias-free examination of creativity and its relation to mood disorders must be taken seriously – and must be held to high scientific standards. It's not an easy task.

Exercise III.

Fill in the gaps.

1) His leadership and results focus will _____ our already strong executive team.

2) Even the President has come under_____ for his slow response to the scandal.

3) Are you a _____ information gatherer with a passion for getting things done?

4) Largely unnoticed by the public, botnets have come to _____ the Internet.

5) Learning to speaking English is a concept that is itself fraught with _____.

6) Roberts'story is long on accusation and _____, but short on facts and logic.

7) Initially pupils have a narrow or _____ view of both science and technology.

8) Any such attempted proof is a transparent _____ that insults our intelligence.

9) Adventurous computer types can use _____ servers to get around the restrictions.

10) The first _____ to a paid online subscriber system is creating and testing one.

Exercise IV.

Make up sentences of your own with the following word combinations: under careful scrutiny, to be taken seriously, to be held to high scientific standards, is due to, to chalk it up to, to cutt off, to price a piece of artwork higher, to suffer from mood disorder, at a heightened rate, to be engaged in creative pursuits

Exercise V.

Match the words to the definitions in the column on the right:

to enhance	deduce or conclude (information) from evidence and reasoning rather than from explicit statements
paragon	cause to become entangled in something
scrutiny	enabling a person to discover or learn something for themselves
tenacious	fill or cover completely, usually with water
enmesh	a natural ability to do something
to inundate	tending to keep a firm hold of something; clinging or adhering closely
heuristic	critical observation or examination
ambiguity	ideal: model of excellence or perfection of a kind;

	one having no equal
aptitude	intensify, increase, or further improve the quality, value, or extent of
to infer	uncertainty or inexactness of meaning in language

Exercise VI.

Identify the part of speech the words belong to. creativity, dangerous, careful, scrutiny, intimate, relationship, terrible, mental, connection, tenacious

Exercise VII.

Match the words to make word combinations:

public	disorder
creative	reason
multi-layered	genius
scientific	pursuits
common	stereotype
intimate	mind
mood	problems
‘mad’	relationship
romantic	scrutiny
careful	belief

Exercise VIII.

Summarize the article "The myth of 'mad' genius"

4. Habits of highly mathematical people

Exercise I.

Say what Russian words help to guess the meaning of the following words: logical, statisticians, result, process, intuitively, situation, actual, code, risk, detail

Exercise II.

Make sure you know the following words and word combinations.

fluidity, to plaque, ambiguity, iota, enticing, rollercoaster

Habits of highly mathematical people

So here is my list. The unambiguous skills that students of mathematics, when properly taught, will practice and that will come in handy in their lives outside of mathematics

A primary skill that mathematicians develop is fluidity with definitions. There's a lot more to this than it sounds at first. What I mean by this is that mathematicians obsess over the best and most useful meaning of every word they use. Mathematicians need logical precision because they work in the realm of things which can be definitively proven or disproven. And if something can be done "definitively," it must necessarily be definable. Let me start with a mathematical example first, one which has some relationship to real life, the word "random." Randomness as a concept has plagued mathematics for much of its recent

history because it's difficult to nail down a precise definition of what it means for an event to be random. Statisticians deal with this conundrum by saying that things can't be random, but rather processes can be random and you can define the probability of an event happening as a result of the process. That was a very brief overview, but it's the foundation for pretty much all of statistics. But it's not the only definition of randomness. Because we intuitively want to say, for example, that flipping a coin and getting 20 heads in a row is "less random" than getting HTHHTHHHTTTHTHHTHHTH. Mathematicians looked at the situation and decided the statistical definition of randomness is not enough, and invented a second definition called Kolmogorov complexity.Very roughly, an event is called "Kolmogorov random" if the shortest computer program that produces the event is as long as the description of the event. (This uses a purely mathematical definition of a "computer" that was invented before actual computers, think of Alan Turing) Colloquially, you can imagine that a Kolmogorov random event requires the description of the event itself to be written out, in full, in the source code of the computer program that produces it. Kolmogorov complexity has grown into a fascinating part of mathematics and computer science, but it's not the end of the story. At the risk of going into too much detail, mathematicians discovered that Kolmogorov complexity could not be calculated for most events. So it's very difficult to apply it to non-theoretical problems. Mathematicians wanted a definition that could describe numbers that look random and are random enough for practical purposes, but in fact are highly non-random in the Kolmogorov sense. The result was the current definition of

cryptographically secure randomness. Still speaking loosely, randomness in the cryptographic sense means that noefficient computer program which tries to distinguish between pseudo-random and truly random events (in the statistical sense) has a significant advantage over a 50/50 guess. This is a guarantee that your numbers are random enough that your enemies won't be able to predict which ones you'll use next, because your enemies are limited to computations that take less time than their lifespan. This is the basis of modern cryptography, and after engineers took the charge, the resulting systems keep our internet communications secure and private. Okay, so mathematicians have spent a lot of time thinking about definitions which, way down the line, affected how we use math in the real world. That's still not an argument in favor of teaching everyone mathematics. How can having everyone think about definitions help them in real life? Now it's time for some realistic examples. The first one comes from Keith Devlin, a mathematician and consultant who was asked to help some US defense agencies improve their intelligence analysis post 9/11. *So what had I done? Nothing really—from my perspective. My task was to find a way of analyzing how* ***context*** *influences data analysis and reasoning in highly complex domains involving military, political, and social contexts. I took the oh-so-obvious (to me) first step. I need to write down as precise a mathematical definition as possible of what a context is. I gave them a common reference point from which they could compare and contrast their own notions. There we had the beginnings of disaster avoidance.*

As a mathematician, Devlin did nothing unusual. In fact, the most common question a mathematician has when encountering a new topic is,

"What exactly do you mean by that word?" And while Devlin's particular example is very specialized, a consultant for defense intelligence, his technique is universal. It's one of the foundations of the wishy-washy term "critical thinking." So now an average citizen who might discard the idea of mathematics is listening to the news and hears a politician say, "We have strong evidence of weapons of mass destruction in Iraq." If they had a good mathematics education they will ask, "What exactly do you mean by strong evidence and weapons of mass destruction?" And, the crucial follow-up question, does the definition provided justify the proposed response, starting a war? If you don't understand the definition you can't make an informed voting decision. (Of course, if you watch the news for entertainment and to be part of a political tribe, the truth is irrelevant). Typical mathematics students begin thinking hard about definitions early in their undergraduate career, and they develop this skill deeper and deeper through a research career. A mathematician typically encounters new definitions daily, on both small and big scales, and fluency in discussing definitions is something that would benefit everyone.

Producing examples and counterexamples. Let's practice our definitions in an informal setting. By "counterexample" I mean an example that shows something is wrong. For example, the number 5 is a counterexample to the claim that 10 is a prime number, because 5 evenly divides 10. Mathematicians spend a lot of time coming up with examples and counterexamples to various claims. This point ties very closely to the previous about definitions in two ways. 1) Often, when coming up with a new definition, one has a set of examples and counterexamples that one wants the definition to adhere to. So examples and counterexamples help

guide one to build good definitions. 2) When encountering a new existing definition, the first thing every mathematician does is write down examples and counterexamples to help them understand it better. However, examples and counterexamples go beyond just thinking about definitions. They help one evaluate and make sense of claims. Anyone who has studied mathematics knows this pattern well, and it goes by the name of “conjecture and proof.” The pattern is as follows. As you’re working on a problem, you study some mathematical object and you write down what you want to prove about that object. This is the conjecture, like an informed (or uninformed) guess about some pattern that governs your object of study. This is followed by the proof, where you try to prove or disprove the claim. As a bad analogy, maybe you conjecture that the Earth is the center of the universe. Then you try to come up with examples of the object that satisfy the claim. You could try to go make some measurements involving the sun and moon and come up with evidence that the claim is false, that actually the Earth revolves around the sun. The difference in mathematics is that the “evidence” is a counterexample and it’s only called such if it’s provable. “Evidence” in mathematics is often just a temporary placeholder until the truth is discovered, though for some high profile math problems mathematicians have found nothing but “evidence,” even after hundreds of years of study. The analogy is also bad because this happens in mathematics on an almost microscopic level. When you’re deep in a project, you’re making new little conjectures every few minutes, and mostly disproving them because you later realize the conjectures were highly uninformed guesses. The counterexamples you find along the way

are like signposts. They guide your future intuition, and once they're deeply ingrained in your head they help you accept or denounce more complicated conjectures and questions with relative ease. If, as a collective modern society, we agree that people are too willing to believe others (say, politicians, media "experts"), then studying mathematics is also a fantastic way to build a healthy sense of skepticism. This is just as useful for engineers as it is for plumbers, nurses, and garbage collectors.

Being wrong often and admitting it Two mathematicians, Isabel and Griffin, are discussing a mathematical claim in front of a blackboard. Isabel thinks the claim is true, and she is arguing with Griffin, who thinks it is false. Ten minutes later they have completely switched sides, and now Isabel thinks it's false while Griffin thinks it's true. I witness scenarios like this all the time, but only in the context of mathematics. The only reason it can happen is because both mathematicians, regardless of who is actually right, is not only willing to accept they're wrong, but eager enough to radically switch sides when they see the potential for a flaw in their argument. Sometimes I will be in a group of four or five people, all discussing a claim, and I'll be the only one who disagrees with the majority. If I provide a good argument, everyone immediately accepts they were wrong without bad feelings. Having to do this so often—foster doubt, be wrong, admit it, and start over—distinguishes mathematical discourse even from much praised scientific discourse. There's just the search for insight and truth.The mathematical habit is putting your personal pride or embarrassment aside for the sake of insight.

Evaluating many possible consequences of a claim. Exploring the limits of a claim is the mathematician's bread and butter. It's one of the

simplest high-level tools one has for evaluating the validity of a claim before going through the details of the argument. Sometimes, the limits of an argument result in an even better and more elegant theorem that includes the origin claim. More often, you simply realize you were wrong. So this habit is a less formal variation on being wrong often, and coming up with counterexamples. **Teasing apart the assumptions underlying a claim.** One perhaps regrettable feature of mathematics is that is fraught with ambiguity. We like to think of math as rigor incarnate. And I would even argue that's a reasonable idea, once the math has been built upon for a hundred or so years. But even so, the process of doing math—of learning existing ideas or inventing new ideas—is more about human to human communication than stone-cold rigor. As such, when someone makes a claim in mathematics (out loud), they're usually phrasing it in a way that they hope will convey the core idea to another human as easily as possible. That usually means they're using words in ways one might not expect, especially if the conversation is between two mathematicians with a shared context and you're an outsider trying to understand. When you face a situation like this in mathematics, you spend a lot of time going back to the basics. You ask questions like, "What do these words mean in this context?" and, "What obvious attempts have already been ruled out, and why?" More deeply, you'd ask, "Why are these particular open questions important?" and, "Where do they see this line of inquiry leading?"

These are the methods a mathematician uses to become informed on a topic. The unifying theme is to isolate each iota of confusion, each assumption underlying a belief or claim. It's decidedly different from the kinds of discourse you see in the world.

Scaling the ladder of abstraction. The last habit is a concept I'm borrowing from Bret Victor. It's the idea that when you're reasoning about a problem, there are many different resolutions at which you can think (he uses "rung"). In Victor's example, if you're designing a car-driving algorithm, you can study it at the finest resolution, where you are writing an algorithm and watching it behave in a single execution.

At a higher level, you can control different parameters of the algorithm (and time) with a slider, elevating one algorithm into a family of algorithms that can be tuned. And you can further generalize which parameters and behaviors are tunable to find a way to search through the space of all possible algorithms. As you go, you're looking for high-level patterns that can help you achieve your end goal, designing a great car-driving algorithm back down at the bottom rung. Mathematicians regularly scale this ladder, particularly in the later stages of graduate school when you need to learn to read a lot of research papers. Here, you don't have time to deeply understand every bit of notation and every claim in every paper (just those papers that are important enough to read in detail). Instead, you develop a ladder of abstraction: the lowest rung is individual definitions and theorems and examples, the next level up is the high-level flow of a paper, next up is a paper in relation to other papers and the broader mathematical context, and above that is the overarching trends in the field, what's considered important and fashionable, etc. You might start at the lowest rung of the ladder, understanding some examples of a definition, then jump up to the main theorem of the paper and understand how its perceived as a huge improvement over previous work. Then maybe you go to the open problem section to see what work is left to do, and if it

seems enticing enough you can prepare yourself to do that by reading the rest of their paper in detail. Indeed, mathematicians have to exercise this ladder-scaling muscle whenever they give a talk on their own work. There are many kinds of audience, each of which can appreciate the content of a mathematical idea at a different resolution. Part of the big struggle of mathematics is synthesizing all of the information in all of these ladder rungs into a coherent world-view that you can personally scale up and down at will. Mathematicians practice it with whatever techniques they can get their hands on.

In the real world, many of these habits are a double-edged sword. Anyone who has gone through an undergraduate math education has known a person (or been that person) to regularly point out that X statement is not precisely true in the very special case of Y that nobody intended to include as part of the discussion in the first place. It takes a lot of social maturity beyond the bare mathematical discourse to understand when this is appropriate and when it's just annoying. Moreover, it usually takes a few years beyond introductory proofs to become comfortable with the "always being wrong" part. It can be a huge turn-off to many students who don't have good role models or other students to talk to who are at the same stage of understanding. Math really is an emotional roller coaster. It's knowing when it matters to hold to these principles that allows one to wield mathematical thinking skills like a chef's knife, safely and efficiently slicing up ideas and arguments into their essential forms.

Adapted from Medium

Exercise III.

Fill in the gaps.

1) There will never be _____ proof that joining the euro would benefit Britain.

2) One of the aspects of his critical personality was its _____ of attention.

3) The correlogram is a commonly used tool for checking _____ in a data set.

4) The ingredients of a mutually beneficial collaboration can be hard to _____.

5) There is no easy way out of resolving this _____, but it must be confronted.

6) However, as hypothesis is molded by experiment, _____ is superseded by fact.

7) Working alone, it would have taken Spence's computer 940 years to find this _____.

8) He does not _____ them as lacking accuracy as you are clearly trying to imply.

9) It's luxury _____, and it's what I'd order if someone else were paying.

10) Hearing the news has sent our emotions on another _____.

Exercise IV.

Make up sentences of your own with the following word combinations: to nail down, to tease apart, to come in handy in one's lives, to obsess over, to nail down, to be random, flipping a coin, getting 20 heads in a row, to be written out, in full

Exercise V.

Match the words to the definitions in the column on the right:

unambiguous	hold and use (a weapon or tool)
randomness	embodied in flesh; in human form
conundrum	the quality of supporting the intended point or claim; soundness or cogency
colloquially	publicly declare to be wrong or evil
conjecture	not open to more than one interpretation
to denounce	the quality of lacking any predictable order or plan
validity	a confusing and difficult problem or question
incarnate	casual conversation, informal, or regional writing, often includes slang expressions.
wield	an opinion or conclusion formed on the basis of incomplete information

Exercise VI.

Identify the part of speech the words belong to: unambiguous, definitions, fluidity, useful, logical, precision, definable, mathematical, randomness, recent

Exercise VII.

Match the words to make word combinations:

precise	program
random	complexity

Kolmogorov	overview
computer	precision
prime	example
brief	number
real	definition
mathematical	event
unambiguous	life
logical	skills

Exercise VIII .

Summarize the article “Habits of highly mathematical people”.

SUPPLEMENTARY READING

Inside the student mental health crisis

A surge in anxiety and stress is sweeping UK campuses. What is troubling students, and is it the universities' job to fix it?

When he started working at Brunel University London 19 years ago, Terry Vass, who is now head of security, recalls that most of his work involved breaking up drunken fights outside the bars and nightclub on campus. Over the two decades he has been in the job, he has noticed a shift. Now, an increasing number of calls are for mental health incidents.

The worst times are at the start of term, when students are adjusting to being away from home, or over the holidays, when the small number who remain on campus may feel lonely and isolated. Increasingly, Vass's security team are called out to mental health emergencies, sometimes accompanying suicidal students to A&E and staying with them. "We spend as much time as it takes," says Vass. On occasion, he has spent six hours with a student in distress.

British universities are experiencing a surge in student anxiety, mental breakdowns and depression. There has been a sharp rise in students dropping out – of the 2015 intake, 26,000 left in their first year, an increase for the third year running – and an alarming number of suicides. In the 12 months ending July 2017, the rate of suicide for university students in England and Wales was 4.7 deaths per 100,000 students, which equates to 95 suicides or about one death every four days.

The crisis in student mental health hit the news in 2017 after a high number ofsuicides at Bristol University. Over 18 months, starting in October 2016, 12 students are believed to have killed themselves. While the university tried to tackle the crisis, it struggled to keep up with the rising demand for help. In November 2018, a group of students gathered on a chilly Bristol street holding placards demanding better access to psychological support. The students told reporters that despite promises of more investment in student wellbeing, services were still badly overstretched.

Ruth Day, who helped organise the protest, had been suspended for eight weeks under a rule which says students can be sent home if they are considered unfit to study, or their presence poses a risk to themselves or others. Day said being suspended made her feel "terrified" and "hopeless". Just a few months earlier, in April 2018, Natasha Abrahart, a 20-year-old physics student at Bristol who suffered from severe anxiety, killed herself on the day she was due to have an oral assessment. Her parents said they would take legal action against the university for failing to offer Natasha an alternative to the oral test, which she saw as an unbearable ordeal.

Students around the country feel their universities are failing them. On World Mental Health Day in October 2018, students at University College London disrupted an open day with a demonstration about waiting times for counselling. In March this year, Goldsmiths students occupied Deptford town hall, calling for better access to counselling for BAME students. Student protests and demands for better mental

health services are frequently dismissed in the press. “We just can’t cope with essay deadlines, and tests stress us out, moan ‘snowflake’ students,” read a headline in the Daily Mail in November 2017. In September 2018, the Times described today’s students as “Generation Snowflake” and suggested that “helicopter parents” had “coddled the minds” of young people. Meanwhile, some university staff worry that teaching is having to come second to supporting students’ emotional needs.

“One of the most worrying phenomena that many of us have witnessed in recent years is the rise of chronic anxiety, that afflicts some students so deeply that they feel unable to come to the campus at all,” says William Davies, lecturer at Goldsmiths and author of The Happiness Industry, a book about the commercialisation of wellbeing. “Above all, a growing proportion just seem terrified of failure, and experience the whole process of learning and assessment as an unforgiving ordeal that offers no room for creativity or mistakes.”

Given that about half of young people in the UK now go to university, the number of students seeking help inevitably reflects a wider crisis in young people’s mental health. One study found that six times more young people in England (aged four to 24) have psychological problems today than a generation ago, in 1995. Budget cuts to social work, youth services, the NHS and state schools over the last decade mean that many young people experiencing problems do not get any help at all before they reach university, where they meet a new set of challenges.

“Universities are just a reflection of what goes on in the whole society,” says Irene Stone, a counsellor at Brunel University. “There are a lot of demands on young people today. The pressure is shifting on how we work – now we don’t just have one job, we juggle three. There are pressures of technology, managing social platforms, forming relationships. It can all cause a lot of anxiety and stress.”

The University of the West of England, Bristol, recently released a report into the deaths of the 14 students who took their own lives there between 2010 and 2018. It found that half of the suicides occurred between January and April, when students were preparing for exams.

In the drive to make universities profitable, there is a fundamental confusion about what they are for. As a result, there has been a shift from prizing learning as an end in itself to equipping graduates for the job market, in what for some can be a joyless environment.

Expectations have changed radically over the last two decades – not least because students paying thousands of pounds in fees expect a certain level of service in return. I spoke to academics around the country who expressed their own anxiety that they might miss a vital sign that one of their students is struggling. “It’s extremely stressful to have this extra responsibility that we aren’t really equipped for, especially when many of us are already operating in an atmosphere of uncertain working conditions,” said one academic.

Of course, universities have a duty of care to their students, but as the situation stands, we are expecting them to fill the role of parent and therapist as well as educator. These are institutions under terrible strain, striving to adapt to new

demands. The question is not only whether they can fix the crisis in young people's mental health, but whether it is their job to do so.

Ever since Tony Blair pledged in 1999 to get 50% of young people into university, "widening participation" has been a political priority. It has more or less been achieved: in 2017, official figures showed that 49% of people in England entered advanced studies by the age of 30. University degrees have become a requirement for many jobs which previously allowed people to start as school-leavers and work their way up.

At the same time as access to university was dramatically expanded, spending on public services was slashed: in the decade after the financial crash, day-to-day spending on public services as a share of GDP was at its lowest since the late 1930s. This meant savage cuts to local authorities, schools budgets and NHS mental health provision. Figures released in November 2017 showed that two-thirds of under-18s referred for specialist mental healthcare in England were not receiving treatment, while there had been a 30% fall in hospital beds available for acute mental health conditions since 2009.

In search of a cause for the dramatic increase in mental health problems among young people, studies have looked at the impact of social media, or lack of sleep caused by electronic devices, as well as the effects of an uncertain job market, personal debt and constricted public services. In his book Kids These Days: The Making of Millennials, Malcolm Harris argues that far from the stereotype of young people being entitled and narcissistic, millennials are harder working but poorer than their parents' generation. Harris identifies the pressures of the labour market, rising student debt and a target-driven culture as contributing to steep increases in anxiety and depression among young people. "Young people feel – reasonably accurately – less in control of their lives than ever before," he writes.

With about half of 18-year-olds now going to university, inevitably that population will follow the same patterns as the rest of society. "And some of their cases are very complex," says Steve West, vice-chancellor of the University of the West of England and chair of the mental health working group for Universities UK (UUK), the steering body for British universities.

The Office for National Statistics produced a report on England and Wales last year which found that in the past, students were less likely than the general population to commit suicide, and that the recent spike had merely brought them more in line with the rest of the population aged under 24. If universities once provided a respite from the pressures of the world of work, they no longer do. Now they compete with one another for students and the hefty fees they pay.

In 1998, universal free higher education ended: fees of £1,000 per year were introduced, and maintenance grants were replaced with loans to be paid back when the student started earning more than £10,000 a year. Since then, costs have risen. In 2006, fees were raised to £3,000 a year. In 2012, this went up to £9,000. In 2017, the cap went up to £9,250, and is expected to keep rising. The average student now leaves university with about £50,000 of debt.

“Driving our universities to act like businesses doesn’t just cannibalise the joy of learning and the social utility of research and teaching; it also makes us ill,” wrote Mark Crawford, then a postgraduate student union officer at UCL, in a 2018 piece for Red Pepper magazine. When I spoke to Crawford, he reeled off a list of ways in which university, as it is structured, can worsen student mental health. “It’s self-worth being reduced to academic outcomes, support services being cut, the massive cost of housing,” he says.

When Crawford was working for the UCL student union – from 2016 to 2018 – it launched a petition for the university to improve mental health services, which got 2,000 signatures within a week. The campaign drew a direct link between the university’s large overall budgets and its low spending on mental health services. “Universities enact policies and a structure of learning that encourages poor mental health among students while at the same time underfunding services that could offset the consequences,” Crawford told me. After the students’ campaign, UCL agreed to hire three more counsellors.

But the problems cannot all be solved with more counsellors. William Leahy, Brunel’s deputy vice-chancellor, has been closely involved in his university’s efforts to improve mental health support. He points out that starting university might be the first time many students access any kind of psychological help. “We have seen unbelievable underfunding of secondary schools over many years – and not just schools but social services, youth clubs, all those services that used to be preventative, they’ve all gone.” This places an extra burden on universities to take on the responsibilities of the health or social services.

Successive prime ministers have urged more young people to go to university, with the promise of a better job at the end of it. But given the sluggish state of the economy since the 2008 crash, and the scarcity of graduate-level jobs, the connection is hardly clear. “The context of stagnating job markets can make university seem like a three-year job application,” says Crawford.

Many lecturers I spoke to noted that their students place intense pressure on themselves to get a first-class degree or to take on extra commitments so that they can stand out from the crowd. Some can’t keep it up. Dropout rates have increased every year since 2015, with high fees and lack of support for disadvantaged or troubled students cited as two possible reasons. At the worst affected universities one in five students drop out before the end of their first year.

“Clearly university and essay writing have always produced stress, but I do think something new has appeared since the fees and debt rose so sharply, which raise the stakes to a whole new level,” says Davies, the Goldsmiths lecturer. “Very few students respond to this as the government would like – as demanding consumers – and a large number simply shrink from the situation, or drop out altogether.”

Brunel University, on the outer edge of west London, is one institution where the shockwaves of government policy are felt. Built in the 1960s, it has been subject to all the drastic changes the university sector has undergone, but is not part of the elite Russell Group, so its student intake tends to be from a broader range of

backgrounds, some with complex needs. Like other universities, it is struggling to deal with increasing mental health problems among students, and in the last few years it has been forced to rethink its mental health provisions, making it easier to access counselling and mentoring, and training lecturers and other staff in mental health first aid. When Sean Cullen started at Brunel in 2014, he knew that he would need support: a serious motorcycle accident during his gap year meant that he could not walk. Before moving on to Brunel's campus, he discussed wheelchair access with the university. "I was incredibly pleased," he told me when we met at a bustling coffee shop on campus. "They had everything in place, so I didn't need to worry." He settled into university life, but the same day-to-day pressures that affected most of his peers – deadlines and money management – began to feel overwhelming.

"It was a combination of lots of different things at once," he recalls. "Stress of studying, worry about the future. I found myself constantly feeling like I should be doing something, but the thought of doing any of those things made me stay doing nothing." He tried to access the university counselling service, which at that point was run on a drop-in basis, so he could not make an appointment. There was a long queue and he wasn't seen. In the end, despairing of seeing a counsellor face to face, he sought support from an online forum.

"Student terms are quite short," says Lesley O'Keeffe, deputy director of academic and student services at Brunel. "If you've got a four- or five-week waiting list, it might not sound very long, but that's half a term. The amount of living they can lose in that time is quite significant."

Cullen, now 24, was struck by the contrast in the care he had received for his physical and mental health. "You can see physical disabilities, so it's a lot easier to fix the symptoms. You're in a wheelchair, you can't climb stairs, so we'll provide a lift: job done," he says. "But if you've got anxiety and are struggling to go to classes – well, there's no short answer."

A greater number of young people arriving with more complex home situations, who have not managed to get help in the NHS, means that universities are facing a perfect storm. Joyce (not her real name) is 25, a second-year undergraduate student at Brunel. She is studying a science subject, which she likes partly because of the order it represents. "In life, you come across problems you can't find a solution for, but when it comes to numbers and data, you normally always find a solution," she told me when we met at Brunel on a snowy day in January.

In her own life, she has often experienced problems with no solution. Joyce, who grew up in London, had an abusive childhood, and is now completely estranged from her family. Undergraduate living has been challenging for her. At first, she moved on to campus, but found it intensely stressful living in halls, in close quarters to people in relationships, couples fighting, flatmates bickering – all the complications of cohabiting. "My adult brain had to deal with the childhood stuff that it had locked away," she says.

Now she rents privately in the area. Her living costs are not covered by her termly maintenance loans, so she works several different part time jobs on zero-hours

contracts. Added to the daily stress of exams and deadlines, this is a gruelling schedule. “At the moment, all I do is study and work,” she says.

Brunel, like most universities, has a range of social activities – from club nights to prayer groups. But over the last couple of years, Cullen and the rest of the student union staff have noticed a fall in participation. It’s getting harder to fill up events, most likely a symptom of the sharp increase in students living far away from campus to save money – over 50% of the student body now commute. Many opt to live with their parents, as much as two or three hours’ drive away, to save money. Others have limited time as they juggle studies with paid work. It is another sign of the pressure weighing on students that they allow themselves less time for fun.

Over the last two years, many universities have taken steps to reduce waiting time for counselling, launched courses on managing stress and anxiety, made support services easier to access, and tried to make students more aware of what is available – although Steve West at UUK acknowledges efforts are “variable”. Some, including Birmingham University and the London School of Economics, did not have a procedure for dealing with students’ mental health problems as late as last year. Some universities are increasing funding for wellbeing and counselling services: at Bristol, spending doubled from 2016 to 2017.

Counselling may be helpful for many people, but it can’t address the stresses built into university life, which can compound mental health problems or create new ones. For Cullen, money worries have been a grinding and ever-present aspect of his university experience. In addition to the £9,000 in tuition fee loans, he has received between £7,000 and £8,000 each year in maintenance loans for living costs. Generally, this just about covers the cost of rent, leaving little to live on. “You learn fast as a student what’s the bare minimum you can get away with,” he says. In his first year, he socialised more than he does now. But given that a single night out costs as much as a weekly food shop, he soon began to think twice about going out with friends. To complicate matters, the amount he receives from Student Finance England, the body responsible for student loans, changed year by year, with unpredictable amounts and repayment terms. “The financial aid is getting worse and worse, even though the cost of living is going up,” he says.

In 2017, Cullen was elected as the student union’s disability officer. As well as advocating for disabled students, this meant helping with the union’s Advice and Representation Centre, where students can come for advice on housing, mental health and academic or financial problems. He heard accounts of mental health problems from hundreds of other students, many of whose experiences chimed with his own. “I’ve not yet met a student that hasn’t experienced high levels of stress while studying, whether it’s because of deadlines, balancing paid work, or problems with housing,” he says.

While many students survive more or less on their overdrafts, Cullen has noticed that many have mental health problems in their final year. “Nowadays, getting a degree doesn’t necessarily guarantee you a job, or not a better job than without one,” he says.

According to a 2014 report, a significant number of students(45%) do paid part-time work alongside their studies, with 13% doing a 35-hour week. Inevitably, this has an impact not only on academic performance but on students' ability to fully participate in university life. "We sometimes get students coming to lectures having just done a night shift, and we can see they're tired and might not be in the best frame of mind to be learning," says Michael Thomas, a lecturer in social work at Brunel. Students exhausted from working while studying full time, and still struggling to cover their basic living costs, are bound to be more anxious about deadlines and exams. "It's all the environmental stuff that makes it more stressful," says Thomas. "If you're tired, you haven't had time to study, you have to make a long journey to university, it's all cumulative."

Some of the more attention-grabbing measures that universities have introduced do nothing to address these fundamental questions. This year Bristol University introduced a course in the science of happiness, a unit that, alongside lectures, will include happiness "exercises" to be practised for a week at a time, such as sleeping more, meditation, savouring enjoyment and performing random acts of kindness. It can count towards a degree. In the past few years, Cambridge, Brunel, London Metropolitan and Warwick, among many others, have organised "therapy pets" for exam periods – dogs, cats and guinea pigs that students can pet to ease their stress. To augment overstretched counselling services, many universities run free yoga or mindfulness courses.

"Often these measures are being done instead of properly funding mental health services," says Crawford, the former UCL student. "Universities are competing for students. Therapy dogs look nice and are cost-effective. It's insulting." Even if they are helpful for some people, such measures can only provide short-term relief, as Leahy, the Brunel deputy vice-chancellor, acknowledges. "In one sense, the system inherently pressurises people, while at the same time you're saying, 'chill out, relax, it's all fine'."

After the rise in suicides, in 2017 a national strategy was launched by UUK, giving out new guidelines to help universities improve the way they handle mental health. The guidance gave a boost to work that was already being done at Brunel. While two years earlier Cullen had found the system hard to navigate and slow, the process had been improved. "Our waiting lists are better, students can see the right person quicker, or multiple people if that's what they need," says O'Keeffe.

While Brunel has made a concerted effort to invest in student mental health services and reduce waiting times, across the UK this is patchy. Former health minister and mental health campaigner Norman Lamb recently gathered information from 110 universities, and found that many do not even record their counselling waiting lists or budgets for support services. He told the BBC: "If we are operating in a fog, if we have no idea how long students are waiting ... this is putting students at risk. We know from the data that the longest waiting times could be over half a term for some students. We know also that there have been some tragedies among some

student populations – students who have taken their own lives. If that happens while they are waiting for support, that's utterly intolerable."

When Leah (not her real name) started at Brunel in autumn 2018, she thought carefully about disclosing her history of bipolar disorder and anxiety. She was in her mid-30s and had spent much of the previous decade in and out of hospital. She had been sectioned more than once. Brunel, where she is studying for a postgraduate degree, was going to be a new start. "I don't want to deal with other people's prejudices as well," she told me when we met in a quiet room on Brunel's campus. "I'd rather just be accepted for who I am." This is not an uncommon dilemma: a key part of the new strategy is for universities to encourage students to disclose that they have a problem. Teachers and staff I interviewed said many of their students worry that telling the university about their condition might adversely affect their degree result. Leah, who rents a flat some distance from the campus, doesn't talk to her peers about her condition, but she did disclose it to the university. When she started at Brunel, the new strategy for dealing with mental health had been in action for a year, and things went smoothly. She was set up with a counsellor and a mentor, who helps her manage her time and offers practical advice.

A few weeks after starting, Leah found herself sitting in the library, completely overwhelmed. Her mind was whirring: had she expected too much of herself by coming back to university? Should she quit? How would she bear the shame of telling her friends and family she couldn't manage it? She spoke to her mentor, and in a very short space of time they had helped her to switch to a part-time master's, meaning that her course would be spread over two years rather than completed in one. That also meant she could get a part-time job.

Leah's problems first surfaced when she first went to university. She was younger then, and less sure about what help she needed or was entitled to. "It's one thing needing the support, and another being aware that you need it," she says. Although graduating was a triumph, the following eight years were often harrowing, with Leah in and out of hospital as she struggled to manage her condition.

Having decided to return to university, Leah was anxious about how she would cope with the stress – she likes to keep busy, but stress can trigger manic episodes. But she has been pleasantly surprised. It has actually been easier to access certain kinds of support than it was outside university. "There's a lot of cuts in the community, and I've been on a waiting list for NHS counselling for years now," she says. At Brunel, she sees a counsellor regularly.

When communication between university and health service works, it can provide valuable support. Leah is still supported by a mental health crisis team in her borough. The university is in touch with the team and can inform them if they have concerns about Leah, and vice versa. "No matter how well put together I am, that vulnerability is still there," she says. "But I have a safety net to catch me if anything does go wrong."

Everyone I spoke to in university administration around the country viewed mental health support as part of their duty to students, but they are struggling to meet

the need. “We’re not residential care and we don’t have live-in staff,” says O’Keeffe at Brunel. “Sometimes there’s an expectation, even by our local services, that we can do more than we can do. We’re not here to give medical treatment or take the place of the NHS. Our aim is to get everyone to achieve the best they can. Everyone here at some point wanted to get a degree. If that desire is still in them, that’s what we try and work with them for.”

Yet even as university mental health provisions slowly improve, the particular stress of university life continues. “At the end of the day, it doesn’t matter what a counsellor says to you if you can’t afford to pay your rent,” says Crawford. “The way universities currently operate is manufacturing conditions that create poor mental health. So at the very least, they should invest some resources so that everyone can be seen and supported.”

Adapted from the Guardian

The Digital Ruins of a Forgotten Future

Second Life was supposed to be the future of the internet, but then Facebook came along. Yet many people still spend hours each day inhabiting this virtual realm. Their stories—and the world they’ve built—illuminate the promise and limitations of online life.

Gidge Uriza lives in an elegant wooden house with large glass windows overlooking a glittering creek, fringed by weeping willows and meadows twinkling with fireflies. She keeps buying new swimming pools because she keeps falling in love with different ones. The current specimen is a teal lozenge with a waterfall cascading from its archway of stones. Gidge spends her days lounging in a swimsuit on her poolside patio, or else tucked under a lacy comforter, wearing nothing but a bra and bathrobe, with a chocolate-glazed donut perched on the pile of books beside her. “Good morning girls,” she writes on her blog one day. “I’m slow moving, trying to get out of bed this morning, but when I’m surrounded by my pretty pink bed it’s difficult to get out and away like I should.” In another life, the one most people would call “real,” Gidge Uriza is Bridgette McNeal, an Atlanta mother who works eight-hour days at a call center and is raising a 14-year-old son, a 7-year-old daughter, and severely autistic twins, now 13. Her days are full of the selflessness and endless mundanity of raising children with special needs: giving her twins baths after they have soiled themselves (they still wear diapers, and most likely always will), baking applesauce bread with one to calm him down after a tantrum, asking the other to stop playing “the Barney theme song slowed down to sound like some demonic dirge.” One day, she takes all four kids to a nature center for an idyllic afternoon that gets interrupted by the reality of changing an adolescent’s diaper in a musty bathroom. But each morning, before all that—before getting the kids ready for school and putting in eight hours at the call center, before getting dinner on the table or keeping peace during the meal, before giving baths and collapsing into bed—Bridgette spends an hour and a half on the online platform Second Life, where she lives in a sleek paradise of her own devising. Good morning girls. I’m slow moving,

trying to get out of bed this morning. She wakes up at 5:30 to inhabit a life in which she has the luxury of never getting out of bed at all.

What is Second Life? The short answer is that it's a virtual world that launched in 2003 and was hailed by some as the future of the internet. The longer answer is that it's a landscape full of goth cities and preciously tattered beach shanties, vampire castles and tropical islands and rainforest temples and dinosaur stomping grounds, disco-ball-glittering nightclubs and trippy giant chess games. In 2013, in honor of Second Life's tenth birthday, Linden Lab—the company that created it—released an infographic charting its progress: 36 million accounts had been created, and their users had spent 217,266 cumulative years online, inhabiting an ever-expanding territory that comprised almost 700 square miles. Many are tempted to call Second Life a game, but two years after its launch, Linden Lab circulated a memo to employees insisting that no one refer to it as that. It was a platform. This was meant to suggest something more holistic, more immersive, and more encompassing.

Second Life has no specific goals. Its vast landscape consists entirely of user-generated content, which means that everything you see has been built by someone else—an avatar controlled by a live human user. These avatars build and buy homes, form friendships, hook up, get married, and make money. They celebrate their "rez day," the online equivalent of a birthday: the anniversary of the day they joined. At church, they cannot take physical communion—the corporeality of that ritual is impossible—but they can bring the stories of their faith to life. At their cathedral on Epiphany Island, the Anglicans of Second Life summon rolling thunder on Good Friday, or a sudden sunrise at the moment in the Easter service when the pastor pronounces, "He is risen." As one Second Life handbook puts it: "From your point of view, SL works as if you were a god."

In truth, in the years since its peak in the mid-2000s, Second Life has become something more like a magnet for mockery. When I told friends that I was working on a story about it, their faces almost always followed the same trajectory of reactions: a blank expression, a brief flash of recognition, and then a mildly bemused look. Is that still around? Second Life is no longer the thing you joke about; it's the thing you haven't bothered to joke about for years.

Many observers expected monthly user numbers to keep rising after they hit 1 million in 2007, but instead they peaked—and have, in the years since, stalled at about 800,000. An estimated 20 to 30 percent are first-time users who never return. Just a few years after declaring Second Life the future of the internet, the tech world moved on. As a 2011 piece in Slate proclaimed, joining a chorus of disenchantment: "Looking back, the future didn't last long."

But if Second Life promised a future in which people would spend hours each day inhabiting their online identity, haven't we found ourselves inside it? Only it's come to pass on Facebook, Instagram, and Twitter instead. As I learned more about Second Life, and spent more time exploring it, it started to seem less like an obsolete relic and more like a distorted mirror reflecting the world many of us live in.

Perhaps Second Life inspires an urge to ridicule not because it's unrecognizable, but because it takes a recognizable impulse and carries it past the bounds of comfort, into a kind of uncanny valley: not just the promise of an online voice, but an online body; not just checking Twitter on your phone, but forgetting to eat because you're dancing at an online club; not just a curated version of your real life, but a separate existence entirely. It crystallizes the simultaneous siren call and shame of wanting an alternate life. It raises questions about where unfettered fantasy leads, as well as about how we navigate the boundary between the virtual and the real.

As virtual-reality technology grows more advanced, it promises to deliver a more fully realized version of what many believed Second Life would offer: total immersion in another world. And as our actual world keeps delivering weekly horrors —another mass shooting, another hurricane, another tweet from the president threatening nuclear war—the appeal of that alternate world keeps deepening, along with our doubts about what it means to find ourselves drawn to it.

From 2004 to 2007, an anthropologist named Tom Boellstorff inhabited Second Life as an embedded ethnographer, naming his avatar Tom Bukowski and building himself a home and office called Ethnographia. His immersive approach was anchored by the premise that the world of Second Life is just as "real" as any other, and that he was justified in studying Second Life on "its own terms" rather than feeling obligated to understand people's virtual identities primarily in terms of their offline lives. His book Coming of Age in Second Life, titled in homage to Margaret Mead's classic, documents the texture of the platform's digital culture. He finds that making "small talk about lag [streaming delays in SL] is like talking about the weather in RL," and interviews an avatar named Wendy, whose creator always makes her go to sleep before she logs out. "So the actual world is Wendy's dream, until she wakes up again in Second Life?," Boellstorff recalls asking her, and then: "I could have sworn a smile passed across Wendy's … face as she said, 'Yup. Indeed.' "

In Hinduism, the concept of an avatar refers to the incarnation of a deity on Earth, among mortals. In Second Life, it's your body—an ongoing act of self-expression. One woman described her avatar to Boellstorff like this: "If I take a zipper and pull her out of me, that's who I am." Female avatars tend to be thin and impossibly busty; male avatars are young and muscular; almost all avatars are vaguely cartoonish in their beauty. These avatars communicate through chat windows, or by using voice technology to actually speak with one another. They move by walking, flying, teleporting, and clicking on "poseballs," literal floating orbs that animate avatars into various actions: dancing, karate, pretty much every act you can imagine. The local currency in Second Life is the Linden Dollar, and recent exchange rates put the Linden at just less than half a cent. In the 10 years following its launch, Second Life users spent $3.2 billion of real money on in-world transactions. The first Second Life millionaire, a digital-real-estate tycoon who goes by Anshe Chung, graced the cover of Businessweek in 2006, and by 2007, the GDP of Second Life was larger than that of several small countries. In the vast digital Marketplace, you can buy a wedding gown for 4,000 Lindens (just over $16) or a

ruby-colored corset with fur wings for just under 350 Lindens (about $1.50). You can even buy another body entirely: different skin, different hair, a pair of horns, genitalia of all shapes and sizes. A private island currently costs almost 150,000 Lindens (the price is fixed at $600), while the Millennium II Super Yacht costs 20,000 Lindens (just over $80) and comes with more than 300 animations attached to its beds and trio of hot tubs, designed to allow avatars to enact a vast range of fantasies.

The number of Second Life users peaked just as Facebook started to explode. The rise of Facebook wasn't the problem of a competing brand so much as the problem of a competing model: It seemed that people wanted a curated version of real life more than they wanted another life entirely—that they wanted to become their most flattering profile picture more than they wanted to become a wholly separate avatar. But maybe Facebook and Second Life aren't so different in their appeal. Both find traction in the allure of inhabiting a selective self, whether built from the materials of lived experience (camping-trip photos and witty observations about brunch) or from the impossibilities that lived experience precludes: an ideal body, an ideal romance, an ideal home.

Bridgette McNeal, the Atlanta mother of four, has been on Second Life for just over a decade. She named her avatar Gidge after what bullies called her in high school. While Bridgette is middle-aged, her avatar is a lithe 20-something whom she describes as "perfect me—if I'd never eaten sugar or had children." During her early days on Second Life, Bridgette's husband created an avatar as well, and the two of them would go on Second Life dates together, a blond Amazon and a squat silver robot, while sitting at their laptops in their study at home. It was often the only way they could go on dates, because their kids' special needs made finding babysitters difficult. When we spoke, Bridgette described her Second Life home as a refuge that grants permission. "When I step into that space, I'm afforded the luxury of being selfish." She invoked Virginia Woolf: "It's like a room of my own." Her virtual home is full of objects she could never keep in her real home because her kids might break or eat them—jewelry on dishes, knickknacks on tables, makeup on the counter.

In addition to the blog that documents her digital existence, with its marble pools and frilly, spearmint-green bikinis, Bridgette keeps a blog devoted to her daily life as a parent. It's honest and hilarious and full of heartbreaking candor. Recounting the afternoon spent with her kids at the nature center, she describes looking at a bald eagle: "Some asshole shot this bald eagle with an arrow. He lost most of one wing because of it and can't fly. He's kept safe here at this retreat we visited a few days ago. Sometimes I think the husband and I feel a little bit like him. Trapped. Nothing really wrong, we've got food and shelter and what we need. But we are trapped for the rest of our lives by autism. We'll never be free." When I asked Bridgette about the allure of Second Life, she said it can be easy to succumb to the temptation to pour yourself into it when you should be tending to real life. I asked whether she had ever slipped close to that, and she said she'd certainly felt the pull at times. "You're thin and beautiful. No one's asking you to change a diaper," she told me. "But you can

burn out on that. You don't want to leave, but you don't want to do it anymore, either."

Second Life was invented by a man named Philip Rosedale, the son of a U.S. Navy carrier pilot and an English teacher. As a boy, he was driven by an outsize sense of ambition. He can remember standing near the woodpile in his family's backyard and thinking, "Why am I here, and how am I different from everybody else?" As a teenager in the mid-'80s, he used an early-model PC to zoom in on a graphic representation of a Mandelbrot set, an infinitely recursive fractal image that just kept getting more and more detailed as he got closer and closer. At a certain point, he told me, he realized he was looking at a graphic larger than the Earth: "We could walk along the surface our whole lives, and never even begin to see everything." That's when he realized that "the coolest thing you could do with a computer would be to build a world." n 1999, just as Rosedale was starting Linden Lab, he attended Burning Man, the annual festival of performance art, sculptural installations, and hallucinogenic hedonism in the middle of the Nevada desert. While he was there, he told me, something "inexplicable" happened to his personality. "You feel like you're high, without any drugs or anything. You just feel connected to people in a way that you don't normally." He went to a rave in an Airstream trailer, watched trapeze artists swing across the desert, and lay in a hookah lounge piled with hundreds of Persian rugs. Burning Man didn't give Rosedale the idea for Second Life —he'd been imagining a digital world for years—but it helped him understand the energy he wanted to summon: a place where people could make the world whatever they wanted it to be. This was the dream, but it was a hard sell for early investors. Linden Lab was proposing a world built by amateurs, and sustained by a different kind of revenue model—based not on paid subscriptions, but on commerce generated in-world. One of Second Life's designers recalled investors' skepticism: "Creativity was supposed to be a dark art that only Spielberg and Lucas could do." As part of selling Second Life as a world, rather than a game, Linden Lab hired a writer to work as an "embedded journalist." This was Wagner James Au, who ended up chronicling the early years of Second Life on a blog (still running) called "New World Notes," and then, after his employment with Linden Lab ended, in a book called The Making of Second Life. In the book, Au profiles some of Second Life's most important early builders: an avatar named Spider Mandala (who was managing a Midwestern gas station offline) and another named Catherine Omega, who was a "punky brunette … with a utility belt" in Second Life, but offline was squatting in a condemned apartment building in Vancouver, a building that had no running water and was populated mainly by addicts, where she used a soup can to catch a wireless signal from nearby office buildings so she could run Second Life on her laptop. Rosedale told me about the thrill of those early days, when Second Life's potential felt unbridled. No one else was doing what he and his team were doing, he remembered: "We used to say that our only competition was real life." He said there was a period in 2007 when more than 500 articles a day were written about Linden Lab's work. Rosedale loved to explore Second Life as an avatar named Philip Linden. "I was like

a god," he told me. He envisioned a future in which his grandchildren would see the real world as a kind of "museum or theater," while most work and relationships happened in virtual realms like Second Life. "In some sense," he told Au in 2007, "I think we will see the entire physical world as being kind of left behind."

Alice Krueger first started noticing the symptoms of her illness when she was 20 years old. During fieldwork for a college biology class, crouching down to watch bugs eating leaves, she felt overwhelmed by heat. Standing in the grocery store, she noticed that it felt as if her entire left leg had disappeared—not just gone numb, but disappeared. Whenever she went to a doctor, she was told it was all in her head. "And it was all in my head," she told me, 47 years later. "But in a different way than how they meant."

Alice was finally diagnosed with multiple sclerosis at the age of 50. By then she could barely walk. Her neighborhood association in Colorado prohibited her from building a ramp at the front of her house, so it was difficult for her to go anywhere. Her three children were 11, 13, and 15. She didn't get to see her younger son's high-school graduation, or his college campus. She started suffering intense pain in her lower back and eventually had to have surgery to repair spinal vertebrae that had fused together, then ended up getting multidrug-resistant staph from her time in the hospital. Her pain persisted, and she was diagnosed with a misalignment caused by the surgery itself, during which she had been suspended "like a rotisserie chicken" above the operating table. At the age of 57, Alice found herself housebound and unemployed, often in excruciating pain, largely cared for by her daughter. "I was looking at my four walls," she told me, "and wondering if there could be more." That's when she found Second Life. She created an avatar named Gentle Heron, and loved seeking out waterslides—excited by the sheer thrill of doing what her body could not. As she kept exploring, she started inviting people she'd met online in disability chat rooms to join her. But that also meant she started to feel responsible for their experience, and eventually she founded a "cross-disability virtual community" in Second Life, now known as Virtual Ability, a group that occupies an archipelago of virtual islands and welcomes people with a wide range of disabilities —everything from Down syndrome to PTSD to manic depression. What unites its members, Alice told me, is their sense of not being fully included in the world. While she was starting Virtual Ability, Alice also embarked on a real-life move: to the Smoky Mountains in Tennessee from Colorado, where she'd outlived her long-term disability benefits. ("I didn't know you could do that," I told her, and she replied, "Neither did I!") When I asked her whether she felt like a different version of herself in Second Life, she rejected the proposition strenuously. Alice doesn't particularly like the terms real and virtual. To her, they imply a hierarchical distinction, suggesting that one part of her life is more "real" than the other, when her sense of self feels fully expressed in both. After our first conversation, she sent me 15 peer-reviewed scientific articles about digital avatars and embodiment. She doesn't want Second Life misunderstood as a trivial diversion. Alice told me about a man with Down syndrome who has become an important member of the Virtual Ability

community. In real life, his disability is omnipresent, but on Second Life people can talk to him without even realizing he has Down's. In the offline world, he lives with his parents—who were surprised to see he was capable of controlling his own avatar. After they eat dinner each night, as his parents are washing the dishes, he sits expectantly by the computer, waiting to return to Second Life, where he rents a duplex on an island called Cape Heron, part of the Virtual Ability archipelago. He has turned the entire upper level into a massive aquarium, so he can walk among the fish, and the lower level into a garden, where he keeps a pet reindeer and feeds it Cheerios. Alice says he doesn't draw a firm boundary between Second Life and "reality," and others in the community have been inspired by his approach, citing him when they talk about collapsing the border in their own minds.

When I initially envisioned writing this essay, I imagined falling under the thrall of Second Life: a wide-eyed observer seduced by the culture she had been dispatched to analyze. But being "in world" made me queasy from the start. I had pictured myself defending Second Life against the ways it had been dismissed as little more than a consolation prize for when "first life" doesn't quite deliver. But instead I found myself wanting to write, Second Life makes me want to take a shower. Intellectually, my respect deepened by the day, when I learned about a Middle Eastern woman who could move through the world of Second Life without a hijab, and when I talked with a legally blind woman whose avatar has a rooftop balcony and who could see the view from it (thanks to screen magnification) more clearly than the world beyond her screen. I heard about a veteran with PTSD who gave biweekly Italian cooking classes in an open-air gazebo, and I visited an online version of Yosemite created by a woman who had joined Second Life in the wake of several severe depressive episodes and hospitalizations. She uses an avatar named Jadyn Firehawk and spends up to 12 hours a day on Second Life, many of them devoted to refining her bespoke wonderland—full of waterfalls, sequoias, and horses named after important people in John Muir's life—grateful that Second Life doesn't ask her to inhabit an identity entirely contoured by her illness, unlike internet chat rooms focused on bipolar disorder that are all about being sick. "I live a well-rounded life on SL," she told me. "It feeds all my other selves."

But despite my growing appreciation, and my fantasies of enchantment, a certain visceral distaste for Second Life endured—for the emptiness of its graphics, its nightclubs and mansions and pools and castles, their refusal of all the grit and imperfection that make the world feel like the world. Whenever I tried to describe Second Life, I found it nearly impossible—or at least impossible to make interesting—because description finds its traction in flaws and fissures, and exploring the world of Second Life was more like moving through postcards. Second Life was a world of visual clichés. Nothing was ragged or broken or dilapidated—or if it was dilapidated, it was because that particular aesthetic had been chosen from a series of prefab choices. Of course, my aversion to Second Life—as well as my embrace of flaw and imperfection in the physical world—testified to my own good fortune as much as anything. When I move through the real world, I am buffered by my (relative) youth,

my (relative) health, and my (relative) freedom. Who am I to begrudge those who have found in the reaches of Second Life what they couldn't find offline?

One day when Alice and I met up as avatars, she took me to a beach on one of the Virtual Ability islands and invited me to practice tai chi. All I needed to do was click on one of the poseballs levitating in the middle of a grassy circle, and it would automatically animate my avatar. But I did not feel that I was doing tai chi. I felt that I was sitting at my laptop, watching my two-dimensional avatar do tai chi.

I thought of Bridgette in Atlanta, waking up early to sit beside a virtual pool. She doesn't get to smell the chlorine or the sunscreen, to feel the sun melt across her back or char her skin to peeling crisps. And yet Bridgette must get something powerful from sitting beside a virtual pool—pleasure that dwells not in the physical experience itself but in the anticipation, the documentation, the recollection, and the contrast to her daily obligations. Otherwise she wouldn't wake up at 5:30 in the morning to do it.

From the beginning, I was terrible at navigating Second Life. Body part failed to download, my interface kept saying. Second Life was supposed to give you the opportunity to perfect your body, but I couldn't even summon a complete one. For my avatar, I'd chosen a punk-looking woman with cutoff shorts, a partially shaved head, and a ferret on her shoulder. On my first day in-world, I wandered around Orientation Island like a drunk person trying to find a bathroom. The island was full of marble columns and trim greenery, with a faint soundtrack of gurgling water, but it looked less like a Delphic temple and more like a corporate retreat center inspired by a Delphic temple. The graphics seemed incomplete and uncompelling, the motion full of glitches and lags. This wasn't the grit and struggle of reality; it was more like a stage set with the rickety scaffolding of its facade exposed. I tried to talk to someone named Del Agnos, but got nothing. I felt surprisingly ashamed by his rebuff, transported back to the paralyzing shyness of my junior-high-school days.

At my first Second Life concert, I arrived excited for actual music in a virtual world: Many SL concerts are genuinely "live" insofar as they involve real musicians playing real music on instruments or singing into microphones hooked up to their computers. But I was trying to do too many things at once that afternoon: reply to 16 dangling work emails, make my stepdaughter a peanut-butter-and-jelly sandwich before her final rehearsal for a production of Peter Pan. With my jam-sticky fingers, I clicked on a dance poseball and started a conga line—except no one joined my conga line; it just got me stuck between a potted plant and the stage, trying to conga and going nowhere. My embarrassment—more than any sense of having fun—was what made me feel implicated and engaged, aware that I was sharing the world with others.

Each time I signed off Second Life, I was eager to plunge back into the obligations of my ordinary life: Pick up my stepdaughter from drama class? Check! Reply to my department chair about hiring a replacement for the faculty member taking an unexpected leave? I was on it! These obligations felt real in a way that Second Life did not, and they allowed me to inhabit a particular version of myself as someone capable and necessary. It felt like returning to the air after struggling to find

my breath underwater. I came up gasping, desperate, ready for entanglement and contact, ready to say: Yes! This is the real world! In all its vexed logistical glory! When I interviewed Philip Rosedale, he readily admitted that Second Life has always presented intrinsic difficulties to users—that it is hard for people to get comfortable moving, communicating, and building; that there is an "irreducible level of difficulty associated with mouse and keyboard" that Second Life "could never make easier." Peter Gray, Linden Lab's senior director of global communications, told me about what he called the "white-space problem"—having so much freedom that you can't be entirely sure what you want to do—and admitted that entering Second Life can be like "getting dropped off in the middle of a foreign country." When I spoke with users, however, the stubborn inaccessibility of Second Life seemed to have become a crucial part of their narratives as Second Life residents. They looked back on their early embarrassment with nostalgia. Gidge told me about the time someone had convinced her that she needed to buy a vagina, and she'd ended up wearing it on the outside of her pants. (She called this a classic #SecondLifeProblem.) A Swedish musician named Malin Östh—one of the performers at the concert where I'd started my abortive conga line—told me about attending her first Second Life concert, and her story wasn't so different from mine: When she'd tried to get to the front of the crowd, she'd ended up accidentally flying onto the stage. Beforehand, she'd been sure the whole event would seem fake, but she was surprised by how mortified she felt, and this made her realize that she actually felt like she was among other people. I knew what she meant. If it feels like you are back in junior high school, then at least it feels like you are somewhere.

One woman put it like this: "Second Life doesn't open itself up to you. It doesn't hand you everything on a silver platter and tell you where to go next. It presents you with a world, and it lets you to your own devices, tutorial be damned." But once you've figured it out, you can buy a thousand silver platters if you want to —or buy the yacht of your dreams, or build a virtual Yosemite. Rosedale believed that if a user could survive that initial purgatory, then her bond with the world of Second Life would be sealed for good: "If they stay more than four hours, they stay forever."

Neal Stephenson's 1992 cyberpunk novel, Snow Crash, featuring a virtual "Metaverse," is often cited as Second Life's primary literary ancestor. But Rosedale assured me that by the time he read the novel he'd already been imagining Second Life for years ("Just ask my wife"). The hero of Snow Crash, aptly named Hiro Protagonist, lives with his roommate in a U-Stor-It unit, but in the Metaverse he is a sword-fighting prince and a legendary hacker. No surprise he spends so much time there: "It beats the shit out of the U-Stor-It."

Hiro's double life gets at one of the core fantasies of Second Life: that it could invert all the metrics of real-world success, or render them obsolete; that it could create a radically democratic space because no one has any idea what anyone else's position in the real world is. Many residents of Second Life understand it as a utopia connecting people from all over the world—across income levels, across disparate

vocations and geographies and disabilities, a place where the ill can live in healthy bodies and the immobilized can move freely. Seraphina Brennan—a transgender woman who grew up in a small coal-mining community in Pennsylvania and could not afford to begin medically transitioning until her mid-20s—told me that Second Life had given her "the opportunity to appear as I truly felt inside," because it was the first place where she could inhabit a female body.

In The Making of Second Life, Wagner James Au tells the story of an avatar named Bel Muse, a classic "California blonde" who is played by an African American woman. She led an early team of builders working on Nexus Prime, one of the first Second Life cities, and told Au that it was the first time she hadn't encountered the prejudices she was accustomed to. In the real world, she said, "I have to make a good impression right away—I have to come off nice and articulate, right away. In Second Life, I didn't have to. Because for once, I can pass." But this anecdote—the fact that Bel Muse found respect more readily when she passed as white—confirms the persistence of racism more than it offers any proof of liberation from it.

Many Second Life users see it as offering an equal playing field, free from the strictures of class and race, but its preponderance of slender white bodies, most of them outfitted with the props of the leisure class, simply re-inscribe the same skewed ideals—and the same sense of "whiteness" as invisible default—that sustain the unequal playing field in the first place.

Sara Skinner, an African American woman who has always given her avatars skin tones similar to her own, told me the story of trying to build a digital black-history museum in a seaside town called Bay City. Another avatar (playing a cop) immediately built walls and, eventually, a courthouse that blocked the museum from view. The cop avatar claims it was a misunderstanding, but so much racism refuses to confess itself as such—and it's certainly no misunderstanding when white men on Second Life tell Sara that she looks like a primate after she rejects their advances; or when someone calls her "tampon nose" because of her wide nostrils; or when someone else tells her that her experience with bias is invalid because she is a "mixed breed."

Au told me that initially he was deeply excited by the premise of Second Life, particularly the possibilities of its user-generated content, but that most people turned out to be less interested in exercising the limits of their creative potential than in becoming consumers of a young, sexy, rich world, clubbing like 20-somethings with infinite money. Rosedale told me he thought the landscape of Second Life would be hyper-fantastic, artistic and insane, full of spaceships and bizarre topographies, but what ended up emerging looked more like Malibu. People were building mansions and Ferraris. "We first build in a place what we most covet," he told me, and cited an early study by Linden Lab that found the vast majority of Second Life users lived in rural rather than urban areas in real life. They came to Second Life for what their physical lives lacked: the concentration, density, and connective potential of urban spaces; the sense of things happening all around them; the possibility of being part of

that happening. Jonas Tancred first joined Second Life in 2007, after his corporate-headhunting company folded during the recession. Jonas, who lives in Sweden, was graying and middle-aged, a bit paunchy, while his avatar, Bara Jonson, was young and muscled, with spiky hair and a soulful vibe. But what Jonas found most compelling about Second Life was not that it let him role-play a more attractive alter ego; it was that Second Life gave him the chance to play music, a lifelong dream he'd never followed. (He would eventually pair up with Malin Östh to form the duo Bara Jonson and Free.) Jonas started playing virtual gigs. In real life he stood in front of a kitchen table covered with a checkered oilcloth, playing an acoustic guitar connected to his computer, while in Second Life Bara was rocking out in front of a crowd. Before a performance one night, a woman showed up early and asked him, "Are you any good?" He said, "Yes, of course," and played one of his best gigs yet, just to back it up. This woman was Nickel Borrelly; she would become his (Second Life) wife and eventually, a couple of years later, the mother of his (real life) child. Offline, Nickel was a younger woman named Susie who lived in Missouri. After a surreal courtship full of hot-air-balloon rides, romantic moonlit dances, and tandem biking on the Great Wall of China, the pair had a Second Life wedding on Twin Hearts Island—at "12pm SLT," the electronic invitations said, which meant noon Standard Linden Time. During their vows, Bara called it the most important day of his life. But which life did he mean?

Bara's Second Life musical career started to take off, and eventually he was offered the chance to come to New York to make a record, one of the first times a Second Life musician had been offered a real-life record deal. It was on that trip that Jonas first met Susie in the real world. When their relationship was featured in a documentary a few years later, she described her first impression: Man, he looks kinda old. But she said that getting to know him in person felt like "falling in love twice." How did she end up getting pregnant? "I can tell you how it happened," she said in the documentary. "A lot of vodka."

Susie and Jonas's son, Arvid, was born in 2009. (Both Susie's and Arvid's names have been changed.) By then, Jonas was back in Sweden because his visa had run out. While Susie was in the delivery room, he was in his club on Second Life—at first waiting for news, and then smoking a virtual cigar. For Susie, the hardest part was the day after Arvid's birth, when the hospital was full of other fathers visiting their babies. What could Susie and Jonas do? Bring their avatars together to cook a virtual breakfast in a romantic enclave by the sea, holding steaming mugs of coffee they couldn't drink, looking at actual videos of their actual baby on a virtual television, while they reclined on a virtual couch.

Susie and Jonas are no longer romantically involved, but Jonas is still part of Arvid's life, Skyping frequently and visiting the States when he can. Jonas believes that part of the reason he and Susie have been able to maintain a strong parenting relationship in the aftermath of their separation is that they got to know each other so well online before they met in real life—that Second Life wasn't an illusion but a

conduit that allowed them to understand each other better than real-life courtship would have.

Jonas describes Second Life as a rarefied version of reality, rather than a shallow substitute for it. As a musician, he feels that Second Life hasn't changed his music but "amplified" it, enabling a more direct connection with his audience, and he loves the way fans can type their own lyrics to his songs. He remembers everyone "singing along" to a cover he performed of "Mmm Mmm Mmm Mmm," by the Crash Test Dummies, when so many people typed the lyrics that their "mmm"s eventually filled his entire screen. For Jonas, the reality and beauty of his creations—the songs, the baby—have transcended and overpowered the vestiges of their virtual construction.

Of the 36 million Second Life accounts that had been created by 2013—the most recent data Linden Lab will provide—only an estimated 600,000 people still regularly use the platform. That's a lot of users who turned away. What happened? Au sees the simultaneous rise of Facebook and the plateau in Second Life users as proof that Linden Lab misread public desires. "Second Life launched with the premise that everyone would want a second life," Au told me, "but the market proved otherwise."

But when I spoke with Peter Gray, Linden Lab's global communications director, and Bjorn Laurin, its vice president of product, they insisted that the problem doesn't lie in the concept, but in the challenge of perfecting its execution. The user plateau simply testifies to interface difficulties, they told me, and to the fact that the technology hasn't yet advanced enough to deliver fully on what the media hype suggested Second Life might become: an utterly immersive virtual world. They are hoping virtual reality can change that.

In July, Linden Lab launched a beta version of a new platform called Sansar, billed as the next frontier: a three-dimensional world designed for use with a virtual-reality headset such as Oculus Rift. The company's faith, along with the recent popularity of VR in the tech world (a trend that Facebook's purchase of Oculus VR attests to), raises a larger question. If advances in virtual reality solve the problem of a cumbersome interface, will they ultimately reveal a widespread desire to plunge more fully into virtual worlds unfettered by glitches, lags, and keyboards? Rosedale stepped down as CEO of Linden Lab in 2008. He told me he thinks of himself as more of an inventor, and he felt that the company needed a better manager. He isn't disappointed in what Second Life has become, but he, too, sees the horizon of future possibility elsewhere: in full-fledged virtual reality, where he can "build planets and new economies." His current company, High Fidelity, is working on creating VR technology so immersive that you actually feel like you are present in the room with someone else.

Au told me that he has noticed a recurrent hubris in the tech world. Instead of learning from mistakes, people and companies do the same thing over and over again. Is this the story of Second Life—the persistence of a tech-world delusion? Or is the

delusion something more like prophecy? Is Second Life the prescient forerunner of our future digital existence?

When I asked Rosedale whether he stood behind the predictions he'd made during the early years of Second Life—that the locus of our lives would become virtual, and that the physical world would start to seem like a museum—he didn't recant. Just the opposite: He said that at a certain point we would come to regard the real world as an "archaic, lovable place" that was no longer crucial. "What will we do with our offices when we no longer use them?" he wondered. "Will we play racquetball in them?"

I pressed him on this. Did he really think that certain parts of the physical world—the homes we share with our families, for example, or the meals we enjoy with our friends, our bodies leaning close across tables—would someday cease to matter? Did he really believe that our corporeal selves weren't fundamental to our humanity? I was surprised by how rapidly he conceded. The sphere of family would never become obsolete, he said—the physical home, where we choose to spend time with the people we love. "That has a more durable existence," he said. "As I think you'd agree."

Alicia Chenaux lives on an island called Bluebonnet, a quaint forested enclave, with her husband, Aldwyn (Al), to whom she has been married for six years, and their two daughters: Abby, who is 8, and Brianna, who is 3, although she used to be 5, and before that she was 8. As a family, they live their days as a parade of idyllic memories, often captured as digital snapshots on Alicia's blog: scouting for jack-o'-lantern candidates at the pumpkin patch, heading to Greece for days of swimming in a pixelated sea. It's like a digital Norman Rockwell painting, an ideal of upper-middle-class American domesticity—an utterly unremarkable fantasy, except that Abby and Brianna are both child avatars played by adults.

When Alicia discovered in her early 30s that she couldn't have biological children, she fell into a lengthy depression. But Second Life offered her a chance to be a parent. Her virtual daughter Abby endured a serious trauma in real life at the age of 8 (the specifics of which Alicia doesn't feel the need to know), so she plays that age to give herself the chance to live it better. Brianna was raised by nannies in real life—her parents weren't particularly involved in her upbringing—and she wanted to be part of a family in which she'd get more hands-on parenting. Perhaps that's why she kept wanting to get younger.

Alicia and her family are part of a larger family-role-play community on Second Life, facilitated by adoption agencies where children and potential parents post profiles and embark on "trials," during which they live together to see whether they are a good match. Sara Skinner, the would-be founder of the Second Life black-history museum, told me about parenting a 4-year-old son played by a man in the armed services deployed overseas: He often logged on with a patchy connection, just to hang out with Sara for a few hours while his service flickered in and out.

Sometimes adoptive parents will go through a virtual pregnancy, using "birth clinics" or accessories called "tummy talkers"—kits that deliver everything you need:

a due date and body modifications (both adjustable), including the choice to make the growing fetus visible or not; play-by-play announcements ("Your baby is doing flips!"); and the simulation of a "realistic delivery," along with a newborn-baby accessory. For Second Life parents who go through pregnancy after adopting in-world, it's understood that the baby they are having is the child they have already adopted—the process is meant to give both parent and child the bond of a live birth. "Really get morning sickness," one product promises. "Get aches." Which means being informed that a body-that-is-not-your-corporeal-body is getting sick. "You have full control over your pregnancy, have it EXACTLY how you want," this product advertises, which—as I write this essay, six months into my own pregnancy—does seem to miss something central to the experience: that it doesn't happen exactly how you want; that it subjects you to a process beyond your control.

In real life, Alicia lives with her boyfriend, and when I ask whether he knows about her Second Life family, she says, "Of course." Keeping it a secret would be hard, because she hangs out with the three of them on Second Life nearly every night of the week except Wednesday. (Wednesday is what she calls "real-life night," and she spends it watching reality television with her best friend.) When I ask Alicia whether she gets different things from her two romantic relationships, she says, "Absolutely." Her boyfriend is brilliant but he works all the time; Al listens to her ramble endlessly about her day. She and Al knew each other for two years before they got married (she says his "patience and persistence" were a major part of his appeal), and she confesses that she was a "total control freak" about their huge Second Life wedding. In real life, the man who plays Al is a bit older than Alicia—51 to her 39, with a wife and family—and she appreciates that he has a "whole lifetime of experiences" and can offer a "more conservative, more settled" perspective.

After their Second Life wedding, everyone started asking whether Alicia and Al planned to have kids. (Some things remain constant across virtual and actual worlds.) They adopted Abby four years ago, and Brianna a year later, and these days their family dynamic weaves in and out of role-play. When Brianna joined their family, she said she wanted more than "just a story," and sometimes the girls will interrupt role-play to say something about their real adult lives: guy trouble or job stress. But it's important to Alicia that both of her daughters are "committed children," which means that they don't have alternate adult avatars. While Alicia and Al share real-life photos with each other, Alicia told me, "the girls generally don't share photos of themselves, preferring to keep themselves more childlike in our minds."

For Christmas, Al gave Alicia a "pose stand," which allows her to customize and save poses for her family: she and Al embracing on a bench, or him giving her a piggyback ride. Many of Alicia's blog posts show a photograph of her family looking happy, often accompanied by a note at the bottom. One such note reads: "Btw, if you want to buy the pose I used for this picture of us, I put it up on Marketplace." In one post, beneath a photograph of her and Al sitting on a bench, surrounded by snowy trees, cuddling in their cozy winter finery, she admits that she took the photo after Al

had gone to bed. She had logged his avatar back on and posed him to get the photo just as she wanted.

To me, posing illuminates both the appeal and the limits of family role-play on Second Life: It can be endlessly sculpted into something idyllic, but it can never be sculpted into something that you have not purposely sculpted. Though Alicia's family dynamic looks seamless—a parade of photogenic moments—a deep part of its pleasure, as Alicia described it to me, seems to involve its moments of difficulty: when she has to stop the girls from bickering about costumes or throwing tantrums about coming home from vacation. In a blog post, Alicia confesses that her favorite time each evening is the "few minutes" she gets alone with Al, but even invoking this economy of scarcity—appealing for its suggestion of obligation and sacrifice—feels like another pose lifted from real-world parenting.

Last year, Alicia and Al adopted two more children, but found it problematic that the new kids wanted "so much, so fast." They wanted to call Alicia and Al Mom and Dad right away, and started saying "I love you so much" from the very beginning. They had a desire for intense, unrelenting parenting, rather than wanting to weave in and out of role-play, and constantly did things that demanded attention, like losing their shoes, jumping off the roof, climbing trees they couldn't get down from, and starting projects they couldn't finish. Basically, they behaved more like actual kids than like adults pretending to be kids. The adoption lasted only five months. There's something stubbornly beautiful about Alicia's Second Life family, all four of these people wanting to live inside the same dream. And there's something irrefutably meaningful about the ways Alicia and her children have forged their own version of the intimacies they've been denied by circumstances. But their moments of staged friction (the squabbling, the meltdowns) also illuminate the claustrophobia of their family's perfection. Perhaps Second Life families court the ideals of domesticity too easily, effectively short-circuiting much of the difficulty that constitutes family life. Your virtual family will never fully reach beyond your wildest imagining, because it's built only of what you could imagine.

One evening during the earliest days of my Second Life exploration, I stood with my husband outside a barbecue joint in (offline) Lower Manhattan and asked him: "I mean, why isn't Second Life just as real as 'real life'?" He reached over and pinched my arm, then said, "That's why it's not as real."

His point wasn't just about physicality—the ways our experiences are bound to our bodies—but about surprise and disruption. So much of lived experience is composed of what lies beyond our agency and prediction, beyond our grasp, beyond our imagining. In the perfected landscapes of Second Life, I kept remembering what a friend had once told me about his experience of incarceration: Having his freedom taken from him meant not only losing access to the full range of the world's possible pleasure, but also losing access to the full range of his own possible mistakes. Maybe the price of a perfected world, or a world where you can ostensibly control everything, is that much of what strikes us as "experience" comes from what we

cannot forge ourselves, and what we cannot ultimately abandon. Alice and Bridgette already know this, of course. They live it every day.

In Second Life, as elsewhere online, afk stands for "away from keyboard," and during the course of his ethnographic research, Tom Boellstorff sometimes heard residents saying that "they wished they could 'go afk' in the actual world to escape uncomfortable situations, but knew this was not possible; 'no one ever says "afk" in real life.' " This sentiment inspired what Boellstorff calls the "afk test": "If you can go 'afk' from something, that something is a virtual world." Perhaps the inverse of the afk test is a decent definition of what constitutes reality: something you can't go afk from—not forever, at least. Philip Rosedale predicted that the physical world would become a kind of museum, but how could it? It's too integral to our humanity to ever become obsolete, too necessary to our imperfect, aching bodies moving through it.

Did I find wonder in Second Life? Absolutely. When I sat in a wicker chair on a rooftop balcony, chatting with the legally blind woman who had built herself this house overlooking the crashing waves of Cape Serenity, I found it moving that she could see the world of Second Life better than our own. When I rode horses through the virtual Yosemite, I thought of how the woman leading me through the pines had spent years on disability, isolated from the world, before she found a place where she no longer felt sidelined. That's what ultimately feels liberating about Second Life—not its repudiation of the physical world, but its entwinement with that world, their fierce exchange. Second Life recognizes the ways that we often feel more plural and less coherent than the world allows us to be.

Some people call Second Life escapist, and often its residents argue against that. But for me, the question isn't whether or not Second Life involves escape. The more important point is that the impulse to escape our lives is universal, and hardly worth vilifying. Inhabiting any life always involves reckoning with the urge to abandon it—through daydreaming; through storytelling; through the ecstasies of art and music, or hard drugs, or adultery, or a smartphone screen. These forms of "leaving" aren't the opposite of authentic presence. They are simply one of its symptoms—the way love contains conflict, intimacy contains distance, and faith contains doubt.

Adapted from the Atlantic

A Sociology of the Smartphone

Smartphones have altered the texture of everyday life, digesting many longstanding spaces and rituals, and transforming others beyond recognition.

They are the last thing we look at before sleep each night, and the first thing we reach for upon waking.The smartphone is the signature artifact of our age. Less than a decade old, this protean object has become the universal, all-but-indispensable mediator of everyday life. Very few manufactured objects have ever been as ubiquitous as these glowing slabs of polycarbonate.

For many of us, they are the last thing we look at before sleep each night, and the first thing we reach for upon waking. We use them to meet people, to communicate, to entertain ourselves, and to find our way around. We buy and sell things with them. We rely on them to document the places we go, the things we do and the company we keep; we count on them to fill the dead spaces, the still moments and silences that used to occupy so much of our lives.

They have altered the texture of everyday life just about everywhere, digesting many longstanding spaces and rituals in their entirety, and transforming others beyond recognition. At this juncture in history, it simply isn't possible to understand the ways in which we know and use the world around us without having some sense for the way the smartphone works, and the various infrastructures it depends on.

For all its ubiquity, though, the smartphone is not a simple thing. We use it so often that we don't see it clearly; it appeared in our lives so suddenly and totally that the scale and force of the changes it has occasioned have largely receded from conscious awareness. In order to truly take the measure of these changes, we need to take a step or two back, to the very last historical moment in which we negotiated the world without smartphone in hand.

There are few better guides to the pre-smartphone everyday than a well-documented body of ethnographic research carried out circa 2005, by researchers working for Keio University and Intel Corporation's People and Practices group. Undertaken in London, Tokyo and Los Angeles, the study aimed to identify broad patterns in the things people carried in their wallets, pockets and purses on a daily basis. It found a striking degree of consistency in what Londoners, Angelenos and Tokyoites thought of as being necessary to the successful negotiation of the day's challenges:

Pictures, firstly, and similar mementoes of family, friends and loved ones. Icons, charms and other totems of religious or spiritual significance. Snacks. Personal hygiene items, breath mints, chewing gum—things, in other words, that we might use to manage the bodily dimensions of the presentation of self. Things we used to gain access of one sort or another: keys, identity cards, farecards and transit passes. Generally, a mobile phone, which at the time the research was conducted was just that, something used for voice communication and perhaps text messaging. And invariably, money in one or more of its various forms.

If the Intel/Keio study found in the stuff of wallets and handbags nothing less than circa-2005 in microcosm, its detailed accounting provides us with a useful and even a poignant way of assessing just how much has changed in the intervening years. We find that a great many of the things city dwellers once relied upon to manage everyday life as recently as ten years ago have by now been subsumed by a single object, the mobile phone. This single platform swallowed most all the other things people once had floating around in their pockets and purses, and in so doing it became something else entirely.

Once each of the unremarkable acts we undertake in the course of the day—opening the front door, buying the groceries, hopping onto the bus—has been

reconceived as a digital transaction, it tends to dematerialize. The separate, dedicated chunks of matter we needed to use in order to accomplish these ends, the house keys and banknotes and bus tokens, are replaced by an invisible modulation of radio waves. And as the infrastructure that receives those waves and translates them into action is built into the ordinary objects and surfaces all around us, the entire interaction tends to disappear from sight, and consequently from thought.

Intangible though this infrastructure may be, we still need some way of communicating with it. The 2005-era mobile phone was perfect in this role: a powered platform the right shape and size to accommodate the various antennae necessary to wireless communication, it was quite literally ready-to-hand, and best of all, by this time most people living in the major cities of the world already happened to be carrying one, And so this one device began to stand in for a very large number of the material objects we previously used to mediate everyday urban life.

Most obviously, the smartphone replaced conventional telephones, leading to the widespread disappearance from streetscapes everywhere of that icon of midcentury urbanity, the telephone booth, and all the etiquettes of negotiated waiting and deconfliction that attended it. Where phone booths remain, they now act mostly as a platform for other kinds of services—WiFi connectivity, or ads for sex workers.
In short order, the smartphone supplanted the boombox, the Walkman and the transistor radio: all the portable means we used to access news and entertainment, and maybe claim a little bubble of space for ourselves in doing so. Except as ornamentation and status display, the conventional watch, too, is well on its way to extinction, as are clocks, calendars and datebooks. Tickets, farecards, boarding passes, and all the other tokens of access are similarly on the way out, as are the keys, badges and other physical means we use to gain entry to restricted spaces.

The things we used to fix cherished memory—the dogeared, well-worried-over Kodachromes of lovers, children, schoolmates and pets that once populated the world's plastic wallet inserts—were for the most part digitized at some point along the way, and long ago migrated to the lockscreens of our phones.

Most of the artifacts we once used to convey identity are not long for this world, including among other things name cards, calling cards and business cards. Though more formal identity-authentication documents, notably driver's licenses and passports, are among the few personal effects to have successfully resisted assimilation to the smartphone, it remains to be seen how much longer this is the case.

What else disappears from the world? Address books, Rolodexes and "little black books." The directories, maps and guidebooks of all sorts that we used to navigate the city. Loyalty and other stored-value cards. And finally money, and everything it affords its bearer in freedom of behavior and of movement. All of these have already been transfigured into a dance of ones and zeroes, or are well on their way to such a fate. Of all the discrete artifacts identified by the Intel/Keio studies, after a single decade little more remains in our pockets and purses than the snacks, the breath mints and the lip-balm.

Time flows through the world at different rates, of course, and there are many places where the old ways yet reign. We ourselves are no different: some of us prefer the certainty of transacting with the world via discrete, dedicated objects, just as some still prefer to deal with a human teller at the bank. But as the smartphone has come to stand between us and an ever greater swath of the things we do in everyday life, the global trend toward dematerialization is unmistakable. As a result, it's already difficult to contemplate objects like a phone booth, a Filofax or a Palm Pilot without experiencing a shock of either reminiscence or perplexity, depending on the degree of our past acquaintance.

However clumsy they may seem to us now, what's important about such mediating artifacts is that each one implied an entire way of life—a densely interconnected ecosystem of commerce, practice and experience. And as we've overwritten those ecosystems with new and far less tangible webs of connection based on the smartphone, the texture of daily experience has been transformed. The absorption of so many of the technics of everyday life into this single device deprives us of a wide variety of recognizably, even distinctively urban sites, gestures and practices. Stepping into the street to raise a hand for a cab, or gathering in front of an appliance-shop window to watch election results or a championship game tumble across the clustered screens. Stopping at a newsstand for the afternoon edition, or ducking into a florist shop or a police booth to ask directions. Meeting people at the clock at Grand Central, or the Ginza branch of the Wako department store, or in the lobby of the St. Francis Hotel. What need is there for any of these metropolitan rituals now?

It isn't particularly helpful to ask whether this new everyday life is "better" or "worse"; I very much doubt we'd have permitted the smartphone to supplant so many other objects and rituals in our lives if we didn't, on balance, perceive some concrete advantage in doing so. But there are a few circumstances that arise as a result of this choice that we might want to take careful note of.

Firstly, the most basic tasks we undertake in life now involve the participation of a fundamentally different set of actors than they did even ten years ago. Beyond the gargantuan enterprises that manufacture our devices, and the startups that develop most of the apps we use, we've invited technical standards bodies, national- and supranational-level regulators, and shadowy hackers into the innermost precincts of our lives. As a result, our ability to perform the everyday competently is now contingent on the widest range of obscure factors—things we'd simply never needed to worry about before, from the properties of the electromagnetic spectrum and our moment-to-moment ability to connect to the network to the stability of the software we're using and the current state of corporate alignments.

Secondly, all of the conventions and arrangements that constitute our sense of the everyday now no longer evolve at any speed we'd generally associate with social mores, but at the far faster rate of digital innovation. We're forced to accommodate some degree of change in the way we do things every time the newest version of a device, operating system or application is released.

And thirdly, and perhaps most curiously of all, when pursuits as varied as taking a photograph, listening to music and seeking a romantic partner all start with launching an app on the same device, and all of them draw on the same, relatively limited repertoire of habits and mindsets, a certain similarity inevitably comes to color each of them. We twitch through the available options, never fully settling on or for any one of them.

This is our life now: strongly shaped by the detailed design of the smartphone handset; by its precise manifest of sensors, actuators, processors and antennae; by the protocols that govern its connection to the various networks around us; by the user interface conventions that guide our interaction with its applications and services; and by the strategies and business models adopted by the enterprises that produce them. These decisions can never determine our actions outright, of course, but they do significantly condition our approach to the world, in all sorts of subtle but pervasive ways. (Try to imagine modern dating without the swipe left, or the presentation of self without the selfie.) Fleshing out our understanding of the contemporary human condition therefore requires that we undertake a forensic analysis of the smartphone and its origins, and a detailed consideration of its parts.

Though its precise dimensions may vary with fashion, a smartphone is fundamentally a sandwich of aluminosilicate glass, polycarbonate and aluminum sized to sit comfortably in the adult hand, and to be operated, if need be, with the thumb only. This requirement constrains the device to a fairly narrow range of shapes and sizes; almost every smartphone on the market at present is a blunt slab, a chamfered or rounded rectangle between eleven and fourteen centimeters tall, and some six to seven wide. These compact dimensions permit the device to live comfortably on or close to the body, which means it will only rarely be misplaced or forgotten, and this in turn is key to its ability to function as a proxy for personal identity, presence and location.

The contemporary smartphone bears very few, if any, dedicated ("hard") controls: generally a power button, controls for audio volume, perhaps a switch with which to silence the device entirely, and a "home" button that closes running applications and returns the user to the top level of the navigational hierarchy. On many models, a fingerprint sensor integrated into the home button secures the device against unauthorized access.

Almost all other interaction is accomplished via the device's defining and most prominent feature: a shatter-resistant glass touchscreen of increasingly high resolution, covering the near entirety of its surface. It is this screen, more than any other component, that is responsible for the smartphone's universal appeal. Using a contemporary touchscreen device is almost absurdly easy. All it asks of us is that we learn and perform a few basic gestures: the familiar tap, swipe, drag, pinch and spread. This interaction vocabulary requires so little effort to master that despite some tweaks, refinements and manufacturer-specific quirks, virtually every element of the contemporary smartphone interface paradigm derives from the first model that featured it, the original Apple iPhone of summer 2007.

Beneath the screen, nestled within a snug enclosure, are the components that permit the smartphone to receive, transmit, process and store information. Chief among these are a multicore central processing unit; a few gigabits of nonvolatile storage (and how soon that "giga-" will sound quaint); and one or more ancillary chips dedicated to specialized functions. Among the latter are the baseband processor, which manages communication via the phone's multiple antennae; light and proximity sensors; perhaps a graphics processing unit; and, of increasing importance, a dedicated machine-learning coprocessor, to aid in tasks like speech recognition. The choice of a given chipset will determine what operating system the handset can run; how fast it can process input and render output; how many pictures, songs and videos it can store on board; and, in proportion to these capabilities, how much it will cost at retail.

Thanks to its Assisted GPS chip—and, of course, the quartertrillion-dollar constellation of GPS satellites in their orbits twenty million meters above the Earth—the smartphone knows where it is at all times. This machinic sense of place is further refined by the operation of a magnetometer and a three-axis microelectromechanical accelerometer: a compass and gyroscope that together allow the device to register the bearer's location, orientation and inclination to a very high degree of precision. These sensors register whether the phone is being held vertically or oriented along some other plane, and almost incidentally allow it to accept more coarsely grained gestural input than that mediated by the touchscreen, i.e. gestures made with the whole device, such as turning it upside down to silence it, or shaking it to close applications and return the user to the home screen.

A microphone affords voice communication, audio recording and the ability to receive spoken commands, while one or more speakers furnish audible output. A small motor allows the phone to produce vibrating alerts when set in silent mode; it may, as well, be able to provide so-called "haptics," or brief and delicately calibrated buzzes that simulate the sensation of pressing a physical button.

Even cheap phones now come with both front and rear cameras. The one facing outward is equipped with an LED flash, and is generally capable of capturing both still and full-motion imagery in high resolution; though the size of the aperture limits the optical resolution achievable, current-generation cameras can nonetheless produce images more than sufficient for any purpose short of fine art, scientific inquiry or rigorous archival practice. The user-facing camera generally isn't as capable, but it's good enough for video calls, and above all selfies.

Wound around these modules, or molded into the chassis itself, are the radio antennae critical to the smartphone's basic functionality: separate ones for transmission and reception via cellular and WiFi networks, an additional Bluetooth antenna to accommodate short-range communication and coupling to accessories, and perhaps a near-field communication (NFC) antenna for payments and other ultra-short-range interactions. This last item is what accounts for the smartphone's increasing ability to mediate everyday urban interactions; it's what lets you tap your way onto a bus or use the phone to pay for a cup of coffee.

Finally, all of these components are arrayed on a high-density interconnect circuit board, and powered by a rechargeable lithium-ion or lithium-polymer battery capable of sustaining roughly 1,500 charging cycles. This will yield just about four years of use, given the need to charge the phone daily, though experience suggests that few of us will retain a given handset that long.

There is one final quality of the smartphone that is highly significant to its ability to mediate everyday experience: it is incomplete at time of purchase. For all its technical capability, the smartphone as we currently conceive of it remains useless unless activated by a commercial service provider. In the business of mobile telephony, the process by which this otherwise-inactive slab of polycarbonate and circuitry is endowed with functionality is called "provisioning." A user account is established, generally with some means of payment authenticated, and only once this credential has been accepted do you find that the object in your hands has come alive and is able to transact with the things around it.

Even once provisioned, the smartphone is not particularly useful. It can be used to make voice calls, certainly; it generally comes loaded with a clock, a calendar, weather and map applications, a Web browser, and—rather tellingly—a stock ticker. But the overwhelming balance of its functionality must be downloaded from the network in the form of "apps," designed and developed by third parties with wildly differing levels of craft, coding ability and aesthetic sensibility.

This immediately confronts the would-be user with a choice to make about which corporate ecosystem they wish to participate in. The overwhelming majority of smartphones in the world run either on Apple's iOS or on some flavor of the open-source Android operating system, and these are incompatible with one another. Apps designed to work on one kind of device and operating system must be acquired from the corresponding marketplace—Apple's App Store, Google Play—and cannot be used with any other. In this light, we can see the handset for what it truly is: an aperture onto the interlocking mesh of technical, financial, legal and operational arrangements that constitutes a contemporary device and service ecosystem.

The smartphone as we know it is a complicated tangle of negotiations, compromises, hacks and forced fits, swaddled in a sleekly minimal envelope a few millimeters thick. It is, by any reckoning, a tremendously impressive technical accomplishment. Given everything it does, and all of the objects it replaces or renders unnecessary, it has to be regarded as a rather astonishing bargain. And given that it is, in principle, able to connect billions of human beings with one another and the species' entire stock of collective knowledge, it is in some sense even a utopian one.
But behind every handset is another story: that of the labor arrangements, supply chains and flows of capital that we implicate ourselves in from the moment we purchase one, even before switching it on for the first time.

Whether it was designed in studios in Cupertino, Seoul or somewhere else, it is highly probable that the smartphone in your hand was assembled and prepared for shipment and sale at facilities within a few dozen kilometers of Shenzhen city, in the gritty conurbation that has sprawled across the Pearl River Delta since the Chinese

government opened the Shenzhen Special Economic Zone for business in August 1980. These factories operate under circumstances that are troubling at best. Hours are long; the work is numbingly repetitive, produces injuries at surreal rates, and often involves exposure to toxic chemicals. Wages are low and suicide rates among the workforce are distressingly high. The low cost of Chinese labor, coupled to workers' relative lack of ability to contest these conditions, is critical to the industry's ability to assemble the components called for in each model's bill of materials, apply a healthy markup and still bring it to market at an acceptable price point. Should Chinese wages begin to approximate Western norms, or local labor win for itself anything in the way of real collective bargaining power, we may be certain that manufacturers will find other, more congenial places to assemble their devices. But for now Shenzhen remains far and away the preeminent global site of smartphone manufacture.

Take a step or two further back in the production process, and the picture gets bleaker still. To function at all, the smartphone—like all electronic devices—requires raw materials that have been wrested from the Earth by ruthlessly extractive industries. The cobalt in its lithium-ion batteries was mined by hand in the Congo, often by children; the tin in the soldered seams that bind it together most likely comes from the Indonesian island of Bangka, where the water table is irreparably fouled, 70 percent of the coral reefs have been destroyed by mine runoff, and on average one miner a week is killed on the job. The damage caused by the processes of extraction fans out across most of a hemisphere, mutilating lives, human communities and natural ecosystems beyond ready numbering. And so the polluted streams, stillborn children and diagnoses of cancer, too, become part of the way in which the smartphone has transformed everyday life, at least for some of us.

Though these facts might give us pause in just about any other context, we don't appear to be too troubled by them when it comes to the smartphone. The smartphone isn't like any other product, and in fact ranks among the most rapidly adopted technologies in human history. And so we suppress whatever qualms we may have about the conditions in the mines and factories, the environmental footprint, the energetic cost of the extended supply chain, or the authoritarian governments we ultimately support through our act of purchase. To the degree that we're even aware of it, we leave this deniable prehistory behind the moment we plunk down our cash and take home our new phone.

And for whatever it may be worth, our desire for the smartphone has yet to reach its saturation point. As prices fall, an ever-higher proportion of the planetary population acquires some sort of device with this basic feature set. It is always dangerous to imagine futures that are anything like linear extrapolations from the present, but if the augurs can be relied upon, we balance on the cusp of an era in which every near- or fully adult person on Earth is instrumented and connected to the global network at all times. Though we've barely begun to reckon with what this implies for our psyches, our societies, or our ways of organizing the world, it is no exaggeration to say that this capability—and all the assumptions, habits, relations of

power and blindspots bound up in it—is already foundational to the practice of the everyday.

Part of the difficulty in approaching the smartphone analytically is that there is so very much to say about it. Entire books could be written, for example, about how the constant stream of notifications it serves up slices time into jittery, schizoid intervals, and may well be eroding our ability to focus our attention in the time between them. Or how its camera has turned us all into citizen photojournalists, and in so doing significantly altered the social dynamics surrounding police violence. We might find some purchase, though, by considering a single one of its functions: the ability it grants us to locate ourselves.

Consider that for the entire history of cartography, using a map effectively meant decoding a set of abstract symbols that had been inscribed on a flat surface, and then associating those symbols with the various three-dimensional features of the local environment. The ability to do so, and therefore to successfully determine one's position, was by no means universally distributed across the population, and this scarcity of knowledge was only compounded by the fact that until relatively recently, maps themselves were rare (and occasionally militarily sensitive) artifacts.

But the maps we see on the screen of a phone cut across all this. Everyone with a smartphone has, by definition, a free, continuously zoomable, self-updating, high-resolution map of every part of the populated surface of the Earth that goes with them wherever they go, and this is in itself an epochal development. These maps include equally high-resolution aerial imagery that can be toggled at will, making them just that much easier for the average user to comprehend and use. Most profoundly of all—and it's worth pausing to savor this—they are the first maps in human history that follow our movements and tell us where we are on them in real time.

It's dizzying to contemplate everything involved in that achievement. It fuses globally dispersed infrastructures of vertiginous scale and expense—the original constellation of American NAVSTAR Global Positioning System satellites, and its Russian, European and Chinese equivalents; fleets of camera- and Lidarequipped cars, sent to chart every navigable path on the planet; map servers racked in their thousands, in data centers on three continents; and the wired and wireless network that yokes them all together—to a scatter of minuscule sensors on the handset itself, and all of this is mobilized every time the familiar blue dot appears on the screen. By underwriting maps of the world that for the first time include our real-time position, center on us, and move as we do, two dollars' worth of GPS circuitry utterly transforms our relationship to place and possibility. Thanks to a magnetometer that costs another dollar or so, they automatically orient themselves to the direction we're looking in and pivot as we turn, helping us perform the necessary cognitive leap between the abstraction on screen and the real world we see around us. And in a neatly Borgesian maneuver, the touchscreen controller and the onboard RAM let us fold a map that would otherwise span some 30 miles from side to side, if the entire world were rendered at the highest level of detail, into an envelope small and light enough to be gripped in a single hand and carried everywhere.

The maps we see on the screen of a smartphone help us rebalance the terms of our engagement with complex, potentially confounding spatial networks, allowing newcomers and tourists alike to negotiate the megacity with all the canniness and aplomb of a lifelong resident. By furnishing us with imagery of places we've never yet been, they can help to banish the fear that prevents so many of us from exploring unfamiliar paths or districts. They are the most generous sort of gift to the professional lover of cities, and still more so to everyone whose livelihood and wellbeing depends on their ability to master the urban terrain. But they also furnish us with a great deal of insight into the networked condition.

Most obviously, in using them to navigate, we become reliant on access to the network to accomplish ordinary goals. In giving ourselves over to a way of knowing the world that relies completely on real-time access, we find ourselves at the mercy of something more contingent, more fallible and far more complicated than any paper map. Consider what happens when someone in motion loses their connection to the network, even briefly: lose connectivity even for the time it takes to move a few meters, and they may well find that they have been reduced to a blue dot traversing a featureless field of grey. At such moments we come face to face with a fact we generally overlook, and may even prefer to ignore: the performance of everyday life as mediated by the smartphone depends on a vast and elaborate infrastructure that is ordinarily invisible to us.

Beyond the satellites, camera cars and servers we've already identified, the moment-to-moment flow of our experience rests vitally on the smooth interfunctioning of all the many parts of this infrastructure—an extraordinarily heterogeneous and unstable meshwork, in which cellular base stations, undersea cables, and microwave relays are all invoked in what seem like the simplest and most straightforward tasks we perform with the device. The very first lesson of mapping on the smartphone, then, is that the handset is primarily a tangible way of engaging something much subtler and harder to discern, on which we have suddenly become reliant and over which we have virtually no meaningful control.

We ordinarily don't experience that absence of control as a loss. Simultaneously intangible and too vast to really wrap our heads around, the infrastructure on which both device and navigation depend remains safely on the other side of the emotional horizon. But the same cannot be said for what it feels like to use the map, where our inability to make sense of what's beneath our fingertips all too frequently registers as frustration, even humiliation. Here we're forced to reckon with the fact that the conventions of interaction with the device are obscure or even inexplicable to many. Spend even a few minutes trying to explain basic use of the device to someone picking it up for the first time, and you'll realize with a start that what manufacturers are generally pleased to describe as "intuitive" is in fact anything but. When we do fail in our attempts to master the device, we are more likely to blame ourselves than the parties who are actually responsible. And while there will no doubt come a point at which everyone alive will have been intimately acquainted with such artifacts and their interface conventions since earliest childhood, that point

remains many years in the future. Until that time, many users will continue to experience the technics of everyday life as bewildering, overwhelming, even hostile.
If we are occasionally brought up short by the complexities of interacting with digital maps, though, we can also be badly misled by the very opposite tendency, the smoothness and naturalness with which they present information to us. We tend to assume that our maps are objective accounts of the environment, diagrams that simply describe what is there to be found. In truth, they're nothing of the sort; our sense of the world is subtly conditioned by information that is presented to us for interested reasons, and yet does not disclose that interest.

Even at its highest level of detail, for example, it's generally not feasible to label each and every retail store or other public accommodation that may appear on the map. Decisions have to be made about which features to identify by name, and increasingly, those decisions are driven by algorithms that leverage our previous behavior: where we've been in the past, the websites we've visited, what we've searched for, the specific apps we have installed, even who we've spoken with. As a result, it may never be entirely clear to us why a particular business has been highlighted on the map we're being offered. It would be a mistake to think of this algorithmic surfacing as somehow incidental, or lacking in economic consequence: according to Google, four out of every five consumers use the map application to make local searches, half of those who do so wind up visiting a store within twenty-four hours, and one out of every five of these searches results in a "conversion," or sale.

There are two aspects of this to take note of: the seamless, all-but-unremarked-upon splicing of revenue-generating processes into ordinary behavior, which is a pattern that will crop up time and again in the pages to come, and the fact that by tailoring its depiction of the environment to their behavior, the smartphone presents each individual user with a different map. Both of these qualities are insidious in their own way, but it is the latter that subtly erodes an experience of the world in common. We can no longer even pretend that what we see on the screen is a shared, consistent representation of the same, relatively stable underlying reality. A map that interpellates us in this way ensures, in a strikingly literal sense, that we can only ever occupy and move through our own separate lifeworlds.

This is not the only way in which the smartphone sunders us from one another even as it connects. For in the world as we've made it, those who enjoy access to networked services are more capable than those without. Someone who is able to navigate the city in the way the smartphone allows them to will, by and large, enjoy more opportunities of every sort, an easier time availing themselves of the opportunities they are presented with, and more power to determine the terms of their engagement with everything around them than someone not so equipped— and not by a little way, but by a great deal.

This will be felt particularly acutely wherever the situations we confront are predicated on the assumption of universal access. If the designers (or funders) of shared space become convinced that "everyone" has a phone to guide them, we may

find that other aids to wayfinding—public maps, directional signage, cues in the arrangement of the physical environment— begin to disappear from the world. Under such circumstances, the personal device is no longer an augmentation but a necessity; under such circumstances, design that prevents people from understanding and making full use of their devices is no longer simply a question of shoddy practice, but of justice.

There's something of an ethical bind here, because if the smartphone is becoming a de facto necessity, it is at the same time impossible to use the device as intended without, in turn, surrendering data to it and the network beyond. In part, this is simply a function of the way mobile telephony works. Most of us know by now that our phones are constantly tracking our location, and in fact have to do so in order to function on the network at all: the same transaction with a cellular base station or WiFi router that establishes connectivity suffices to generate at least a low-resolution map of our whereabouts. But it is also a function of business model. Your location can be used to refine real-time traffic reports, tailor targeted advertising, or otherwise bolster the map vendor's commercial imperatives, and this means that high-resolution tracking will invariably be enabled by default.

Unless you explicitly go into your device's settings menu and disable such tracking, and possibly several other application-specific functions as well, it's continuously shedding traces of your movement through the world—and the terms and conditions you assented to when you set your phone up for the first time permit those traces to be passed on to third parties. (Here, again, the interface's inherent opacity crops up as an issue: many people don't know how to find the controls for these functions, or even that they can be switched off in the first place.) On top of the map you yourself see, then, superimpose another: the map of your peregrinations that is at least in principle available to the manufacturers of your phone, its operating system and mapping application, and any third-party customers they may have for that data.

That map can be combined with other information to build up detailed pictures of your behavior. Algorithms applied to the rate at which you move are used to derive whether you're on foot or in a vehicle, even what kind of vehicle you're in, and of course such findings have socioeconomic relevance. More pointedly still, when latitude and longitude are collapsed against a database of "venues," you're no longer understood to be occupying an abstract numeric position on the surface of the Earth, but rather Père Lachaise cemetery, or Ridley Road Market, or 30th Street Station. And just like our choice of transportation mode, a list of the venues we frequent is not in any way a neutral set of facts. There are any number of places—an Alcoholics Anonymous meeting, a fetish club, a betting shop or a psychotherapist's practice—that may give rise to inferences about our behavior that we wouldn't necessarily want shared across the network. And yet this is precisely what leaches off the phone and into the aether, every time you use the map.

Whenever we locate ourselves in this way, whether we're quite aware of it or not, we are straightforwardly trading our privacy for convenience. For most of us,

most of the time, the functionality on offer is so useful that this is a bargain we're more than happy to strike, yet it remains distressing that its terms are rarely made explicit.

And however much one may believe that it's an ethical imperative to ensure that people are aware of what their smartphone is doing, this is by no means a straightforward proposition. It is complicated by the fact that a single point of data can be mobilized by the device in multiple ways. For example, the map is not the smartphone's only way of representing its user's location. The suite of sensors required to produce the map—the GPS, the accelerometer, the magnetometer and barometer—can also pass data to other applications and services on the device via a structured conduit called an API, or application programming interface. Through the API, the same data that results in the familiar blue dot being rendered on the map lets us geotag photos and videos, "check in" to venues on social media, and receive weather forecasts or search results tailored for the particular place in which we happen to be standing. Depending on the applications we have running, and the degree of access to location data we've granted them, place-specific information can be served to us the moment we traverse a "geofence," the digitally defined boundaries demarcating some region of the Earth's surface, and this might mean anything from vital safety alerts, to discount coupons, to new powers in a game.
When we move through the world with a smartphone in hand, then, we generate an enormous amount of data in the course of our ordinary activities, and we do so without noticing or thinking much about it. In turn, that data will be captured and leveraged by any number of parties, including handset and operating system vendors, app developers, cellular service providers, and still others; those parties will be acting in their interests, which may only occasionally intersect our own; and it will be very, very difficult for us to exert any control over any of this.

What is true of the map is true of the device it resides on, as it is of the broader category of networked technologies to which both belong: whatever the terms of the bargain we entered into when we embraced it, this bargain now sets the conditions of the normal, the ordinary and the expected. Both we ourselves and the cultures we live in will be coming to terms with what this means for decades to come.

The familiar glowing rectangles of our smartphone screens are by now unavoidable, pretty much everywhere on Earth. They increasingly dominate social space wherever we gather, not even so much an extension of our bodies as a prosthesis grafted directly onto them, a kind of network organ. Wherever you see one, there too is the vast ramified array of the planetary network, siphoning up data, transmuting it into a different form, returning it to be absorbed, acted upon, ignored entirely. Equipped with these devices, we're both here and somewhere else at the same time, joined to everything at once yet never fully anywhere at all.

The individual networked in this way is no longer the autonomous subject enshrined in liberal theory, not precisely. Our very selfhood is smeared out across a global mesh of nodes and links; all the aspects of our personality we think of as constituting who we are—our tastes, preferences, capabilities, desires—we owe to the

fact of our connection with that mesh, and the selves and distant resources to which it binds us.

How could this do anything but engender a new kind of subjectivity? Winston Churchill, in arguing toward the end of the Second World War that the House of Commons ought to be rebuilt in its original form, famously remarked that "we shape our buildings, and afterwards our buildings shape us." Now we make networks, and they shape us every bit as much as any building ever did, or could.

It's easy, too easy, to depict the networked subject as being isolated, in contact with others only at the membrane that divides them. But if anything, the overriding quality of our era is porosity. Far from affording any kind of psychic sanctuary, the walls we mortar around ourselves turn out to be as penetrable a barrier as any other. Work invades our personal time, private leaks into public, the intimate is trivially shared, and the concerns of the wider world seep into what ought to be a space for recuperation and recovery. Above all, horror finds us wherever we are.

This is one of the costs of having a network organ, and the full-spectrum awareness it underwrites: a low-grade, persistent sense of the world and its suffering that we carry around at all times, that reaches us via texts and emails and Safety Check notices. The only way to hide from that knowledge is to decouple ourselves from the fabric of connections that gives us everything else we are. And that is something we clearly find hard to do, for practical reasons as much as psychic ones: network connectivity now underwrites the achievement of virtually every other need on the Maslovian pyramid, to the extent that refugees recently arriving from warzones have been known to ask for a smartphone before anything else, food and shelter not excluded.

We need to understand ourselves as nervous systems that are virtually continuous with the world beyond the walls, fused to it through the juncture of our smartphones. And what keeps us twitching at our screens, more even than the satisfaction of any practical need, is the continuously renewed opportunity to bathe in the primal rush of communion.

Whether consciously or otherwise, interaction designers have learned to stimulate and leverage this desire: they know full well that every time someone texts you, "likes" your photo or answers your email, it changes you materially, rewiring neurotransmitter pathways, lighting up the reward circuits of your brain, and enhancing the odds that you'll trigger the whole cycle over again when the dopamine surge subsides in a few seconds. This clever hack exploits our most primal needs for affirmation, generally from the most venal of motivations. But it can also sensitize us to the truth of our own radical incompleteness, if we let it, teaching us that we are only ever ourselves in connection with others. And as we have never been anything but open and multiple and woven of alterity—from the DNA in our cells, to the microbes in our guts, to the self-replicating modules of language and learned ideology that constitute our very selves—in the end maybe the network we've wrought is only a clunky way of literalizing the connections that were always already there and waiting to be discovered.

It remains to be seen what kind of institutions and power relations we will devise as selves fully conscious of our interconnection with one another, though the horizontal turn in recent politics might furnish us with a clue. Whatever form they take, those institutions and relations will bear little resemblance to the ones that now undergird everyday experience, even those that have remained relatively stable for generations. The arrangements through which we allocate resources, transact value, seek to exert form on the material world, share our stories with one another, and organize ourselves into communities and polities will from now on draw upon a fundamentally new set of concepts and practices, and this is a horizon of possibilities that first opened up to us in equipping ourselves with the smartphone.

Adapted from Radical Technologies: The Design of Everyday Life by Adam Greenfield.