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Being Human in the Age of Algorithms:

part 3

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PREFACE

Настоящее учебное пособие включает актуальные тексты (2017-2018гг.) 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 выразить 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: *BBC, The Guardian, Nautilus, Wired*) 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. The dangerous downsides of perfectionism

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: perfectionism, positive, list, problems, agent, tendency, epidemic, potential, irony, career

Exercise II

Make sure you know the following words and word combinations:

to deflate, excruciating, coy, maladaptive, to intertwine, ideation, warrant, averse, to tumble, inconsequential

The dangerous downsides of perfectionism

Many of us believe perfectionism is a positive. But researchers are finding that it is nothing short of dangerous, leading to a long list of health problems – and that it's on the rise. (1)

In one of my earliest memories, I'm drawing. I don't remember what the picture is supposed to be, but I remember the mistake. My marker slips, an unintentional line appears and my lip trembles. The picture has long since disappeared. But that feeling of deep frustration stays with me. More often than I'd like to admit, something seemingly inconsequential will cause the same feeling to rear its head again. Something as small as accidentally squashing the panettone I was bringing my boyfriend's family for Christmas can tumble around in my mind for several days, accompanied by occasional voices like "How stupid!" and "You should have known better". Falling

short of a bigger goal, even when I know achieving it would be near-impossible, can temporarily flatten me. When an agent told me that she knew I was going to write a book someday but that the particular idea I'd pitched her didn't suit the market, I felt deflated in a gut-punching way that went beyond disappointment. The negative drowned out the positive. "You're never going to write a book," my internal voice said. "You're not good enough." That voice didn't care that this directly contradicted what the agent actually said. That's the thing about perfectionism. It takes no prisoners. If I've struggled with perfectionism, I'm far from alone. The tendency starts young – and it's becoming more common. Thomas Curran and Andrew Hill's recent analysis of rates of perfectionism, the first study to compare perfectionism across generations, found significant increases among more recent undergraduates in the US, UK and Canada. In other words, the average college student last year was much more likely to have perfectionistic tendencies than a student in the early 2000s. "As many as two in five kids and adolescents are perfectionists," says Katie Rasmussen, who researches child development and perfectionism at West Virginia University. "We're starting to talk about how it's heading toward an epidemic and public health issue." The rise in perfectionism doesn't mean each generation is becoming more accomplished. It means we're getting sicker, sadder and even undermining our own potential. Perfectionism, after all, is an ultimately self-defeating way to move through the world. It is built on an excruciating irony: making, and admitting, mistakes is a necessary part of growing and learning and being human. It also makes you better at your career and relationships

and life in general. By avoiding mistakes at any cost, a perfectionist can make it harder to reach their own lofty goals. But the drawback of perfectionism isn't just that it holds you back from being your most successful, productive self. Perfectionistic tendencies have been linked to a laundry list of clinical issues: depression and anxiety (even in children), eating disorders, chronic fatigue syndrome, insomnia, chronic headaches, and, most damning of all, even early mortality and suicide. There are studies that suggest that the higher the perfectionism is, the more psychological disorders you're going to suffer. (2)

Culturally, we often see perfectionism as a positive. Even saying you have perfectionistic tendencies can come off as a coy compliment to yourself; it's practically a stock answer to the "What's your worst trait?" question in job interviews. This is where perfectionism gets complicated – and controversial. Some researchers say there is adaptive, or 'healthy' perfectionism (characterised by having high standards, motivation and discipline) versus an 'unhealthy' version (when your best never seems good enough and not meeting goals frustrates you). In one study of more than 1,000 Chinese students, researchers found that gifted students were more perfectionistic in the adaptive ways. And while research shows that maladaptive attributes like beating yourself up for mistakes or feeling like you can't live up to parental expectations make you more vulnerable to depression, some other studies have shown that 'adaptive' aspects like striving for achievement have no effect at all or may even protect you. But that isn't always the case. Even if there sometimes may be upsides to perfectionist thinking, they are minor – and, researchers argue, misunderstood. In the

analysis of 43 studies on perfectionism and burnout, for example, Hill and Curran found that athletes, employees and students experienced either a tiny or no benefit from aspects like having very high personal standards, compared to people who didn't have them. People who expressed more 'maladaptive' perfectionism, on the other hand, experienced significantly more burnout. "There has been some suggestion that, in some cases, perfectionism might be healthy and desirable. Based upon the 60-odd studies that we've done, we think that's a misunderstanding," says York St John University's Hill. "Working hard, being committed, diligent, and so on – these are all desirable features. But for a perfectionist, those are really a symptom, or a side product, of what perfectionism is. Perfectionism isn't about high standards. It's about unrealistic standards. Perfectionism isn't a behaviour. It's a way of thinking about yourself. Perfectionism isn't defined by working hard or setting high goals. It's that critical inner voice. Take the student who works hard and gets a poor mark. If she tells herself: "I'm disappointed, but it's okay; I'm still a good person overall," that's healthy. If the message is: "I'm a failure. I'm not good enough," that's perfectionism. That inner voice criticises different things for different people – work, relationships, fitness. My own tendencies may differ greatly from somebody else's. As a result, perfectionists and non-perfectionists might look the same for a short period of time from a distance. But when you get up close and observe them over time, you notice that perfectionists feel every bump in the road. They're quite stress-sensitive. Perfectionists can make smooth sailing into a storm, a brief ill wind into a category-five hurricane. At the very least, they

perceive it that way. The behaviours perfectionists adapt ultimately, actually, do make them more likely to fail. In one lab experiment, for example, Hill gave both perfectionists and non-perfectionists specific goals. What he didn't tell them was that the test was rigged: none of them would succeed. Interestingly, both groups kept putting in the same amount of effort. But one group felt much unhappier about the whole thing – and gave up earlier. Guess which. Faced with failure, "perfectionists tend to respond more harshly in terms of emotions. They experience more guilt, more shame," says Hill. They also experience more anger. "They give up more easily. They have quite avoidant coping tendencies when things can't be perfect." That, of course, hinders them from the very success that they want to achieve. In his 60-plus studies focusing on athletes, for example, Hill has found that the single biggest predictor of success in sports is simply practice. But if practice isn't going well, perfectionists might stop. It makes me think of my own childhood peppered with avoiding (or starting and quitting) almost every sport there was. If I wasn't adept at something almost from the get-go, I didn't want to continue – especially if there was an audience watching. In fact, multiple studies have found a correlation between perfectionism and performance anxiety even in children as young as 10. (3)

The trouble is that, for perfectionists, performance is intertwined with their sense of self. When they don't succeed, they don't just feel disappointment about how they did. They feel shame about who they are. Ironically, perfectionism then becomes a defence tactic to keep shame at bay: if you're perfect, you never fail, and if you never fail, there's no shame. As a result, the pursuit of perfection becomes a

vicious cycle – and, because it's impossible to be perfect, a fruitless one. Perfectionism is also dangerous. Record numbers of young people are experiencing mental illness, according to the World Health Organisation. Depression, anxiety and suicide ideation are more common in the US, Canada and the UK now than a decade ago. Worsening matters, being self-critical might lead to depressive symptoms but those symptoms then can make self-criticism worse, closing a distressing loop. A recent analysis, the most complete on the suicide-perfectionism link to date, found that nearly every perfectionistic tendency – including being concerned over mistakes, feeling like you are never good enough, having critical parents, or simply having high personal standards – was correlated with thinking about suicide more frequently. (The two exceptions: being organised or demanding of others). Black-and-white thinking can lead perfectionists to interpret failures as catastrophes that, in extreme circumstances, are seen as warranting death. In many ways, poor health outcomes for perfectionists aren't that surprising. Perfectionists are pretty much awash with stress. Even when it's not stressful, they'll typically find a way to make it stressful. No matter how self-defeating perfectionism may seem, it's a tendency being shared by more and more people. Where is this increase coming from? When you keep in mind the idea that perfectionism stems from marrying your identity with your achievements, the question might become: where isn't it coming from? After all, many of us live in societies where the first question when you meet someone is what you do for a living. Where we are so literally valued for the quality and extent of our accomplishments that those achievements often correlate,

directly, to our ability to pay rent or put food on the table. Where complete strangers weigh these on-paper values to determine everything from whether we can rent that flat or buy that car or receive that loan. Where we then signal our access to those resources with our appearance – these shoes, that physique – and other people weigh that, in turn, to see if we're the right person for a job interview or dinner invitation. Curran and Hill have a similar hunch. "Failure is so severe in a market-based society," points out Curran. Competition even has been embedded in schools: take standardised testing and high-pressure university entrances. As a result, Curran says, it's no wonder that parents are putting more pressure on themselves – and on their children – to achieve more and more. "If the focus is on achievement, then kids become very averse to mistakes," Curran says. "If children come to internalise that – the idea that we only can define ourselves in strict, narrow terms of achievement – then you see perfectionistic tendencies start to come in." If you get praised whenever you do something well and not praised when you don't, you can learn that you're only really worth something when you've had others' approval. If other strategies, like making children feel guilty for making a mistake, come in, it can get even more problematic. Research has found that these types of parental tactics make children more likely to be perfectionists – and, later, to develop depression. Fear of failure is getting magnified in other ways, too. Take social media: make a mistake today and your fear that it might be broadcast, even globally, is hardly irrational. At the same time, all of those glossy feeds reinforce unrealistic standards. So how can parents counteract it? Model good behaviour by watching their own

perfectionistic tendencies, researchers say. And exhibit unconditional love and affection. It's saying things like 'You really tried hard at that. I'm proud of the effort you put in.' It's about creating an environment where imperfection isn't just accepted but is celebrated – because it means we're human. Or communicating to the child that love and care aren't conditional on performance. It's the idea that you don't have to be perfect to be lovable or to be loved. Perfectionism can be a particular challenge to treat. You can train someone to be more self-compassionate in a therapeutic setting. But if they go back to the office, say, with the same demanding boss and same deep-seated behaviours, a lot of that can go out the door. Then, of course, there is that widespread (if erroneous) belief that being a perfectionist makes us better workers (or parents, or athletes, or whatever the task is at hand). It's a work in progress. I've started (with varying success) consciously stopping myself from overreacting to other people's mistakes. More difficult, but also important, has been stopping myself from overreacting to my own. Ironically, that includes trying not to criticise myself when I fall short of that goal in itself. What I've noticed is that, each time I'm able to replace criticising with compassion, I feel not only less stressed, but freer. (4)

Adapted from BBC Future.

Exercise III.

Find paragraphs, dealing with the following: lofty, drawback, insomnia, disorders, coy, audience, parental, diligent, symptom, inner

Exercise IV.

Fill in the gaps.

1. To be able to curb that …................... is a big thing, and she was able to do that.

2. It is................................ that Microsoft is not the most far out in front innovator.

3. McGuire originally planned to retire in September but is staying on …...............................

4. Technology shares took another big …......................... on the American stockmarket this week.

5. This year alone we're having 40%, not to mention what we …..................... last year.

6. Reality is that you're going to be handed …............................... losses from time to time.

7. Those with …............................... perfectionism don't really have a choice to strive or excel.

8. Competitors, such as Yahoo and Mapquest, also …........................... maps with local results.

9. Colleagues gave him a glass-encased cigarette to …........................ the nicotine urges …..................................

10. The object of your …............................ will be flattered to know how much you really care.

Exercise V.

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

nothing short of, to drown out, to keep at bay, to hold somebody back from, at any cost, come off, to live up

Exercise VI.

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

frustration	skilled
affection	done in a careful and detailed way
inconsequential	to fall quickly and without control
to flatten	to crush something into a flat shape
physique	the feeling of being upset or annoyed, esp. because of inability to change or achieve something
temporarily	feelings of liking or love
squash	not important
to tumble	to become level or cause something to become level
diligent	the shape and size of a human body
accomplished	in a way that does not last for long or for ever

Exercise VII.

Summarize the article "The dangerous downsides of perfectionism"

Part 2

Exercise I.

Identify the part of speech the words belong to.

depression, anxiety, perfectionism, successful, productive, perfectionist, perfectionism, generation, negative, internal

Exercise II .

Form nouns from the following words:

disappear (1), accidentally (1), directly (1), contradicted (1), compare (2), significant (2), successful (2), productive (2), perfectionistic (2), suggest (2)

Exercise III.

Find synonyms to the following words. Translate them into Russian: to suffer (2), complicated (3), motivation (3), discipline (3), gifted (3), protect (3), stress (3), depression (3), tiny (3), suggestion (3)

Exercise IV.

Find antonyms to the following words. Translate them into Russian:

disorder (2), higher (2), healthy (3), vulnerable (3), minor (3), argue (3), misunderstood (3), researchers, important (4), success (4)

Exercise V.

Match the words to make word combinations:

excruciating	goals
eating	list
laundry	slips
fatigue	tendencies
chronic	disorders
early	frustration
perfectionistic	syndrome
deep	irony
marker	headaches
lofty	mortality

2. How rich are you?

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: millionaires, global, standards, investors, criteria, million, effect, psychological, lottery, personal

Exercise II

Make sure you know the following words and word combinations:

affluent, bespoke, tier, burnout, societal, tenacity, aftermath, disparity, slacker, aversive

How rich are you?

They say comparison is the thief of joy. In a world where even millionaires don't consider themselves wealthy, is the key to life satisfaction to simply stop lining ourselves up against others? (1)

Imagine having a six-figure income, owning at least one home and sitting on a spare $1 million in investable assets. Surely a sign that you've "made it" and are, by global standards, incredibly rich? Apparently not.A recent survey of affluent US investors found 70% of people meeting these criteria don't consider themselves wealthy. Only those with $5 million or more in assets thought they have enough set aside to feel secure about their future, while the majority of the rest feared a single setback could have a major effect on their lifestyle. So, if millionaires don't consider themselves wealthy, where does that leave

the rest of us? If we're unlikely to "feel" rich, no matter how much we earn, is it really worth aspiring to get there at all? (2)

Getting off the treadmill. Decades of psychological research has already disproven the idea that money can buy long-term happiness, with one study even suggesting that lottery winners ended up no more satisfied with their lives after a big win. And The New York Times reported about a boom in bespoke therapy for billionaires suffering personal struggles. (3)

Who doesn't want to be a billionaire? A millionaire, even? Think of all the troubles that would simply melt away. Of course, we know deep down that money won't solve all of life's problems. And billionaires, it seems, have problems, too. One difference is, no one is likely to feel sorry for them.The difference is that a billionaire can't indulge in the fantasy that money would make everything better. More money is not going to make them happy. But although they know money is not the key to happiness, they can't stop counting it. It's especially challenging for those who are self-made, as opposed to those who inherit a fortune. For self-made billionaires their entire self-image and all their self-esteem is wrapped up in the pursuit of money. Billionaires often feel isolated and find it difficult to trust people or have authentic relationships that are not about money. On top of that, they have a hard time finding a sympathetic ear. There is a sense they can't really tell anyone what they are dealing with, because no one wants to hear about their struggles. Like everyone else, billionaires do have bad days.They have different problems, but not a lack of problems. People are drawn to them for their status and power, so they tend to be surrounded by people

who endorse their worldview and don't challenge their way of thinking. Very few people are honest with them. (4)

As people get wealthier, they are more satisfied to start, but at some stage there is no additional increase in satisfaction. Plenty of high earners can't get off the treadmill, even if they're aware that their happiness or quality of life has flatlined, because they become too defined by their wealth. This is because rich people, just as the less well-off, make upwards comparisons, rating their income, home, investments or possessions against those of even richer friends and colleagues, rather than the rest of the population. The more money you make, the more you also have a need for more money – it's like an addiction. It's a pattern that's all too familiar with life and career coaches like Pia Webb, who focuses on guiding top-tier managers in Europe. Even in her home country, Sweden, a social democracy famed for work-life balance rather than excess, she says many still fall victim to benchmarking themselves against those in higher income brackets. "Nobody looks up to you because you work a lot in Sweden. But there is still a pressure to keep up with others, to show your wealth in other ways, like going on holidays with your family, having a boat, a summer house," she says. Webb asks her clients to reflect on the experiences or items they think they personally need to feel satisfied, rather than striving to keep earning more to match societal or peer-group expectations. "When it comes to wealth, many people think money is the key. But you don't need much if you can be happy living in the moment," she argues. Webb, who was much more focused on wealth before experiencing a burnout 10 years ago, now enjoys simple pleasures such as having a sauna, taking a walk in the forest or enjoying time with friends and relatives. (5)

Happy peasants and miserable millionaires. Research suggests people living in poverty are already accustomed to finding ways to boost their life satisfaction and well-being, that go beyond money and material possessions. They are more likely to spend time with family and volunteer in the community, for instance. "Well-being is related quite strongly to the extent to which people feel connected to others around them," she explains. "In developing nations, while much smaller amounts of money can make a huge difference to a person's lifestyle – helping them move beyond very basic needs – those who don't have much can also be much less frightened of what they've got to lose," she adds. Carol Graham has described the paradox as the "happy peasant and miserable millionaire problem". Wealthier countries are, on average, happier than destitute ones, but after that, the story becomes more complicated. "Freedom and democracy make people happy, but they matter less when these goods are less common. People can adapt to tremendous adversity and retain their natural cheerfulness, while they can also have virtually everything and be miserable." Of course, this doesn't mean we should in any way conclude that it is better to live closer to the poverty line (in the UN's latest World Happiness Report, richer countries still dominate the table). But, Graham's research suggests wealthier people may be more adaptable to negative shifts in their income than they might think. And richer people could have a lot to learn from the connecting with others that is more common in poorer groups and societies. Krishna Prasad, a mountain tour guide in Nepal, says he noted high levels of tenacity in the aftermath of the the worst earthquake in his country's history in 2015. It cost 8,000 lives and left

thousands more homeless. Yet by making downwards comparisons, many residents were able to count their blessings. In the earthquake a lot of things got destroyed but people were still happy because if they had not lost their family...it could have been a lot worse. However he doesn't believe his homeland is completely immune to the kind of upwards comparisons that appear to be stressing out the rest of us. "In the city, more educated people are more worried about life. My parents have no money but they are more happy than me," he laughs. (6)

The future of wealth. As research into income and wellbeing becomes increasingly nuanced, growing numbers of experts are also speculating that traditional symbols of wealth – such as owning a car or a house – are set to shift, as millennials in many countries become the first generation to earn relatively less than their parentsand struggle to buy homes in tough property markets. Though frustrating for millennials, it may mean that this generation will show fewer of the negative effects of wealth such as selfishness, narcissism and a high sense of entitlement. There are even signs that even high-earning young professionals who could choose to invest in stocks or property are instead becoming increasingly focused on making memories instead of money. In the US, since 1987, the share of consumer spending on live experiences and events relative to total consumer expenditure has risen by 70%, according to figures from the US Department of Commerce. Fashion photographer Eileen Cho, 25, for example, grew up in an affluent neighbourhood, but describes the idea of earning cash in order to save or invest it in property as "like a jail sentence". Despite being offered financial help from her parents, who wanted to help her buy a home, she's opted to share a 30-square metre rented apartment with her

boyfriend instead."We pay 950 euro ($1030) a month in rent and still have enough for one international trip a month," she explains. "For me it's about experiencing things and being happy. Tomorrow I am off to Spain; my next trip is France." It's an approach that coach Pia Webb supports, although she argues that young workers should be mindful to avoid travel and other experience-based adventures simply becoming the new norm against which they benchmark their "wealth". "Travelling is a great way of learning about other cultures, getting to know yourself and finding your place in the world, but it can also become an addiction. You're getting hit from experiencing new things - just like when people go shopping for example. But this can mean you're not so rooted, or you miss out on quality time with family," she says."My best advice is that you need to work out what's right for you as an individual and learn to be happy with the really small things in life, wherever you are". (7)

We are failing to look at inequality in the right way, according to researchers who study people's attitudes to wealth disparity. Haves and have-nots. The 99%. The income gap. The chasm between rich and poor has never mattered more. It's estimated that the top 1% of the world's richest people owns 50% of the planet's wealth. Solving this level of inequality is often held up as a 'grand challenge' for the world. But is that the right way to look at it? Some researchers argue that income disparity itself may not be the main problem. The issue, they say, is not the existence of a gap between rich and poor, but the existence of unfairness. Some people are treated preferentially and others unjustly – and acknowledging that both poverty and unfairness are related may be the challenge that matters more in the 21st Century. While many people may already view inequality as unfairness, making

the distinction much clearer is important: to improve the society we live in, these researchers are arguing that we need to all be on the same page as to what inequality actually is. (8)

What is it about inequality that bothers us: the fact that some people are rich and others are poor? Or that not everyone has an equal shot? Or something else? In a paper called 'Why people prefer unequal societies', a team of researchers from Yale University argue that humans – even as young children and babies – actually prefer living in a world in which inequality exists. It sounds counter-intuitive, so why would that be? Because if people find themselves in a situation where everyone is equal, studies suggest that many become angry or bitter if people who work hard aren't rewarded, or if slackers are over-rewarded. For example, in one study, a group of six- to eight-year-olds was tasked with divvying up erasers among two boys who cleaned a room as rewards. Researchers found that, if they told the group of children that both boys did a good job, and then gave the group an odd number of erasers, the kids made the decision to throw away the extra eraser rather than give it to one of the boys as an unfair bonus. When the researchers told the kids that one boy worked harder than the other, the group awarded the extra prize to the harder worker. They argue that the public perception of wealth inequality itself being aversive to most people is incorrect, and that instead, what people are truly concerned about is unfairness. In the present-day US, and much of the world, these two issues are confounded, because there is so much inequality that the assumption is that it must be unfair. But this has led to an incorrect focus on wealth inequality itself as the problem that needs addressing, rather than the more central issue of fairness. And people typically prefer fair inequality

to unfair equality. The reason this matters is that trying to create a world with no wealth disparity is at odds with people's perception of fairness, and that could potentially lead to instability. A society where no poverty exists sounds rather utopian, but if that society is equal-but-unfair then it risks collapsing. As reasonable as it sounds, people don't typically work, create or strive without the motivation to do so. "If I'm a painter, dentist or builder, why would I work for 50 hours a week if everything I'm given is free? When you run large teams, there is nothing that sends people mad more than lazy individuals getting the same rewards and promotions as the hard workers. (9)

But how can we define inequality? Researchers argue that we need an agreed-upon definition of the term 'inequality'. It's important to remember that, as we figure out ways to combat inequality, that there are three separate (but related) ideas. First, the idea that people should have equal opportunity in society, regardless of their background, race, gender and so on. The second idea is fair distribution, which says that benefits or rewards should be distributed fairly based on merit. The final idea is the notion of equality of outcome, or that people receive equal outcomes regardless of circumstance. This last one is a little trickier to grasp. So which of these types of inequality should be addressed? Which leads to a potentially better society? Many of the researchers and economists interviewed for this piece agree: too much attention is paid to the fact that the 1%, and the super-rich all exist. Instead, they argue we need to concentrate more on helping those less fortunate, who via a lack of fairness, are unable to improve their situation. The moral obligation should be on eliminating poverty, not achieving equality, and striving to make sure everyone has the means to lead a good life.

Economic inequality is such a massive, intense issue; the product of complex cultural and political forces around the world throughout history. However, by understanding the different definitions of inequality – like inequality of opportunity – it highlights more clearly that not everyone is afforded the same opportunities to succeed, even if they put in that hard work. Depending on your political viewpoint, the way of addressing inequality might be different: perhaps the left might favour universal health care for all, while the right might favour job creation that employs low-wage workers. Whatever the political plan of action, however, experts say the solution lies in in addressing the fact that poverty and unfairness exist. (10)

Adapted from BBC

Exercise III.

Find paragraphs, dealing with the following: satisfaction, well-off, addiction, pattern, top-tier, democracy, pressure, striving, sauna, poverty

Exercise IV.

Fill in the gaps.

1. Cigar smoking is associated with the …..................... and pipe smoking with the learned.

2. You shouldn't feel like you have to step off the …........................ to catch your breath.

3. During holiday stress many humans …............................. in the national pastime of overeating.

4. Whether it's for justice or love, Bentley is searching with staggering …...............................

5. It is strange that in the ……........................, this is the scenario that goes unmentioned.

6. Despite the smaller ratio between men and women's wages, ……......................... still exists.

7. You can share power, but you can't ……............................. the various government functions.

8. As it seems to ……........................... with other published data, I suspect it is also bogus.

9. Almost every key ……............................. about how the program would unfold has proved wrong.

10. We take pride in Google search and ……........................... to make each and every search perfect.

Exercise V.

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

to feel sorry for , to line up, to keep up with, to divvy up, odd and even, to be at odds with, get off, end up, looks up to, to take a walk

Exercise VI.

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

wealth	a level of quality that can be used as a standard when comparing other things
treadmill	something that you accept as true without question or proof
outcome	making you feel annoyed or less confident because you cannot achieve what you want
to strive	to allow yourself or another person to have

	something enjoyable, especially more than is good for you
to endorse	to confuse and very much surprise someone, so that they are unable to explain or deal with a situation
frustrating	a large amount of money or valuable possessions that someone has
to indulge	to make a public statement of your approval or support for something or someone:
to confound	make great efforts to achieve or obtain something
assumption	a job or situation that is tiring, boring, or unpleasant and from which it is hard to escape
benchmark	a result or effect of an action, situation, etc

Exercise VII.

Summarize the article "How rich are you?"

Part 2

Exercise I.

Identify the part of speech the words belong to.

satisfaction, simply, fantasy, happiness, especially, authentic , sympathetic, status, honest, additional

Exercise II .

Form verbs from the following words: satisfaction (1), investable (1), additional (2), possessions (2), addiction (2), expectations (2), difference (2), relative (4), consumer(4), decision(5)

Exercise III.

Find synonyms to the following words. Translate them into Russian: extra (9), bonus (9), worker (9), kid (9), argue (9), perception (9), truly (9), solution (10), massive (10), intense (10)

Exercise IV.

Find antonyms to the following words. Translate them into Russian: inequality (9), incorrect (9), central (9), instability (10), poverty (10), force (10), low-wage (10), left (10), hard (10), complex (10)

Exercise V.

Match the words to make word combinations:

hard	therapy
self-made	ear
bespoke	income
lottery	happiness
investable	time
global	billionaires
big	standards
long-term	assets
six-figure	win
sympathetic	winners

3. Post-work: the radical idea of a world without jobs

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: radical, alternative, modern, dominates, corporate, epic, politicians, economy, form

Exercise II.

Make sure you know the following words and word combinations.
erratic, ancillary, to loom, intermittently, abolition, high-profile, alluring, self-fulfillment, to wrench, to envisage

Post-work: the radical idea of a world without jobs

Work has ruled our lives for centuries, and it does so today more than ever. But a new generation of thinkers insists there is an alternative. (1)

Work is the master of the modern world. For most people, it is impossible to imagine society without it. It dominates and pervades everyday life – especially in Britain and the US – more completely than at any time in recent history. An obsession with employability runs through education. Even severely disabled welfare claimants are required to be work-seekers. Corporate superstars show off their epic work schedules. "Hard-working families" are idealised by politicians. Tech companies persuade their employees that round-the-clock work is play. Gig economy companies claim that round-the-clock work is freedom. Workers commute further, strike less, retire later. Digital

technology lets work invade leisure. In all these mutually reinforcing ways, work increasingly forms our routines and psyches, and squeezes out other influences. As Joanna Biggs put it in her book All Day Long: A Portrait of Britain at Work, "Work is how we give our lives meaning when religion, party politics and community fall away." And yet work is not working, for ever more people, in ever more ways. We resist acknowledging these as more than isolated problems – such is work's centrality to our belief systems – but the evidence of its failures is all around us. As a source of subsistence, let alone prosperity, work is now insufficient for whole social classes. In the UK, almost two-thirds of those in poverty – around 8 million people – are in working households. As a source of social mobility and self-worth, work increasingly fails even the most educated people – supposedly the system's winners. In 2017, half of recent UK graduates were officially classified as "working in a non-graduate role". In the US, "belief in work is crumbling among people in their 20s and 30s", says Benjamin Hunnicutt, a leading historian of work. "They are not looking to their job for satisfaction or social advancement." (You can sense this every time a graduate with a faraway look makes you a latte.) Work is increasingly precarious: more short-term contracts; more self-employed people with erratic income. As a source of sustainable consumer booms and mass home-ownership – for much of the 20th century, the main successes of mainstream western economic policy – work is discredited daily by our ongoing debt and housing crises. (2)

Whether you look at a screen all day, or sell other underpaid people goods they can't afford, more and more work feels pointless or

even socially damaging – what the American anthropologist David Graeber called "bullshit jobs". Among others, Graeber condemned the "ancillary industries (dog-washers, all-night pizza delivery) that only exist because everyone is spending so much of their time working". The argument seemed subjective and crude, but economic data increasingly supports it. The growth of productivity, or the value of what is produced per hour worked, is slowing across the rich world – despite the constant measurement of employee performance and intensification of work routines that makes more and more jobs barely tolerable. Unsurprisingly, work is increasingly regarded as bad for your health: "Stress an overwhelming 'to-do' list and long hours sitting at a desk," the Cass Business School professor Peter Fleming notes in his book, are beginning to be seen by medical authorities as akin to smoking. Work is badly distributed. People have too much, or too little, or both in the same month. And away from our unpredictable, all-consuming workplaces, vital human activities are increasingly neglected. Workers lack the time or energy to raise children attentively, or to look after elderly relations. "The crisis of work is also a crisis of home," declared the social theorists Helen Hester and Nick Srnicek in a paper last year. This neglect will only get worse as the population grows and ages. And finally, beyond all these dysfunctions, loom the most-discussed, most existential threats to work as we know it: automation, and the state of the environment. Some recent estimates suggest that between a third and a half of all jobs could be taken over by artificial intelligence in the next two decades. Other forecasters doubt whether work can be sustained in its current, toxic form on a warming planet. (3)

We know work's multiplying problems, but it feels impossible to solve them all. Is it time to start thinking of an alternative? Our culture of work strains to cover its flaws by claiming to be unavoidable and natural. The idea of a world freed from work, wholly or in part, has been intermittently expressed – and mocked and suppressed – for as long as modern capitalism has existed. Repeatedly, the promise of less work has been prominent in visions of the future. In 1845, Karl Marx wrote that in a communist society workers would be freed from the monotony of a single draining job to "hunt in the morning, fish in the afternoon, rear cattle in the evening, criticise after dinner". In 1884, the socialist William Morris proposed that in "beautiful" factories of the future, surrounded by gardens for relaxation, employees should work only "four hours a day". (4)

In 1930, the economist John Maynard Keynes predicted that, by the early 21st century, advances in technology would lead to an "age of leisure and abundance", in which people might work 15 hours a week. In 1980, as robots began to depopulate factories, the French social and economic theorist André Gorz declared: "The abolition of work is a process already underway." Since the early 2010s, as the crisis of work has become increasingly unavoidable in the US and the UK, these ideas have been rediscovered and developed further. Brief polemics such as Graeber's "bullshit jobs" have been followed by more nuanced books, creating a rapidly growing literature that critiques work as an ideology – sometimes labelling it "workism" – and explores what could take its place. A new anti-work movement has taken shape. Graeber, Hester, Srnicek, Hunnicutt, Fleming and others are members of a loose, transatlantic network of thinkers who advocate a profoundly different

future for western economies and societies, and also for poorer countries, where the crises of work and the threat to it from robots and climate change are, they argue, even greater. They call this future "post-work". For some of these writers, this future must include a universal basic income (UBI) – currently post-work's most high-profile and controversial idea – paid by the state to every working-age person, so that they can survive when the great automation comes. For others, the debate about the affordability and morality of a UBI is a distraction from even bigger issues. Post-work may be a rather grey and academic-sounding phrase, but it offers enormous, alluring promises: that life with much less work, or no work at all, would be calmer, more equal, more pleasurable, more thoughtful, more politically engaged, more fulfilled – in short, that much of human experience would be transformed. To many people, this will probably sound outlandish, foolishly optimistic – and quite possibly immoral. But the post-workists insist they are the realists now. "Either automation or the environment, or both, will force the way society thinks about work to change," says David Frayne, a radical young Welsh academic whose 2015 book The Refusal of Work is one of the most persuasive post-work volumes. "So are we the utopians? Or are the utopians the people who think work is going to carry on as it is?" (5)

One of post-work's best arguments is that, contrary to conventional wisdom, the work ideology is neither natural nor very old. "Work as we know it is a recent construct," says Hunnicutt. Like most historians, he identifies the main building blocks of our work culture as 16th-century Protestantism, which saw effortful labour as leading to a good afterlife; 19th-century industrial capitalism, which required

disciplined workers; and the 20th-century desires for consumer goods and self-fulfillment. The emergence of the modern work ethic from this chain of phenomena was "an accident of history," Hunnicutt says. Before then, "All cultures thought of work as a means to an end, not an end in itself." From urban ancient Greece to agrarian societies, work was either something to be outsourced to others – often slaves – or something to be done as quickly as possible so that the rest of life could happen. Even once the new work ethic was established, working patterns continued to shift and be challenged. Between 1800 and 1900, the average working week in the west shrank from about 80 hours to about 60 hours. From 1900 to the 1970s, it shrank steadily further: to roughly 40 hours in the US and the UK. Trade union pressure, technological change, enlightened employers, and government legislation all progressively eroded the dominance of work. Sometimes, economic shocks accelerated the process. In Britain in 1974, Conservative government, faced with a chronic energy shortage caused by an international oil crisis and a miners' strike, imposed a national three-day working week. For the two months it lasted, people's non-work lives expanded. Golf courses were busier, and fishing-tackle shops reported large sales increases. The economic consequences were mixed. Most people's earnings fell. Working days became longer. Yet a national survey of companies found that productivity improved by about 5%. "Thinking was stimulated" the consultants noted, "on the possibility of arranging a permanent four-day week." Nothing came of it. But during the 60s and 70s, ideas about redefining work, or escaping it altogether, were commonplace in Europe and the US, where a new discipline was

established: leisure studies, the study of recreations such as sport and travel. In 1979, Bernard Lefkowitz, then a well-known American journalist, published a book based on interviews with 100 people who had given up their jobs. Many of the interviewees were living in California, and despite moments of drift and doubt, they reported new feelings of "wholeness" and "openness to experience". By the end of the 70s, it was possible to believe that the relatively recent supremacy of work might be coming to an end in the more comfortable parts of the west. Labour-saving computer technologies were becoming widely available for the first time. And crucially, wages were high enough, for most people, to make working less a practical possibility. Instead, the work ideology was reimposed. During the 80s, the aggressively pro-business governments of Margaret Thatcher and Ronald Reagan used welfare cuts and moralistic rhetoric to create a much harsher environment for people without jobs. Hunnicutt, who has studied the ebb and flow of work in the west for almost 50 years, says, "there is a fear of freedom – a fear among the powerful that people might find something better to do than create profits for capitalism." During the 90s and 2000s, unemployment was lower than it had been for decades. More women than ever were working. Wages for most people were rising. Poverty fell steadily. The chancellor Gordon Brown, one of the country's most famous workaholics, appeared to have found a formula that linked work to social justice. By the early 21st century, the work culture seemed inescapable. (6)

The work culture has many more critics now. In the US, sharp recent books such as How Employers Rule Our Lives (and Why We Don't Talk About It) by the philosopher Elizabeth Anderson, and

No More Work: Why Full Employment Is a Bad Idea by the historian James Livingston, have challenged the dictatorial powers and assumptions of modern employers; and also the deeply embedded American notion that the solution to any problem is working harder. In the UK, even business journals have begun to register the extent of work's crises. In his book The Wealth of Humans: Work and its Absence in the 21st Century, the Economist columnist Ryan Avent predicted that automation would lead to "a period of wrenching political change" before "a broadly acceptable social system" emerges. Post-work ideas are also circulating in party politics. Last April, the Green party proposed that weekends be lengthened to three days. Labour leader Jeremy Corbyn told his party conference that automation"can be the gateway for a new settlement between work and leisure – a springboard for expanded creativity and culture". Some post-workists think work should not be abolished but redistributed, so that every adult labours for roughly the same satisfying but not exhausting number of hours. (7)

Defenders of the work culture such as business leaders and mainstream politicians habitually question whether modern workers have the ability to enjoy, or even survive, the open vistas of time and freedom that post-work thinkers envisage for them. In 1989, two University of Chicago psychologists conducted a famous experiment that seemed to support this view. They recruited 78 people with manual, clerical and managerial jobs at local companies, and gave them electronic pagers. For a week, at frequent but random intervals, at work and at home, these employees were contacted and asked to fill in questionnaires about what they were doing and how they were feeling. The experiment found that people reported "many more positive feelings

at work than in leisure". At work, they were regularly in a state the psychologists called "flow" – "enjoying the moment" by using their knowledge and abilities to the full, while also "learning new skills and increasing self-esteem". Away from work, they employees mainly chose "to watch TV, try to sleep, and in general vegetate, even though they did not enjoy doing these things". US workers, the psychologists concluded, had an "inability to organise their psychic energy in unstructured free time". To the post-workists, such findings are simply a sign of how unhealthy the work culture has become. Our ability to do anything else, only exercised in short bursts, is like a muscle that has atrophied. They argue that in a less labour-intensive society, our capacity for things other than work could be built up again. In today's lower-wage economy, suggesting people do less work for less pay is a hard sell. As with free-market capitalism in general, the worse work gets, the harder it is to imagine actually escaping it, so enormous are the steps required. The end of work as we know it will seem unthinkable – until it has happened. (8)

Adapted from BBC.

Exercise III.

Find paragraphs, dealing with the following: psyches, portrait, prosperity, households, mobility, non-graduate, crumbling, precarious, home-ownership, mainstream

Exercise IV.

Fill in the gaps.

1. The more we glorify the gangsta lifestyle, the more it will …........................ everyday life.

2. Highway billboards promise better days for desperately poor …................. farmers.

3. Wide-spread …...................... is based upon wide-spread employment at well paying jobs.

4. As ever in London, creativity exists in a …..................... relationship with property.

5. However, because hurricane movements are …...................., long-range forecasts can vary.

6. Greater …................. will result from a change in your priorities.

7. They want to …...................... a compulsory national religion of pseudo-science upon on us.

8. So I'm going to …...................... a few of the most frequently asked questions posed to me.

9. At the same time, the intensity and frequency of it will …................... over time.

10. What if this book suggested a future completely different from the one I …........................?

Exercise V.

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

subsistence	having a special mental ability, for example so that you are able to know what will happen in the future or know what people are t hinking
prosperity	relating to the land, especially the use of land for farming

psychic	poisonous
sustainable	not securely held or in position; dangerously likely to fall or collapse
prominent	make determined efforts to deal with (a problem or difficult task)
to impose	the state of having what you need in order to stay alive, but no more
to tackle	the state of being successful and having a lot of money
precarious	able to continue over a period of time
agrarian	very well known and important
toxic	to officially force a rule, tax, punishment, etc. to be obeyed or received

Exercise VI.

Summarize the article "Post-work: the radical idea of a world without jobs"

Part 2

Exercise I.

Identify the part of speech the words belong to.

subsistence, pointless, anthropologist, delivery, argument, subjective, economic, increasingly, productivity

Exercise II .

Form adjectives from the following words: (7), society(1), completely(1), history (1), severely (1), politicians (1), economy (1), technology (1), mutually (1) meaning (1), religion (3

Exercise III.

Find synonyms to the following words. Translate them into Russian:

resist (2), isolated (2), evidence (2), failure (2), mobility (2), satisfaction (2), main (2), delivery (3), exist (3), rich (3)

Exercise IV.

Find antonyms to the following words. Translate them into Russian:

enormous (8), unthinkable (8), end (8), free (8), general (8), sell (8), worse (8), ability (8), short (8), enjoy (8)

Exercise V.

Match the words to make word combinations:

work	workplaces
human	policy
all-consuming	routines
gig	contracts
economic	classes
self-employed	technology
short-term	economy
digital	income
social	activities
erratic	people

4. Love in the Time of Robots

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: robots, androids, realistic, academically, mechanics, fluorescent, copy, gestures regular, intervals

Exercise II.

Make sure you know the following words and word combination

Uncannily, stern, to wiggle, to covet, unsettling, backdrop, slapstick, cortex, pressing, to swerve

Love in the Time of Robots

Hiroshi Ishiguro builds androids. Beautiful, realistic, uncannily convincing human replicas. Academically, he is using them to understand the mechanics of person-to-person interaction. But his true quest is to untangle the ineffable nature of connection itself. (1)

It is summer 2002, mid-morning in a university research lab in Japan. Two girls—both dressed in pale yellow, with child-puffy cheeks and black shoulder-length hair—stand opposite each other under fluorescent lights. More precisely: One is a girl, 5 years old; the other is her copy, her android replica. They are the same size, one modeled on the other, and they are meeting for the first time. The girl stares hard into the eyes of her counterpart; its expression is stern and stiff. It seems to return her gaze. A man is videotaping the pair—he is the father of one, creator of the other—and from off-camera he asks, "Would you like to

say something?" The girl turns to him, disoriented. She turns back to the android. "Talk to her!" he says. "Hello." The girl repeats the word, quietly, to her robot-self. It nods. Her father feeds her another line: "Let's play." The android wiggles its head. Her father chuckles behind the camera. But the girl does not budge. She simply stares at her double, the look on her face one of focus and perhaps concern. Each member of this pair continues making the gestures that serve as signs of life: Each blinks at regular intervals; each tilts her head from side to side. One is processing, in the sensory-overload manner of a human child; the other is performing a series of simple movements made possible by the servomotors installed inside the silicone casing that is its skin. "Is it difficult to play with her?" the father asks. His daughter looks to him, then back at the android. "Do you feel strange?" her father asks. Even he must admit that the robot is not entirely believable. Eventually, after a few long minutes, the girl announces, "I am so tired." Then she bursts into tears. In the 15 years since, Ishiguro has produced some 30 androids, most of them female. They have included replicas of an actress, and a fashion model. These androids have made numerous public appearances—in cafés and department stores, singing in malls, performing in a play. Mostly, though, Ishiguro's brood of pretty "women" is used for his academic experiments. Ishiguro, 54, is a distinguished professor at one of the country's top universities, with two labs, partnerships with a dozen private companies throughout Japan, a recent $16 million grant from the government (one of its most generous in science and engineering, he says), and seven secretaries to manage it all. (2)

Today, the technical ability to produce a robot that truly looks and moves and speaks like a human remains well beyond our reach. Even further beyond our grasp is the capacity to imbue such a machine with humanness. Because to re-create human presence we need to know more about ourselves than we do—about the accumulation of cues and micromovements that trigger our empathy, put us at ease, and earn our trust. Someday we may crack the problem of creating artificial general intelligence—a machine brain that can intuitively perform any human intellectual task—but why would we choose to interact with it? Ishiguro believes that since we're hardwired to interact with and place our faith in humans, the more humanlike we can make a robot appear, the more open we'll be to sharing our lives with it. Toward this end, his teams are pioneering a young field of research called human-robot interaction (HRI). HRI is a hybrid discipline: part engineering, part AI, part social psychology and cognitive science. The aim is to analyze and cultivate our evolving relationship with robots. HRI seeks to understand why and when we're willing to interact with, and maybe even feel affection for, a machine. And with each android he produces, Ishiguro believes he is moving closer to building that trust. At any given time, students and staff may be testing, measuring, and recording the responses of dozens of volunteers to the androids at their disposal. What about its behavior or appearance, its specific facial expressions and minute body movements, do they find alienating? What draws them closer? These androids are used to find answers to an ever-growing list of research questions: How important is nonverbal communication to establishing trust between

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humans (and, therefore, between human and android)? Under what circumstances might we treat an android like a human? (3)

Over the several months we are in contact, Ishiguro will share information that strikes me as deeply personal: He has contemplated suicide twice in his life; though he has a family, he considers himself a lonely man. I will hear him use that word to describe himself—lonely— about half a dozen times. Ishiguro is aware of resistance to the concept of an android—at least in the West, from which many Japanese researchers take their cue. Ishiguro, too, is worried that pushing ahead with an untraditional approach might cost him his academic career. But he can't resist.With his next project, he decides to go rogue. He will create an android "to convince them." His first android should be modeled after a human child. And given the painstaking production process—a model must spend hours encased in plaster to cast an accurate replica—there is only one child he can possibly get permission to use: his own. A few years earlier, Ishiguro became a father to a daughter Risa, named Risa, and he now turns to his wife to explain his plan. In early 2002, the entire family along with makeup and special effects artists, gathers in his lab on campus and begins the process of creating a replica of Risa. The results of the experiment are mixed. Ishiguro has to admit that the low-budget android, with its limited, stuttering movements, is more zombie than human. And though he shows the project only to a trusted inner circle, word of the "daughter android" spreads, becoming a weird legend. (In describing it, one roboticist I speak with uses the word "crazy," another "strange" and "a little bit scary.") But it gives Ishiguro the confidence to move forward. In 2005, Ishiguro unveils another robot to the public. Modeled on a

grown woman (a popular Tokyo newscaster) and produced with better funding, this version can move its upper body fluidly and lip-synch to recorded speech. Twice he has witnessed others have the opportunity to encounter their robot self, and he covets that experience. Besides, his daughter was too young, and the newscaster, though an adult, was, in his words, an "ordinary" person: Neither was able to analyze their android encounter like a trained scientist. A true researcher should have his own double, his mechanical twin. This android is a step forward, but it still falls well short of verisimilitude. Its hands, at rest on its lap, are rubbery to the touch; its eyes are clearly made of a hard, bright plastic. Lean in close and you can hear the soft hum of a hidden motor; a gentle click is audible each time it blinks. At times, its overall effect, and that of its sisters, is of a human-sized puppet. But the it is also unsettling. Because, somehow, all these elements work in concert to simulate a sympathetic interaction with a human. The viewer cannot help but assign an entire range of emotions to its face: melancholic (mouth downturned), upset (eyes squinted shut), skeptical (a sideways glance), pensive (the tilt of its head to the left). When its eyes meet yours, motion sensors detecting your position, just for a moment you feel that it—this "he," this "Ishiguro"—is aware of you. This replica, Geminoid HI, brings Ishiguro the recognition he has longed for. Using his double, he and his team publish dozens of studies, analyzing the participants' range of reactions to him and his copy. Side by side, he and his Geminoid make appearances on TV shows across Asia and Europe. Ishiguro also begins giving lectures around the world without leaving his lab, teleoperating and speaking through the android, which is carefully transported abroad

by an assistant. (Its legs and torso are checked with the luggage; its head is carry-on.) Ishiguro becomes a source of fascination; he is transformed from a researcher to the man who made his copy. Invitations for conferences and festivals stream in. The success of this particular android is due, in part, to how it seems to operate on several levels. It is, like its predecessors, a circus trick: Look at the human, look at his copy! Try to tell them apart! It is also Ishiguro's bid at solving an existential dilemma—a striking attempt by the maker to master himself, to make of himself something more enduring. At the same time, it has created a new predicament. Ishiguro has discovered unexpected consequences of living alongside his own replica Now he must keep his (naturally shifting, aging) human body corralled within the android's static limits. He finds himself accommodating his android, measuring himself against it, being defined by it, his worth determined by it. In this way, his android makes him both painfully conscious of his aging body and more physically confident than he's ever been. Soon his students begin comparing him to the Geminoid—"Oh, professor, you are getting old," they tease—and Ishiguro finds little humor in it. A few years later, at 46, he has another cast of his face made, to reflect his aging, producing a second version of HI. But to repeat this process every few years would be costly and hard on his vanity. Instead, Ishiguro embraces the logical alternative: to alter his human form to match that of his copy. He opts for a range of cosmetic procedures—laser treatments and the injection of his own blood cells into his face. He also begins watching his diet and lifting weights; he loses about 20 pounds. "I decided not to get old anymore," says Ishiguro, whose English is excellent but syntactically imperfect.

"Always I am getting younger." Remaining twinned with his creation has become a compulsion. "Android has my identity," he says. "I need to be identical with my android, otherwise I'm going to lose my identity." (4)

On a winter day in 2012, a crowd clusters around a large glass case in Tokyo's Takashimaya department store. Perched inside is a Geminoid F in an elegant silk dress. Valentine's Day is coming soon, and "she" sits, as if waiting for someone, before a backdrop of gift boxes wrapped in rose-patterned paper and large red bows. She spends her days staring at her smartphone and mostly ignoring the thousands of visitors who press close to the glass. All the while, she goes through a range of facial expressions, a spectrum of subtle emotions, as if reacting to some text she has just received. It's a clever ploy: By not interacting much with her onlookers, the simulation maintains the appearance of a human likeness—after all, real people spend a lot of time willfully ignoring their surroundings. But occasionally, when you approach, she looks up at you and smiles, and for a moment this feels like an encounter with a pretty stranger. Some days, Ishiguro stands by the main entrance and watches the people who stop in front of her. (5)

As complex as we assume ourselves to be, our bonds with one another are often built on very little. Given all the time we now spend living through technology, not many of us would notice, at least at first, if the friend we were messaging were replaced by a bot. And humans do not require much to stir up feelings of empathy with another person or creature—even an object. The test found that subjects were quick to assign emotions and intentions to a piece of wood operated with a joystick. In other words, we are so hardwired for empathy that our

brains are willing to make the leap to humanizing a piece of wood. It's a level of animal instinct that's slapstick-hilarious and a degree of vulnerability that's terrifying. But as the object of our attention moves closer in appearance to human, our expectations of them grow far more complex. Ishiguro published a study of neurons associated with empathy. The team used an fMRI machine to scan the brains of 20 people in their twenties and thirties as they watched separate videos of one of Ishiguro's female androids, the same android with its machinery revealed, and the living human that the android was modeled after. The subjects saw each in turn wave its hand, nod, pick up a piece of paper, wipe a table with a cloth. Of the three videos, it was while watching the humanlike android's motions that the parietal cortex of the subjects' brains would light up most—in particular, the areas that connect our detection of bodily movement with our so-called empathy neurons. The researchers believe this revealed that the smallest gestures can create perceptual contradictions in the brain. Ishiguro returned to the lab and redoubled his focus on the android's most minute movements: the precise tilt of the chin, the rotation of the head, the restraint of the smile. Around the same time as the department store display, Ishiguro managed to use the Geminoid F to generate a bond between two humans. Tettchan, then a game designer based in Tokyo, was recently divorced when he met Ishiguro in 2012, and he mentioned that he was curious about the possibility of a romance with a longtime friend named Miki. Ishiguro invited them both to his research institute. He placed Tettchan at the teleoperation desk and closed the door; he took Miki into the other room to meet the Geminoid F. Then he invited Tettchan (who was

listening in) to talk to him and Miki through the robot. As Tettchan spoke, his voice computer-altered to sound female, the android's lips moved in sync with his words, the tilt of her head and her long human hair in rhythm with his own movements. "It's like a real female," Ishiguro told Miki, enjoying himself. "This is not Tettchan, this is a new woman, really cute and beautiful." And so they "played," making small talk, Tettchan trying out his new female incarnation. He made Miki and Ishiguro laugh, and watching Miki's face through the monitor, he could see a change. That was when Ishiguro, knowing Tettchan's complicated feelings for Miki, said to her, "OK, you should kiss her." And Miki, looking hesitant, leaned in toward the android—the android inhabited by Tettchan—and kissed it on the cheek. The feeling, Tettchan said, was "like thunder." Any boundary between them suddenly vanished. Tettchan is still not exactly sure how Ishiguro's machine worked on them, but he remains convinced that it made them into a couple. (6)

Ishiguro has spent a lot of time talking to himself through his androids, testing them, imagining their effect on other people. Ishiguro tells me he'd like to record himself saying "I love you" and then program an android to repeat it back to him in a female voice. He is kidding when he says this—but maybe it's another of his half-jokes. At the very least, he believes the need for such an exchange exists. It would be, he says, "a real conversation." A conversation with himself. "A conversation is a kind of illusion," he says. "I don't know what is going on in your brain. All I can know is what I'm thinking. Always I am asking questions to myself, but through conversations." Over the years of operating his androids, communicating through them or with them, he has found that he isn't really concerned about the other person's

thoughts. "Always I am thinking of myself. I need to understand your intention, but it is not priority. Before that, I want to make clear something in my brain. Otherwise, what is the motivation to talk?" In other words, he can only imagine using conversation with others as a means to better understand himself—and nothing is more pressing than that. He turns to the conversation the two of us are having. "We don't know how much information we are sharing," he tells me. "I am always guessing, and you are always guessing, and through our conversation patterns we can believe that we exchange information. But I cannot access your brain directly. "What is 'connection'?" he asks. "Other person is just a mirror." On some fundamental level, we understand each other's immediate intentions and desires—of course, we do; how else would we function? But his view, though stark, seems sadly right: There are entire planets of intimate information, our most interior level of consciousness, that we will never fully be able to share. Our longing to connect, to bridge this divide, is a driving human desire—one that he believes will someday be satisfied through humanlike machines. He is convinced that human emotions, whether empathy or romantic love, are nothing more than responses to stimuli, subject to manipulation. Through the fluid interplay of its pneumatic joints, the arch of its mechanical brow, the tilt of its plastic skull, the many subtle movements achieved through years of research studying the human template, the android becomes more able to span that gap, to form a perfectly engineered bond with us. An elaborate trick, perhaps—but what does that matter, if it fills a need? If it feels real? I think of the gentle look on the face of Geminoid F as she glances down at a smartphone that she

cannot read. He wants us to imagine her reading notes we have sent her, to imagine her loneliness, to love her. Every time we project our own feelings onto her—imagine a shared experience, a connection—his work inches forward. He says little about his personal life, but, with his constant travel and self-imposed 16-hour workdays, I understand that he and his wife lead fairly independent lives. "We have some simple rules. She never asks about my job, I never ask about her hobbies." Quickly, he brightens up—he has found a way to return, in his mind, to the work. "I want to know the meaning of 'love.' Do you know the real meaning? What is 'love'?" I think for a moment. "It changes all the time in my mind." "That's good!" he says, surprised. "You are like a scientist. I am always changing too. I am having different hypotheses every year. Before I pass away, I want to have a better understanding about love." He now tells me of the two times he has seriously considered suicide: first at 36, when one of his top students bested him at a computer-programming challenge (his focus at the time), and again 10 years later, when another student proved to be a sharper, more prolific writer of technical papers (something Ishiguro took great pride in). Both times, he swerved out of the depression by finding a new angle on his work. But those instances heightened his dread that he might not be able to prevent the slow, natural deterioration of his mind. He is already certain that his concentration is not what it once was. Developing dementia as he ages is his worst fear. Without being able to generate new ideas, "probably I cannot find any reason to survive in this world. I don't like to imagine that." We are quiet for a moment. "Can you imagine what it would be like," he asks, "to want to kiss a robot? To want to kiss that rubber, not-

human flesh? There are people who have those kinds of desires. Imagine if you could run heat through its skin so that it feels not like cold rubber but warm to the touch? There are people who want to try things with that." Human romantic relationships are unavoidably messy, he says, and many people would like to keep their lives simple—in which case a relationship with an android might be a solution. "I think this is the future," he says. He proposes that we are not far from a time (he suggests roughly the year 2050) when humans will desire robots as friends, partners, even spouses—a premise he seems unnervingly OK with. It all comes down to our willingness to believe in the robot's emotional life and desires. Designed with the physical proportions that its human owner prefers, the preferred eye color and personality type, and the ability to recall its owner's personal stories and little jokes, android will captivate human. "If a robot behaves as though it has feelings, can we reasonably argue that it does not? If a robot's artificial emotions prompt it to say things such as 'I love you,' surely we should be willing to accept these statements at face value. Why, if a robot that we know to be emotionally intelligent, says, 'I love you', should we doubt it?" Human emotions, he argues, are no less "programmed" than those of an intelligent machine: "We have hormones, we have neurons, and we are 'wired' in a way that creates our emotions." In other words, he argues, our inner lives are essentially algorithmic, much like an AI's. A few decades from now, he writes, the differences between human and android may be "no greater than the cultural differences between peoples from different countries or even from different parts of the same country." These are pretty radical ideas about human nature, and yet I

recognize the desire some might have to turn to an android for companionship—for comfort when you're far from home, maybe on the other side of the planet. And if someone provides you with a salve, why not take it? Most of us already allow technology to mediate what was once simple, direct human interaction—what really is the difference? And is that difference so essential to the experience of being human that it must be preserved? (7)

Now Ishiguro tells us about how, from the moment he started exposing people to his androids, a shift took place: The androids, he says, seemed to unmask the humans around them, to reveal a desire they'd carefully been hiding—for connection, for touch. Shortly after the android of his daughter was completed in 2002, Ishiguro had his students use it to test the differences in human response to a mechanical-looking robot and one that was humanlike. When not in use, the android was left in the middle of the lab, and soon a few students complained that they were having trouble working in front of it. They felt it looking at them. (From then on, they made a habit of placing it with its face to the wall.) Things were further complicated when Ishiguro was informed that one of the students had become attached to his daughter's replica. During the day, this student would run the experiments, but late at night, when he thought he was alone in the lab, he would chat with it. This incident made him realize that these androids could have unexpected emotional impact. "That was the first android," Ishiguro says. "We did not know what would happen." He assigned another student to oversee the work. He also laid some ground rules for how it could be used: not late at night and not alone. When he then created the first replica of a grown woman, he was a little wary of what his students might do with it

in the lab. His theory is that a friendly human woman will always be merely a "real person," never as "elegant" as her android counterpart. "We want to have some ideal partner, and the android can be a very strong mirror to reflect your own idea." In this way, a relationship with an android is like having a partner who is, literally, an extension of yourself. Recently he embarked on a new project that marries his personal perfectionism with his ideas about female beauty: During my visit, he and his robotics team are at work on what he refers to as "the most beautiful woman." His not-entirely-empirical approach to its appearance has included speaking with a popular cosmetic surgeon, analyzing images of Miss Universe pageant finalists, and, in the end, trusting his gut. He was thrilled to discover that the slightest change to its eyes or nose transformed the rendering into a completely different person. "It feels like—how can I say?—not my daughter, but a special person for me," he says. Now, when I ask him why he puts such emphasis on good-looking mechanical women, he reminds me that the larger goal of his field is to have people accept robots into their lives. "And which is more acceptable to many people," he asks, "beautiful woman or ugly woman?" In a lecture I later hear him give, he sums it up like this: "A beautiful woman you don't picture going to the restroom or getting tired. So I think beauty is better represented by android." (8)

Now something is starting to happen: I am falling for someone I met on the second night of my trip. It is thrilling. And for me right now, immersed in the world of android design—in which we search for signs of human kindness or sadness or pity in a mechanical face—it is also a relief that something so simple can still happen. It is a relief because it means that our chemistry is not as cool as a set of

programmed responses—there's an immediate magic to it. To know that that instinct is not broken in me, and to be able to answer it, makes me feel like a person again. (9)

Adapted from Wired.

Exercise III.

Find paragraphs, dealing with the following: tilt, sensory-overload , female, malls, brood, grasp, cues, task, hardwired, humanlike

Exercise IV.

Fill in the gaps.

1. Chess can, indeed, be …........................... expressive of life's mystery and mental torture.

2. Such human encounters, momentary though they are, enhance life in an …........................... way.

3. They …........................... in ways that previously seemed possible only with digital animation.

4. I …........................... from some of the great programs that have already been put in place.

5. The implications of these facts are a cause for …............................... for any thinking person.

6. It feels like anxiety, like a constant …............................... sense that something is wrong.

7. The reason for this sort of thing is a certain lack of …........................... in our society.

8. However it came about, this …..............................., technical tweak was extremely consequential.

9. The oceans on the other hand can …............................. even the most cynical of aesthetes.

10. You can comfort yourself with food and stay thin with these simple

…...........................

Exercise V.

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

to take a cue, to stir up, to trigger one's empathy, to put somebody at ease, to earn one's trust, to crack the problem

Exercise VI.

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

incarnation	the outer layer, especially of the brain and other organs
counterpart	to hold the attention of someone by being extremely interesting, exciting, pleasant, or attractive
predecessor	extremely careful and correct, and involving a lot of effort
restraint	existing for a long time
subtle	a person who held a job or office before the current holder
to captivate	a person or thing holding a position or performing a function that corresponds to that of another person or thing in another place
concern	a particular life,

	in religions that believe that we have many lives
enduring	something that limits the freedom of someone or something, or that prevents something from growing or increasing
cortex	not loud, bright, noticeable, or obvious in any way
painstaking	to cause worry to someone

Exercise VII.

Summarize the article "Love in the Time of Robots"

Part 2

Exercise I.

Identify the part of speech the words belong to.

ineffable, predicament, compulsion, interaction, cognitive, affection, appearance, specific, facial, expression

Exercise II.

Form adverbs from the following words:

beautiful (1), realistic (1), nature (1), regular (1), simple (1), artificial (2), general (2), part (2), psychology (2), personal (3)

Exercise III.

Find synonyms to the following words. Translate them into Russian:

lonely (4), confidence (4), inner (4), worried (4), convince (4), replica (4), permission (4), entire (4), movement (4), trust (4)

Exercise IV .

Find antonyms to the following words. Translate them into Russian:

ugly (8), completely (8), tired (8), acceptable (8), immediate (9), magic (9), relief (9), kindness (9), sadness (9), pity (9)

Exercise V.

Match the words to make word combinations:

ground	replicas
person-to-person	intervals
fluorescent	cheeks
pale	manner
child-puffy	rules
shoulder-length	interaction
fashion	yellow
regular	hair
human	model
sensory-overload	lights

SUPPLEMENTARY READING

My Mom, the Missile Computress

What it was like being among the first women in the US missile program.

At first, it was hard to attract women to China Lake. Maybe it was the slot machines at the officers' club; or the taxi to the brothels at the nearby mining town of Red Mountain; or the bikini-clad "pinup" girl in every issue of the *Rocketeer*, with captions like "Eyes are upon shapely Philippine actress Sonja." The nearby defunct mining town of Red Mountain advertised itself as a "living ghost town"—complete with women dressed like Old West barmaids and rooms above the bar where you could take them for a little living history. According to the base's first commander, the men who came to work at China Lake were "war-weary veterans, with nervous disorders and physical problems," just back from the battlefields of World War II. It was not a place that attracted missile wives.

The navy claimed the Indian Wells Valley in 1943. At the time, it was home to the Desert Kawaiisu and Panamint Shoshone, though Sherman Burroughs, who discovered the land, told the navy there was "no one there." The valley was full of mining tunnels but not many miners, the Gold Rush having ended decades before. The few miners who remained had turned into what we call "desert rats." One was living in three sedans—one for a kitchen, another a parlor, and the third for his bedroom—on the lake bed. Another was known locally as the "Mad Doctor" in the struggling town of Crumville, later renamed Ridgecrest. People thought he was mad because he gave up his job as an LA physician to strike it rich in the desert, though there was little gold to be had in the Indian Wells Valley. Crumville was a frontier town full of missionaries, saloons, brothels, homesteaders, and gunplay, with about 100 people.

In its early years, the base was half war town and half Wild West. But base commander Sherman Burroughs had bigger plans. He wanted a permanent research facility to rival Hitler's military base on the Baltic Sea, where engineers developed the V-1 and V-2 missiles that rained down on London in the Blitz. China Lake, Burroughs declared, should be "an American Peenemünde ... a place where nobody knew what the

hell was going on." There would be, Burroughs said, "a huge laboratory wherein men and arms would be perfected for winning this war and for safe-guarding our national integrity in the future." He wanted perfect men and perfect missiles. Today, a giant white "B" still hovers on a hill overlooking the town, commemorating Burroughs as our founder.

Burroughs's only problem was women. Unlike sailors, who had no choice where they were sent, scientists would not permanently move to the desert without their wives. So China Lake was forced to clean up its image and look "safe" enough for women. First, the navy shut down the base casinos and the shuttle to Red Mountain. A short promotional film was made of the slot machines being run over by bulldozers, guaranteeing they would not miraculously reappear. Prospective employee families could watch this video, which lauded the "family friendly" environment of China Lake.

Next, they went after the brothels. In a 1952 memo sent to all base personnel, Captain Walter Vieweg, China Lake's commander at the time, wrote, "All service personnel are prohibited from patronizing, entering, or frequenting the Owl Café and Hotel, Helen's Place (also known as 'Goat Ranch'), Mamie's Place (also known as 'Hog Ranch'), and J and J rooms." All houses of prostitution. Unfortunately, the memo had the opposite of its intended effect since it provided directions to each of these secret establishments. It was even posted on their doors, serving as an inadvertent advertisement. The first thing I noticed about this memo when I found it in the National Archives was the name Captain Vieweg, the namesake of my elementary school after Groves. I weirdly thought of second grade, prostitutes, and farm animals all at once. It didn't sit well in my stomach.

China Lake became a family-friendly environment by aggressively promoting activities such as church ice cream socials, Disney movie screenings, and the base's endless "hobby clubs." There was "Pebble Pups" (I joined), "Rock Hounds" (my sister joined), "Toast-masters " (my mom joined), and "The Wildflower Club" (we all joined). There were also clubs for fencing, four-wheel driving, scuba diving, Ping-Pong, square dancing, watercolor painting, junior rifle, and many more. Christine and I chose the rock clubs because they met in the Quonset huts across the street from our duplex on Rowe Street. There, we learned to polish and grind desert rocks and slice geodes, making them perfect for our wall shelves.

But it turned out the best idea for keeping women in town was simply to hire them. The navy began to advertise a class called "Housewife to Draftsman in Only Twelve Weeks" in the local *Rocketeer* in 1951. Over time, this turned into a quota system for hiring women on the base. So when my mom suddenly said, "I need to get out of the house, Earl. I'm going crazy at home," we all knew what that meant.

My mom wasn't happy if she wasn't working; she had always meant to return to work at some point.

"Hm ..." My dad thought aloud for a moment. "Okay, you could give it a try. You might have a shot."

"But I would hate to leave the kids alone after school," she said. "Do you really think that's okay?"

"We'll be all right," I quickly replied. "Christine can watch me." She raised an eyebrow.

"We can get a babysitter, Mary," my dad offered instead.

So, just like that, my mom disappeared. She had outstrategized us, getting a job in a section of the base called "Area E," short for "Experimental Air Center," where my sister and I were not allowed to go. Her division was Electronics Warfare. She told us only that rattlesnakes liked to sun themselves on the long airstrip there, which had been built for the B-29 bomber to carry the atom bomb. Overnight, we were a triangle that had imploded. The weapons were her new babies, not us, and one big family probably stood over and looked down at the weapons, smiling and holding hands. I wanted her back waiting at home to see if we lived or died in the desert.

My mom was assigned to Code 35203 as a "math aid," but all I knew was that she worked with the Gerber photoplotter, a machine that etches computer-drawn circuit board designs onto negatives. I only knew this because, when I called her at work, the secretary would often say, "She's with the Gerber now." Not me. The Gerber was in a darkroom where she could not be disturbed.

What I did not know was what she did in there. Only later did I find out that through a side door she would feed the Gerber negative paper. Then its innards would slowly digest it, spitting out drawings etched with a xenon lamp. It took around 10 hours. After the negative was done, it was passed to the photo lab for processing, then glued to a sheet of copper and placed in a chemical vat that would eat away everything but the etched design. The final product was installed in the missile's nose, then taken to the desert for tests. My mom's boss

designed the circuit boards. My mom programmed the Gerber with Xs and Ys.

Together, they built the brains that made the missiles run.

The Gerber photoplotter, named after its designer, Joseph Gerber, who has nothing to do with baby food, was my mom's new baby. My mom said the Gerber had to be kept in the dark and cleaned often. It also emitted a moaning howl that was loud enough to require headphones and could blind my mom with its xenon lamp unless she wore her dark safety goggles. It turned out that the Gerber's sensitivities made people sensitive, too.

Her boss, Mr. Bukowski, designed missile circuitry and was a world-renowned expert on "spirals," which I imagined was a Slinky so hard to design that it required a PhD. Their office, which was miles from anywhere, was a magnet for desert creatures seeking shade or water. Once, she said, a rattlesnake was found under a desk at work. Even so, it seemed to me, she was far more worried about the Gerber than that snake.

Her problems all started when she tried to change the filter in the Gerber. Technically, she was supposed to call the Gerber people for that, but she was a Depression-era kid and believed in fixing things herself. She tried to explain the problem with the Gerber people in a memo to Mr. Bukowski: "Their willingness to declare our lamps unusable may be motivated by their desire to sell a modification to the Gerber." She thought a new filter would fix everything instead, that it would be a simple change.

But a co-worker of hers, Harris in Operations, disagreed. He was a middle-aged man with a loud voice and saggy face who thought those Equal Rights Amendment "Freedom Train" feminists were going too far. He supported Phyllis Schlafly, who said women should stay at home. So when he happened to catch my mom changing the filter, disobeying protocol, he knew he had found an easy target. He stormed in, towering over her, and shouted, "That's an Operations job. Our filter changer handles that."

My mom was taken aback by his bulk and apparent confusion. There was no "filter changer," as far as she knew. She had assumed he would tell her to call Gerber. Nevertheless, she was driven back by his size and the way he leaned in over her. "Get out of here!" he yelled.

"Is there a filter changer?" she wrote to Mr. Bukowski from the safety of her office. He had not heard of one either. They decided to wait and see what would happen next.

After a few days with work at a standstill and no filter changer in sight, my mom wrote to her division head—above even Mr. Bukowski —to explain that she was not allowed to change the filter and thus was unable to work. A simple filter change, she explained, would force the machine to recalibrate and fix the problem. Until then, any plots she printed would be bad. The spirals would not have their perfect arc. The missiles would not fly.

For Harris, that memo to Mr. Bukowski's boss may as well have been an official declaration of war. When he got wind of it, he began his own memo-writing campaign. First, he sent one to my mom, even though her office was only down the hallway from his, stating that all further requests for plotting had to go through him. He accused my mom of secretly "tampering" with the Gerber and attached a "request form" for her to mail to him when she wanted to use the plotter again.
"More copies are available in my office," he wrote.

The number of memos written, encoded, and passed between people who were working in the same hall might seem surprising to those who are not in Defense. There, everything has to be documented, double-entry-style, and preferably in acronyms. Otherwise, it does not exist. Today, I picture my mom's days unfolding at work like a twisted ballet, with the Gerber in the middle of the stage. Dancers come and go, sometimes blocking access to the machine, sometimes hiding behind it. Mom and Harris are locked in a ballet battle until one of them dies in the end, falling in a curtain of red ballet blood. Had the Gerber been a shrine and whoever approached it a prophet, the problem would have been that Harris did not believe in female prophets. He thought my mom was a false prophet. He thought this machine was good the way it was and did not need anything but him.

In contrast, for my mom the Gerber was a finicky child who had to be coaxed and preened so it would perform well. She knew that if the needs of the Gerber were ignored, it would create bad plots, little temper tantrums that would lead to bad missiles. Bad missiles made my dad leave town to fix them. And if a missile left a navy carrier chute with a bad circuit, there would be just one big plunk and then a long journey to the bottom of the ocean with all that money trailing behind. My mom believed the troops depended upon her and did not want a plunk. She did

not want to waste that money. To her, sabotaging the Gerber meant sabotaging U.S. Defense. My mom must have thought she was facing an eternal enemy of the United States: treason. And all because Harris was withholding access to the plotter.

Finally, according to my mom's notes, which told me the story of this drama, a new photoplotter operator appeared, Martha, who was petite with feathered red hair, diamond stud earrings, and bright red nails. She was a "downtime" person, which meant her "JO" (Job Order) had run out, leaving her without an assignment or funding from a particular missile program. In China Lake, to be on downtime was humiliating. It meant you were wasting "overhead," or taxpayer money. You would be shunned as if you were contagious. Downtime people had nothing to do because they were not popular or smart enough to be picked for work on a particular missile. For instance, my dad put "AIM-9L" on his work stubs for years because he was being paid with money allotted for the Sidewinder. He was a Sidewinder person, whereas a downtime person is nothing. It meant you did not stay in one place for long but were more like a "temp" worker, sent to fill in holes everywhere, and the hole at my mom's office was suddenly, mysteriously, for a "filter changer."

So Martha was sent to Harris, who put her in charge of the Gerber. One had to wonder how she got to be in charge, to the point that in the end she could stop production on the Sidearm. Apparently, she had only a high school degree. Was Harris having an affair with her and treating the Gerber like a present for her? Was she just that pretty? Whatever the reason, my mom's access to the Gerber did not improve after Martha arrived. Once, after getting two hours with the plotter, my mom had to beg Harris for two more.

Then he yelled at her, "Can't you do anything right?"She started to cry. And the filter was never changed, not for four long months. If my mom believed in "working as good as any man," Martha clearly had a different strategy. She believed in the power of rumors. First, Martha wrote a memo claiming my mom had been imagining problems with the Gerber and was compulsively tampering with it. Next, she started printing plots and showing them to everyone to prove the Gerber worked fine. In response, my mom printed her own plots, pointing out the problem to Martha. My mom wrote to Harris, "Only a non-trivial design, such as a modulated spiral, would likely repeat the problem." In response, Harris accused her of calling him "trivial. Who knows how

long this "print off" might have lasted if Mr. Bukowski had not finally intervened. "The plots are bad," he wrote to Harris. "I should not have to tell you this."

Next, Martha tried a different strategy. She claimed my mom's software instructions were the problem, not the Gerber. She refused to communicate any further with my mom, who she said was being irrational. Because of this, Mr. Bukowski had to be constantly on the phone, even while on vacation, as a mediator between Martha and my mom. He even wrote to his boss to complain.

Finally, Martha hit on a winning rumor. "Why do you think Mr. Bukowski treats her better than everyone else?" she whispered, lifting an eye in insinuation. My mom overheard this and knew there was no evidence to prove Martha wrong this time. There was nothing to print, nothing mathematical to prove, which was her specialty. And rumors will always find allies. Soon my mom heard people whispering in the hallways that she was Mr. Bukowski's "pet." They questioned her credentials, wondering how she got the job without a degree in computer science, only medical technology.

One day, she heard something rattling in her desk drawer and opened it to find bullets. "They were about this size—" She held her fingers an inch apart when she told me.

"What did you do?" I asked, my eyes twice as big.

"I told some people about it, but they just shrugged. Then the janitor said he could use them, so I gave them to him. He said they were for a rifle."

"What were they doing out there?" I said.

My mom shrugged. "I assumed they were for rattlesnakes," she said. "But maybe they were for spies." Then she laughed.

At the time, she was not laughing. Instead, she retreated to the couch and called in sick. That was when Mr. Bukowski finally stepped in. To me,

Mr. Bukowski sounded like the kind of guy who could take a lot but had his breaking point. His parents had escaped from the Soviet Union, after all, so he must have known plenty about cat-and-mouse games, government bullies, and espionage. He decided he could play.

"I want you to keep an eye on the Gerber room and report to me who is using it every day," he first wrote to the micro-miniature lab. They were in the room next to the Gerber lab.

Soon the spy was writing on U.S. Navy letterhead every day, "No one today." Next, Mr. Bukowski passed this information up to his boss: "No

one today." Evidence against Harris began to mount. Cases were being prepared. The plan was to prove that Harris was deliberately withholding the Gerber from my mother, claiming it was in use when it was not. They needed the double-entry ledger for that.

One day, Mr. Bukowski urgently needed plots for a trip to Dallas, but when my mom went to the Gerber room, she found it locked. The secretary then told her that both Martha and Harris had gone out of town for a few days and had taken the key. In a panic, my mom burst into Mr. Bukowski's high-level meeting to explain. A sea of desert- grizzled engineering faces looked up at her.

"They've ... they've gone," my mom sputtered, humiliated. "They took the Gerber key!"

Mr. Bukowski had to cancel his trip to Dallas, the contractors had to postpone the missile production schedule, and ultimately the missiles may not have made it to the field in time. This was when Mr. Bukowski, a mild-mannered Polish man whose parents had told him to be grateful every day for what he had, finally lost it and was no longer grateful. He wrote to his boss, "The generating of high quality Gerber artwork has always been a challenge and undoubtedly will continue to be so; but the events of the last four weeks were almost enough to make me look for some other kind of work."

And because Mr. Bukowski never lost it, a decision from above finally came down. A memo arrived from Code 35, above them all, copied to everyone involved. It read simply, "Any problems with the Gerber will be solved by Mary." The verdict was in. My mom lost many battles but finally won the war. But war leaves scars, and living next to the enemy, even after a détente, is never easy. After that, my mom suffered from a lack of confidence. Since my parents were from different branches and could talk only on a "need to know" basis, she could not tell my dad what was going on. He started to draw the blinds when she was on the couch, afraid she would die as his mother had done. He worried about having to travel so much with all of us left in his wake, bouncing and about to upturn like a boat. My sister would stare at him with her serious glasses face, perched and waiting for him to fall over, too.

The Gerber never fully recovered either. After being fussed and fought over so much, it decided it had had enough even after my mother got full custody. The fight had been too long, the adjustments too few.

Its lamp exploded, destroying the mirror and the lens. After that, my mom explained, "It never got back into perfect adjustment."

I would not be surprised if Harris blew it up.

If I asked my mom what she did at work, she would always say, "Oh, I was at the bottom of the totem pole—nothing important," followed by, "People always said I was too slow." Of course, partly this was my mom's personality. Like my dad, she could be shy, humble, and stoical. She once said, "I've always been a nobody all my life. Your dad was always more popular at church." I found this hard to believe, since my dad was the quietest person I have ever known. Nevertheless, after a lifetime of hearing my mother say such things, I truly came to believe them. At least, I assumed my father had the more important job at China Lake. Imagine my surprise when I discovered her work file, which held the Gerber memos.

They also held so much more. My mom started as a GS-3 math aid, which involved using a miniature calculator and "keypunching data and programs" into the mainframe computer, a machine that took up the whole basement and had to be fed wallet-sized cards full of punch holes. But within a decade, she wrote of her credentials, "I have a system level knowledge of Tomahawk's navigation," including its "Inertial Navigation System (INS), Global Positioning System (GPS), barometric and radar altimeters, pre-stored terrain altitude profiles (TERCOM maps), and terrain imagery." She could change a torpedo heading or launch point with the stroke of a DOS (disk operating system) programming line and, out of sheer boredom, once designed a laser bar-coding program years before anyone had heard of such a thing. She wanted to keep track of government property because she thought too much of it was disappearing. While my dad evaluated pitch and roll, my mom prepared the simulation programs and test plans for him to follow. She plotted his results. She analyzed his data. In one yearly review, her division boss wrote, "She is a perfectionist who holds the team together and could easily do any of our jobs. She needs a substantial raise." Imagine that. She not only wrote computer programs, but also converted them to other languages as computers were evolving. She could even build a computer.

After some research, I discovered that my mom's job was not that unusual for women at the time. Called "computresses," women were once hired to operate 40-pound calculators that did nothing more than add, subtract, and divide. They did the math for the engineers. Back

then, this was considered "clerical," or women's work, like typing. But slowly, computers evolved from these motor-driven calculators, and women were the only ones who knew how to use them.

By the time my mom arrived on the scene, calculators were already "miniature," but computers were enormous. She was at the forefront of the shift to computers that was a room-sized IBM mainframe set up in the basement. She told stories about "punch cards" and how the IBM had to constantly be fed with them. That was "programming" then. Ironically, as computers became central to the process of building a missile, and then guiding missiles, women became central, too. The men did not know how to use them. My mom once said to me, "I was shocked that these guys did not know how to do basic things like plotting. I had to do everything for them. Except for Mr. Bukowski, of course. He knew it was important to learn." Nevertheless, the men still got the big salaries. Imagine that.

Adapted from Nautilus.