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**Being Human in the Age of Algorithms:  
part 5**

**Учебное пособие**

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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: *Aeon*, *Psychology Today*, *Nautilus*) 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 five-paragraph fetish

## Part 1

### Exercise I.

Say what Russian words help to guess the meaning of the following words: essays, formula, scholar, structure, unique, form, function, series, formalisms, dominate

### Exercise II.

Make sure you know the following words and word combinations:

Stifling, to mould, to stir, crutch, template, Educational Testing Service, purportedly, to discern, compelling, QED

### **The five-paragraph fetish**

*Writing essays by a formula was meant to be a step on the way.*

*Now it's the stifling goal for student and scholar alike (1)*

Shools and colleges in the United States are adept at teaching students how to write by the numbers. The idea is to make writing easy by eliminating the messy part – making meaning – and focusing effort on reproducing a formal structure. As a result, the act of writing turns from moulding a lump of clay into a unique form to filling a set of jars that are already fired. Not only are the jars unyielding to the touch, but even their number and order are fixed. There are five of them, which, according to the recipe, need to be filled in precise order. Don't stir. Repeat. So let's explore the form and function of this model of writing,

considering both the functions it serves and the damage it does. I trace its roots to a series of formalisms that dominate US education at all levels. The foundation is the five-paragraph essay, a form that is chillingly familiar to anyone who has attended high school in the US. In college, the model expands into the five-section research paper. Then in graduate school comes the five-chapter doctoral dissertation. Same jars, same order. By the time the doctoral student becomes a professor, the pattern is set. The Rule of Five is thoroughly fixed in muscle memory, and the scholar is on track to produce a string of journal articles that follow from it. Then it's time to pass the model on to the next generation. The cycle continues. (2)

Edward White is one participant in the cycle who decided to fight back. He was on the plane home from an ordeal that would have crushed a man with a less robust constitution. An English professor, he had been grading hundreds of five-paragraph essays drawn from the 280,000 that had been submitted as part of the Advanced Placement Test in English language and composition. In revenge, he wrote his own five-paragraph essay about the five-paragraph essay, whose fourth paragraph reads: *The last reason to write this way is the most important. Once you have it down, you can use it for practically anything. Does God exist? Well you can say yes and give three reasons, or no and give three different reasons. It doesn't really matter. You're sure to get a good grade whatever you pick to put into the formula. And that's the real reason for education, to get those good grades without thinking too much and using up too much time.* White's essay became an instant classic. True to the form, he lays out the whole story in his opening

paragraph: *Since the beginning of time, some college teachers have mocked the five-paragraph theme. But I intend to show that they have been mistaken. There are three reasons why I always write five-paragraph themes. First, it gives me an organisational scheme: an introduction (like this one) setting out three subtopics, three paragraphs for my three subtopics, and a concluding paragraph reminding you what I have said, in case you weren't paying attention. Second, it focuses my topic, so I don't just go on and on when I don't have anything much to say. Three and only three subtopics force me to think in a limited way. And third, it lets me write pretty much the same essay on anything at all. So I do pretty well on essay tests. A lot of teachers actually like the five-paragraph theme as much as I do.* Note the classic elements of the model. The focus on form: content is optional. The comfortingly repetitive structure: here's what I'm going to say, here I am saying it, and here's what I just said. The utility for everyone involved: expectations are so clear and so low that every writer can meet them, which means that both teachers and students can succeed without breaking a sweat – a win-win situation if ever there was one. The only thing missing is meaning. For students who need a little more structure in dealing with the middle three paragraphs that make up what instructors call the 'body' of the essay, some helpful tips are available – all couched in the same generic form that could be applicable to anything. According to one online document by a high-school English teacher: *The first paragraph of the body should contain the strongest argument, most significant example, cleverest illustration, or an obvious beginning point. The first sentence of this paragraph should include the*

*'reverse hook' which ties in with the transitional hook at the end of the introductory paragraph. The topic for this paragraph should be in the first or second sentence. This topic should relate to the thesis statement in the introductory paragraph. The last sentence in this paragraph should include a transitional hook to tie into the second paragraph of the body. You probably won't be surprised that the second paragraph 'should contain the second strongest argument, second most significant example, second cleverest illustration, or obvious follow-up to the first paragraph...' And that the third paragraph 'should contain the third strongest argument...' Well, you get the picture. (3)*

So where does the fetish for five come from? In part, it arises from the nature of sentences. Language conveys meaning by organising words into an order governed by rules. These rules are what allows the listener to understand the relationship between these words in the way intended by the speaker. The core unit of conveying meaning via language is the sentence, and the rules that define the structure of the sentence are its syntax. By its nature, syntax – like the five-paragraph essay – is all form and no content. Its entire utility derives from the fact that a particular syntactical structure can be used to convey an infinite number of meanings. Form, therefore, is not just a crutch for beginners to use in trying to learn how to write; it's also the central tool of writers who are experts at their craft. In his book *How to Write a Sentence: And How to Read One*, Stanley Fish makes the point that, in writing, form comes before content: The conventional wisdom is that content comes first – 'you have to write about something' is the usual commonplace – but if what you want to do is learn how to compose sentences, content must take a backseat to the mastery of the forms without which you



can't say anything in the first place. The point is that learning to write is extraordinarily difficult, and teaching people how to write is just as hard. Writers need to figure out what they want to say, put it into a series of sentences whose syntax conveys this meaning, arrange those sentences into paragraphs whose syntax carries the idea forward, and organise paragraphs into a structure that captures the argument as a whole. That's not easy. Stanley Fish distils the message into a single paradoxical commandment for writers: 'You shall tie yourself to forms and the forms shall set you free.' The five-paragraph essay format is an effort to provide a framework for accomplishing all this. (4)

The issue is this: as so often happens in subjects that are taught in school, the template designed as a means toward attaining some important end turns into an end in itself. As a consequence, form trumps meaning. The form becomes the product. Teachers teach the format as a tool; students use the tool to create five paragraphs that reflect the tool; teachers grade the papers on their degree of alignment with the tool. The form helps students to reproduce the form and get graded on this form. Content, meaning, style, originality and other such values are extraneous – nice but not necessary. This is a variation of Goodhart's Law, which says: 'When a measure becomes a target, it ceases to be a good measure.' For example, if test scores become the way to measure student and teacher success, then both parties will work to maximise these scores at the expense of acquiring the underlying skills that these scores are supposed to measure. Assess students on their ability to produce the form of a five-paragraph essay and they will do so, at the expense of learning to write persuasive arguments. The key distinction here is between form and formalism. A form is useful and

necessary as a means for achieving a valued outcome. But when form becomes the valued outcome, then it has turned into formalism. An extreme example of this phenomenon has emerged in the growing field of machine-graded essays. Having experts grade large numbers of papers, such as for the advanced-placement composition exercise that White took part in, is extremely labour-intensive and expensive, not to say mind-numbing. So the Educational Testing Service (ETS) and other companies have come up with automated systems that can take over this function by deploying a series of algorithms that purportedly define good writing. The problem, of course, is that these systems are better at identifying the formal characteristics of these essays than at discerning their meaning. To demonstrate this Les Perelman, along with Louis Sobel and others, invented a Babel Generator that is capable of producing essays from any three keywords, and of gaining a perfect score on the ETS assessment. They did this by gearing the generator to the ETS algorithms, which allows them to produce the desired measure without all that messy stuff about creating logical and compelling arguments. The algorithm rewards big words and long sentences rather than meaning. Of course, students still need to provide some semblance of subject matter for their essays. But there are plenty of handy resources available to produce relevant content on demand. Students use Google as their primary ‘research’ tool, and the top search result for most topics tends to be Wikipedia. The latter serves the same function for students as the old encyclopaedia – capsulised and bowdlerised content ready for insertion into the five-paragraph essay. Plug and play. The perfect tool for gaming the system of producing papers for school. (5)

It is possible to teach students how to write as a way to make meaning rather than fill pots. The problem is that it's much more difficult for both student and teacher. For students, it takes a lot longer to get better at writing this way, and the path to improvement is littered with the discouraging wreckage of dysfunctional sentences and incoherent arguments. And for teachers, the difficulty of teaching the skill this way undermines their sense of professional competence. In addition, grading papers for meaning takes a lot more time and involves a lot more judgment than grading for form – which, after all, can be done by a computer. Carrying out this kind of teaching calls for concentrating effort at two levels. One is teaching students how to make meaning at the sentence level, using syntax to organise words to say what you want them to say. Books on writing at the sentence level lay out a series of useful rules of thumb: be clear, be concise, be direct, focus on actors and actions, play with language, listen for the music. The other is teaching students how to make meaning across an entire text, using rhetorical moves that help them structure a compelling argument from beginning to end. I've also developed my own set of questions that writers need to answer when constructing an analytical text: 1. What's the point? This is the analysis issue: what is your angle? 2. Who says? This is the validity issue: on what (data, literature) are you basing your claims? 3. What's new? This is the value-added issue: what do you contribute that we don't already know? 4. Who cares? This is the significance issue, the most important issue of all, the one that subsumes all the others. Is this work worth doing? Is the text worth reading? But, you ask, aren't these just alternative sets of rules, much like the Rule of

Five? I say no. One difference is that these are clearly labelled not as rules but rules of thumb. They are things to keep in mind as you write (and especially as you edit your writing), many of which might be in tension with each other, and which you must draw upon or ignore as needed. Another difference is that they resist the temptation to provide a rigid structure for a text of the kind that I have been discussing here. Deal with issues in the literature where it helps to frame and support your argument and don't make the reader wait until the conclusion to find out what gives the text significance; most people would stop long before this point. Rules of thumb call for the writer to exercise judgment rather than follow the format. Of course, it takes more time and effort to develop writerly judgment than it does to follow the shortcut of the five-paragraph essay. Form is harder than formalism. But the result is a text that does more than just look like a piece of writing; it makes meaning.

(6)

Let's turn away from the ideal case – learning to write for meaning – and dive back into the real world: teaching school students to write by filling five pots with words. When students get to college, their skills in writing five-paragraph essays start to pay off big time. Compared with high school, the number of papers they need to write in a semester grows exponentially, the required length of papers also shoots up, and there is increasing expectation that these papers demonstrate a bit of professional polish. This pressure to turn out a lot of reasonably competent writing in a short period of time puts a premium on a student's skills to produce text efficiently. And once again, the Rule of Five comes to the rescue. Nothing aids efficiency better than an easily reproducible template. This

leads to two elaborations of the basic model. The first is a simple extension of the model into a format with more than five paragraphs. The length is greater but the structure is the same: a general claim, followed by three pieces of evidence to support it, leading to a conclusion. The college version of the model also ups the ante on the kind of content that is deemed acceptable. Increasingly, the generic synthesis sources that were so helpful in high school are no longer sufficient. This is particularly true in selective colleges, where faculty members expect students to gain familiarity with this thing that they call ‘the literature’. If you’re Ivy League, you need to crib from the best – refereed journal articles by top scholars. Plug in a topic, and Google Scholar provides you with the most cited pieces on the topic. You don’t have to read them, just cite them as evidence in sections two, three and four. The second version of the model is for students who are thinking about graduate school. They can’t settle for supporting an argument with just three sources; they need to produce ‘research’. This means that they need to define an issue, draw on the literature about that issue, develop a method for gathering data about the issue, analyse the data, and draw conclusions. Sounds complicated, but relax: it’s really not that hard. The Rule of Five is up to the challenge. The paper format contains five standard sections. All you have to do is fill them with plausible content. Here’s the model: *Introduce the argument. Summarise the relevant literature. Spell out your research method. Present your findings and analyse them. Draw conclusions.* The argument is – whatever. The literature is a few things you found on Google related to the argument. The method is how you’re going to find

data that could plausibly inform the argument. Findings are some things you encounter that might support your point (think evidence one, evidence two, evidence three from the five-paragraph model). And the conclusion is that, wow, everything lines up to support your original claim. QED. But now suddenly your writing is telling the world: I'm ready for graduate school. The transition from the college research paper to the doctoral dissertation is not as big a jump as you might think. The Rule of Five lives on in the canonical structure for the dissertation, which by now should look familiar: *Introduction. Review of the literature. Methods. Analysis/ findings Conclusion.* Guides on dissertation-writing specify the content of each of the five chapters in detail, with this detail looking remarkably similar across guides. Chapter 1 is supposed to have a problem statement and list of research questions. Chapter 2 needs to cover both the theoretical and empirical literature relevant to the research questions. Chapter 3 needs to spell out research design, measures used, research procedures, and modes of analysis employed. Chapter 4 summarises the findings of the research and provides analysis of these results. And Chapter 5 covers four canonical areas: summary of results, conclusions, limitations of the study, and recommendations for future research. Of course, you do have to fill up these five chapters with content, and the total length can run from 15,000 to 80,000 words. But you have years to do all this. And graduate school helpfully provides you with the content you need. Courses teach you how to create research questions, what the literature says about your particular subfield of expertise, what methods of data collection and analysis can best be used in this field, how to demonstrate

the validity of your findings, and how to draw credible conclusions from your analysis. Pick a topic and pick a method, and the rest is plug and play. Once those decisions are made and the data gathered, the dissertation more or less writes itself. (7)

A telling sign of formalism is that chapter titles in dissertations frequently assume the titles used in the five-chapter outline. Specifying content, personalising the presentation of results, tailoring the format to the demands of your own study – all of these are either not needed or forbidden. Your job is to reproduce the form of the five-chapter dissertation, and you do so, literally. Given how generic the format is, it's not surprising that some companies are willing to go one step further and actually produce the dissertation for you on demand, for the right price. For a little extra money, they will also carry out a plagiarism check. After all, there's nothing worse than a ghostwriter who cheats by plagiarising someone else's work. This brings us to the top level of my examination of the Rule of Five, the way that this form shapes the dominant type of research production used by the professional scholars – the refereed journal article. This is the medium that governs the process of hiring, promotion and tenure within the academic profession. It's the way to get ahead and stay ahead in your career – the way to establish your reputation, gain a following, and win accolades. And in order to get past the gatekeepers in the process – editors and reviewers at top-ranked academic journals – you need to produce papers that meet generally accepted standards. You need papers that look like, feel like, and sound like the canonical journal article. As we have seen at the lower levels, the content can be nearly anything, as

long as the form is correct. The journal-article version of the Rule of Five is known by the IMRaD (or IMRAD), which identifies the labels and order of the conventional paper. The letters stand for the required sections in the proper order: introduction, methods, results, and discussion. Check them off, and you're done. But wait a minute, you say; this is only four sections. What happened to the literature review? Well, it turns out that it is incorporated within the introduction. In a short journal article, prior literature might take up only a paragraph or two of the text, so why waste a whole section on it? For readers and writers alike, IMRaD is simply too handy to give up: This write-by-numbers approach prompts researchers to plan their research methodically, conduct it rigorously, and present it coherently, without leaving out any crucial information. Moreover, a conventional structure is relatively easy for new academics to learn; all they have to do is follow models established by others before them. Readers, meanwhile, know exactly where to look for key findings. They can skim the abstract, mine the literature review, scan the data, and grab the conclusions without wasting valuable time actually reading. I love the last line – 'without wasting valuable time actually reading'. This is the whole point of the Rule of Five, isn't it? It makes scholarly writing easy to learn, easy to read, and easy to evaluate. Like the five-paragraph essay and the five-chapter dissertation, IMRaD reduces the cognitive load involved in teaching, learning, producing, reviewing and consuming academic texts. If you choose not to write by the numbers, you risk alienating teachers, editors, reviewers and readers. You have a big incentive to make their lives easy, which will then increase the likelihood that you will succeed.



This is my point. The Rule of Five spells out issues that need to be addressed in any piece of analytical writing: argument, frame, evidence, analysis, conclusion. If you don't address these issues, then you are not doing an effective job of presenting your work. But by addressing them only in this order, and confining each function of the argument to a hermetically sealed location within the paper, you turn a useful set of guidelines into an iron cage. It's dysfunctional – to say nothing of off-putting and intellectually arid. But, then again, it makes life easier for all concerned. So it's not going away soon. (8)

*Adapted from Aeon.*

### **Exercise III.**

Find paragraphs, dealing with the following: win-win, off-putting, to bowdlerize, to deem, dissertation, muscle, fight, ordeal, revenge, grades

### **Exercise IV.**

Fill in the gaps.

1. With its emphasis on teamwork and fair play, rugby doesn't quite fit that .....
2. If you are able to work down the whole list, I promise you'll .....
3. ...., which is what he reports believing in, is not always right.
4. They used sophisticated equipment to eliminate all ..... sources of noise.
5. In ....., insistent language, the authors hoist one red flag after another.

6. The show is a dramatic and ..... story of love, revenge and torn loyalties.
7. Photographs ..... taken during the party later were found on a Web site.
8. It should be ..... but, as with everything in life, it often isn't.
9. If it is taught well, you will learn how to think both ..... and creatively.
10. It might ..... the Internet as we know it.

**Exercise V.**

Make up sentences of your own with the following word combinations:  
 to have down, to break a sweat, plug and play, rule of thumb, to ante up,  
 to spell out, to be filled in precise order, to trace roots to, to dominate at  
 all levels, to expand into

**Exercise VI.**

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

discouraging	become or make larger or more extensive
gatekeeper	a statement or theory that is put forward as a premise to be maintained or proved
expertise	very skilled or proficient at something
to gear	undergo condensation; change from a gaseous to a liquid state and fall in drops; "water condenses"
thesis	praise and approval

to expand	the term during which some position is held
adept	causing someone to feel less confident or less hopeful
to distil	an attendant at a gate who is employed to control who goes through it
to tenure	expert skill or knowledge in a particular field
accolade	to make something ready or suitable for a particular purpose

### **Exercise VII.**

Summarize the article “The five-paragraph fetish”

### **Part 2**

#### **Exercise I.**

Identify the part of speech the words belong to.

chillingly, constitution, generic, extraneous, persuasive, semblance, incoherent, validity, plagiarism, rigorously

#### **Exercise II.**

Form nouns from the following words:

reproduce (1), formal (1), unique (1), graduate (1), produce (1), important (1), organisational (1), optional (1), succeed (1), helpful (1)

#### **Exercise III.**

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

contain (3), available (3), applicable (3), significant (3), clever (3), obvious (3), beginning (3), include (3), thesis (3), consume (8), (1)

**Exercise IV.**

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

long (8), conventional (8), prior (8), waste (8), last (8), valuable (8),  
increase (8), conclusion (8), useful (8), effective (8)

**Exercise V.**

Match the words to make word combinations:

conventional	paper
ghost	matter
doctoral	school
subject	memory
research	wisdom
high	structure
precise	dissertation
unique	writer
formal	order
muscle	form

## 2. All Over Your Face

### Part 1

#### Exercise I.

Say what Russian words help to guess the meaning of the following words: pseudonym, autism, schizophrenia, aspects, personality, identity, website, photos, regional, imitator.

#### Exercise II.

Make sure you know the following words and word combinations:

Jaywalker, to infer, fleeting, customize, unbecoming, suitor, to dredge, to augment, nefarious, anguished

### All Over Your Face

*Advanced facial-recognition technology can deduce aspects of our personality as well as our identity. Will this new fact of life change the way we act?(1)*

Last year, a Russian firm launched the website FindFace, which matches submitted photos to profiles on the social networking site VK, a regional Facebook imitator. If a stranger photographs you in the street or spots your image on another site, and you're on VK, then FindFace can likely identify you by name. Meanwhile, Moscow police use facial recognition on a network of 160,000 security cameras across the city, and China is using cameras with facial recognition to tag jaywalkers. You can also use your face to pay at some KFCs in China, and it's required before toilet paper can be dispensed at some public restrooms. In Dubai, police wear Google Glass devices that identify the

faces of people in front of them. Here at home, the faces of half of all American adults are already in the government's facial-recognition system. It's becoming harder to go about your life in private, online or off, anywhere in the world. Now researchers are developing techniques that not only identify people by their faces but also infer what's in their minds. Our expressions signal our emotions, and our facial structure can hint at our genetic makeup. We've always known that faces convey information to others, but now ever-present electronic eyes can watch us with untiring attention and with the training to spot our most fleeting micro-expressions. Facial analysis advances at an accelerating rate. Amazon, for example, is testing grocery stores that track users as they shop. Such technology has the potential to make our lives safer, more convenient, and better customized to our individual needs, but it can also entrap us behind bars of social norms or paranoia. As the machines' learning advances, step by step, we must make or accept tradeoffs, explicitly or implicitly. That's why it's worth looking into those electronic eyes, to understand their applications and their social risks and benefits. (2)

Users of dating sites delicately curate what they reveal online, hiding information that they consider unbecoming or that unwanted suitors might use to pursue them beyond the site. But a pseudonym doesn't deliver what it used to. To see how easily a stranger can learn personal information about you, privacy researcher Alessandro Acquisti conducted an experiment. He and two collaborators first used a web browser to collect profile photos of about 5,000 Match.com users in a North American city. They also collected the primary photos of about 100,000 Facebook users in the same city. Using a commercially

available piece of software called PittPatt, they were able to match about one in 10 Match faces to a Facebook face. Before the introduction of such algorithms, the task would have required 500 million comparisons by hand. For the researchers' next act, they pulled in college students walking by their building and took three photos of each of them. They asked the students how they'd feel if a stranger could photograph them and predict their interests and Social Security numbers. On a scale from 1 (most comfortable) to 7 (most uncomfortable), the average ratings were about 5 and 6, respectively. The researchers then proceeded to do just that. They matched the students' photos to Facebook profiles and grabbed their real names, interests, and other information. Then they used those data points and another algorithm to search online and dredge up Social Security numbers. For about a quarter of the participants, they were able to guess the first five digits—enough to run a brute force identity attack for the remaining four—within a few attempts. The method could easily be improved with more photos or slightly better algorithms. Sample responses from the students: "surprised and shocked," "it makes me reassess what I should ever reveal on the internet." Just for fun, Acquisti's team coded up an augmented-reality iPhone app: Point the phone's camera at a stranger, and next to the person's head it displays his or her name, SSN, and date of birth. Acquisti relied only on primary profile photos, but people upload billions of other photos to Facebook every month, many of them tagged by name. A recent study found that by using albums, comments, information about where and when photos were taken, friend networks, and the bodies and backgrounds displayed, even people in untagged

photos with their faces blurred could be identified. "People like to think that they're anonymous and invisible, despite posting lots and lots of information about themselves all over the internet," says psychologist Nicholas Rule. "It all feels private from your living room, but it's the digital equivalent of posting a billboard on the side of a major highway."(3)

Recent advances have made such unintentional broadcasting possible, primarily in an area of artificial intelligence known as machine learning, in which computers discover patterns in data by themselves. Landmarks in machine learning—self-driving cars, automatic language translation—have resulted from three main factors. First, computing power has steadily increased, and new specialized chips tailored for machine learning can run algorithms exponentially faster and more efficiently. Second, "big data" has gotten bigger; remember those billions of Facebook photos. We're surrounded by sensors collecting information about the world and feeding it into databases. This information doesn't just open up our personal lives; it helps to train the computers, which need massive numbers of examples to learn from. A child can see one hot dog and recognize other hot dogs for life, but a computer needs to "see" thousands or millions. Third, the algorithms have improved. Developing artificial neural networks, or neural nets, is the hottest area of machine learning right now. These software models work somewhat similarly to the brain. "Neurons" each process little bits of information, then pass them on to other layers of the net. At first the strength of the connections between neurons is random. But over time, as the network guesses correctly or incorrectly (nope, not a hot dog), it receives feedback and adjusts accordingly. Once it's trained, it's ready to



be used in situations where the answer is not known in advance. Neural nets can have millions of neurons arranged in dozens of layers for what is called deep learning. There are many ways to arrange the neurons, but one of the most important architectures at the moment is a convolutional neural net, or ConvNet. These algorithms rely on convolution, a mathematical operation that allows them to recognize patterns even as they vary slightly, the way you can recognize a face no matter where it falls on your retina. Since 2012, ConvNets have been the standard tool for image recognition. For facial recognition, neural nets are sometimes used to translate an image like a Match.com photo into a manageable set of numbers representing facial features. Then another algorithm looks for a target image—say, a Facebook photo—with the most similar set of features. As computers, data sets, and algorithms keep improving, so will their ability to recognize us. The longer they work, the more they learn, and the more powerful and accurate they become. And they're just getting started. (4)

Will facial recognition change how we act? One possibility: People won't care. Unless we can see the cameras, see the people looking at our online profiles, and see how they're using our information, we may forget about it. And even if we do care about our privacy in theory, we simply might not be able to maintain it in practice.

"It would require a nearly superhuman effort for an individual to properly manage their privacy," Acquisti says. We're fairly good at managing our privacy offline: If you're having a sensitive conversation at dinner and the waiter walks by, you lower your voice. Online, however, you can't see the stranger. It's informational asymmetry, Acquisti says: We know little about what people know about us, who

knows it, or what their intentions are. The interpersonal effects of facial recognition remain clouded as well. What happens when we can no longer separate our personas and prevent our social worlds from mutual contamination? Or when someone meets you at a bar or clicks on your profile and can use your image to dredge up every other iota of your web presence? Maybe we'll learn to forgive youthful indiscretion when photographic evidence of our entire lives is out there. Maybe we'll learn to see each other as more complete people. Or maybe we'll become paranoid and stop trusting one another. We have some data on how people change when they feel watched. Studies in England, and the United States show that security cameras reduce crime in their immediate vicinity. After Edward Snowden revealed many federal surveillance practices, traffic to Wikipedia pages for topics such as "terrorism" dropped. A study in Helsinki took tracking to an extreme: In each of 12 participating households, researchers installed microphones and three or four cameras, and also monitored wireless traffic and computer and cellphone activity. The intrusion lasted six months. In surveys and interviews, the subjects reported annoyance, anxiety, and occasional anger. As for sharing their video data, they said they'd be least comfortable with the authorities seeing it, even if they hadn't broken any laws, followed by public media, which could spin it into "commercial drama or something," and then friends and acquaintances. But on average, they adapted to the tech over time. Half said they assumed their internet use was already being monitored post-9/11. And while some changed their routines, others didn't ("After I realized that I'd already walked naked to the kitchen a couple of times, my threshold

got lower"). The group's varied responses should come as no surprise. Acquisti and colleagues have written about our inconsistencies when considering privacy. In one study, when participants were asked to rate their concern that a stranger might discern their sexual orientation, half of those who rated it a 7 out of 7 had already revealed their orientation on their Facebook profiles. People will also pay more to keep privacy than to acquire it. Even the temperature of a room can irrationally affect how much people will reveal. If we wanted to be fully informed and calculating, we'd have to put the rest of our lives on hold: By one rough estimate, reading the privacy policies of every web site we visit would cost Americans \$1 trillion a year in lost time. The effects of accepting facial identification are both nefarious and salutary, often in combination. When strangers can call up your biography, warts, laurels and all, you can't start fresh each time you walk into a room or meet someone new. On the flip side, you can more easily avoid people with bad reputations. We'll also enjoy a range of new conveniences and security advantages like walletless checkout and terrorist identification in crowds. Unfortunately, at this point, we can't know whether those benefits will outweigh the costs. We are all part of a gigantic social experiment. (5)

AI can not only identify us by our faces but also read the emotions on them. Our faces reveal more than just our biographies—who we are, what we've done, where we've been. They also reveal what's inside our heads. Facial expressions evolved to signal our mental state to others. Communication can occur strategically, as when we smile politely at a coworker's joke, or subconsciously. People are pretty good at reading expressions already, but machines open new

opportunities. They can be more accurate, they don't get tired or distracted, and they can watch us when no one else is around. One opportunity this opens up is helping people who aren't naturals at face reading. Dennis Wall, a biomedical data scientist at Stanford, has given Google's Glass to children with autism. They wear frames with a built-in camera connected to software that detects faces and categorizes their emotions. The devices can then display words, colors, or emoticons on a little screen attached to the glasses, which the child can view by looking up. The software can run constantly, or the children can play training games, such as one in which they try to guess someone's emotion. Parents can review recordings with a child and explain tricky social interactions. Children can't wear the device in the classroom, but teachers report that the training has improved engagement and eye contact. Ned Sahin, a neuroscientist who has developed Glass apps for autistic children, says anyone could benefit from such assistance. There are indeed some situations in which face-reading tech performs better than people. In one study, individuals were recorded doing two tasks: watching a video of a baby laughing, which elicited smiles of delight, and filling out a frustrating web form, which elicited natural expressions of frustration, closely resembling smiles. When other participants viewed the recordings to categorize the smiles as delighted or frustrated, they performed no better than chance. A machine-learning algorithm, however, got them all right. In the real world, people would have contextual clues beyond facial expressions. "Coding facial movements in the absence of context will not reveal how someone feels or what they think most of the time," says Lisa Feldman Barrett, a psychologist and

neuroscientist. In another experiment, participants watched videos of people holding an arm in ice water or holding an arm in warm water and pretending to look anguished. Subjects' scores at distinguishing real from faked pain expressions remained below 60 percent even after training. A machine-learning algorithm scored around 85 percent. These studies raise the possibility of AI lie detectors—possibly deployed on something like Google Glass. What happens when our polite smiles stop working? When white lies become transparent? After all, if someone says he likes your haircut, how hard do you try to test the comment's veracity? (6)

Face-reading algorithms generally fall into one of two types. There are machine-learning algorithms (including neural networks) trained to translate an image into an emotional label. This process is relatively simple but deals best with stereotypical facial configurations, which can be rare. Second, there are methods that use a machine-learning algorithm (again including neural networks, or one called a support vector machine) that detect in an image a set of active "action units," or facial movements linked to underlying muscle contractions. Another algorithm then translates the action units into an emotional expression. This method is more flexible, but analyzing action units can be tricky. Once you add variations in lighting, head pose, and personal idiosyncrasy, accuracy drops. Automatic face reading has wide applicability. Couples might use it to better understand each other—or to understand themselves and what signals they're really displaying in a conversation. Public speakers might use it to help read their audience during online or offline seminars or to practice their own body language. Criminal investigators could use it for security (or for manipulation). In

a recent book, computer scientists Brais Martinez and Michel Valstar outlined face reading's potential benefits for behavioral medicine in the diagnosis and treatment of such disorders as depression, autism, and schizophrenia. Louis-Philippe Morency has used video analysis to find that depressed people don't smile less than other people but that their smiles are different—shorter and less intense. He's also found that depression makes men frown more and women frown less. Algorithms can be more objective than people, and they can be deployed when doctors aren't around, monitoring people as they live their lives. They can also track subtle changes over time. Morency hopes that by giving doctors more objective, consistent measures of internal states to help them in their assessments, he can create "the blood test of mental health." (7)

Facial analysis is frequently used to measure audience response to ads, because a good deal of the money in tech is in advertising. In one study of supermarket shoppers, some participants expressed discomfort with the potential for micro-expression monitoring. "Understanding how you really feel about this product even though you might not know it yourself... that's a little spooky," one participant said. "It's like mining your thoughts more than just your buying habits." Obviously, we need some extensive discussions about consent for facial analysis. Which norms and laws are necessary to maintain a sense of inner privacy? Facial analysis clearly has great value for users, but to the extent that we don't understand or think about our privacy, people will increasingly come to know us much better than we may be comfortable with. Michal Kosinski, a psychologist at Stanford University, and his collaborator wrote the paper as a warning of what's

possible. One danger in automating judgment about traits or inclinations is the risk of encoding biases while offering the illusion of objectivity. They used machine learning (including a standard convolutional neural net) to assess "criminality" based on headshots. But their basis for measuring criminality was not the committing of a crime, or even traits such as aggression or impulsiveness; it was the existence of a criminal conviction. And one's path through the justice system depends on subjective judgment at every step, including biases based on appearance. Maybe someone looks mean. That person is more likely than someone else to be caught and convicted for a similar crime. The algorithm then learns that mean-looking people have more "criminality." It uses that to catch and convict more mean-looking people. The cycle repeats. It's easy to see race and class biases becoming embedded and amplified. Kosinski is hopeful, however, that AI can actually minimize inaccurate profiling. Even if absolute objectivity is an illusion, a computer might rely on relatively more objective signals than humans. He sees another possible benefit to automated profiling: increased tolerance. (8)

Based on faces, psychologist Nicholas Rule found that people can predict personality, political orientation, and business and political success. AI can do better, but it might never be great. Even if it is, it might not cause as much disruption as we fear, because we already have better ways to identify political ideology, and the rest: what people say, how they move, and what they wear. "Past behavior is a better predictor of future behavior than how you look in the moment," says Alexander Todorov, a psychologist at Princeton University. If possible employers want to know if they're hiring a future terrorist or a bingo player, they're better off looking at your Facebook feed than your profile picture.

Kosinski has done work showing that, based on Facebook likes, a computer can predict a wide variety of characteristics, including personality, intelligence, religion, and drug use. In fact, computers judged personality better than people's own spouses could. In many ways, they're getting to know us better than we know ourselves. Aside from character and demographic traits, AI can also read genetic disorders in our faces. The majority of clinical geneticists now use an app called Face2Gene, which can evaluate the probabilities of 2,000 disorders. It helps to distinguish between different disorders when faces look somewhat abnormal and can suggest diagnoses even when a face shows no obvious signs to a physician's eye. While such technology could be used to diagnose people against their will, the benefits outweigh the possible negatives. As with all technology, there are tradeoffs. Our faces are rich with information, and we won't know what will happen when we harvest it all until we do. Judging from past advances—cars, televisions, the internet—many of our worries will turn out to be for nothing, while other, unforeseen, social dilemmas will surely crop up. Our most public-facing body part is simultaneously our most intimate. We've evolved to share it with people in our close vicinity—and to have equal access to theirs. Someday soon that most basic social compact may be disrupted. (9)

*Adapted from Psychology Today.*

### **Exercise III.**

Find paragraphs, dealing with the following: spots, police, convey, electronic, grocery, entrap, tradeoffs, vicinity, dilemmas, harvest



#### **Exercise IV.**

Fill in the gaps.

1. Moments later, though, Tolbert nearly was engaged in a chase after shouting a warning to a fleeing ..... he recognized.
2. At the time it looked like a smart way to ..... with a potential trouble spot.
3. The thing is, a micro machine would ..... some sort of automation being required.
4. A computer program uses the test results to ..... a course for each student.
5. It is built on lies, carefully woven together to ..... the victim.
6. Other parking vendors in the ..... of Ford Field may charge different prices.
7. That seems to prove the opposite of what this ..... is meant to illustrate.
8. Confidential and ..... should also never be sent through e-mail.
9. .... to wanting more freedom is accepting more responsibility.
10. Social networking site owners work actively to put a lid on ..... activity.

#### **Exercise V.**

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

to crop up, against one's will, to show no obvious signs, a physician's eye, in many ways

**Exercise VI .**

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

paranoia	a serious mental illness in which someone cannot understand what is real and what is imaginary
to entrap	the act of polluting; including (either intentionally or accidentally) unwanted substances or factors
landmark	a fictitious name, esp. one used by an author
abnormal	a mode of behavior or way of thought peculiar to an individual
vicinity	distribute or provide (a service or information) to a number of people
contamination	catch (someone or something) in or as in a trap
idiosyncrasy	a mental illness that causes extreme feelings that others are trying to harm you
to dispense	an object or feature of a landscape or town that is easily seen and recognized from a distance, esp. one that enables someone to establish their location

pseudonym	deviating from what is normal or usual, typically in a way that is undesirable or worrying
schizophrenia	the area near or surrounding a particular place

### **Exercise VII.**

Summarize the article “All Over Your Face”.

### **Part 2**

#### **Exercise I.**

Identify the part of speech the words belong to.

Recognition, technology, deduce, personality, identity, regional, imitator, stranger, likely, identify

#### **Exercise II.**

Form verbs from the following words:

recognition (1), identity (1), regional (1), expression (1), user (1), explicitly (1), implicitly (1), introduction (1), connection (2), operation (2).

#### **Exercise III.**

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

recognize (4), pattern (4), vary (4), slightly (4), tool (4), standard (4), feature (4), target (4), accurate (4), access (9)

#### **Exercise IV.**

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

wide (9), intelligence (9), help (9), abnormal (9), benefit (9), intimate (9), equal (9), close (9), evolve (9), simultaneously (9)

**Exercise V.**

Match the words to make word combinations:

social	technology
data	Vector Machine
sensitive	investigators
convolutional	sites
flip	security number
Support	side,
body	point
criminal	neural network
dating	language
facial-recognition	information

### 3. What Technology Can't Change About Happiness

#### Part 1

##### **Exercise I.**

Say what Russian words help to guess the meaning of the following words: gadgets, association, gene, mutation, metabolizes, serotonin, regulate, appetites, nations, indexes

##### **Exercise II.**

Make sure you know the following words and word combinations.

To proliferate, sidestep, to contemplate, cramped, to bode, to shortchange, groundbreaking, far-flung, to bolster.

#### **What Technology Can't Change About Happiness**

*As pills and gadgets proliferate, what matters is still social connection (1)*

In 2014, researchers at the University of Warwick in England announced they had found a strong association between a gene mutation identified with happiness and well-being. It's called *5-HTTLPR* and it affects the way our body metabolizes serotonin, which helps regulate our moods and appetites. The study asks why some nations, notably Denmark, consistently top "happiness indexes," and wonders whether there may be a connection between a nation and the genetic makeup of its people. Sure enough, controlling for work status, religion, age, gender, and income, the researchers discovered those with Danish DNA had a distinct genetic advantage in well-being. In other words, the more

Danish DNA one has, the more likely he or she will report being happy. This research is not the only example of the power of feel-good genes. One body of research suggests we are genetically pre-programmed with a happiness “set point”—a place on the level of life satisfaction to which, in the absence of a fresh triumph or disappointment, our mood seems to return as surely as a homing pigeon to its base. As much as 50 percent of this set point, some researchers have demonstrated, is determined genetically at birth. The genetic determinants of a higher set point may be what the Danes are blessed with. Neuroscientists are also studying a gene variant that leads to higher levels of a brain chemical, which contributes to a sense of calm. Individuals with mutations that cause them to make less of it are less prone to trudge through life with the weight of the world on their shoulders. Richard Friedman, a professor of clinical psychiatry, lamented in *New York Times* “that we are all walking around with a random and totally unfair assortment of genetic variants that make us more or less content, anxious, depressed or prone to use drugs.” “What we really need,” Friedman continued, “is a drug that can boost our bliss molecule for those who are genetically disadvantaged. Stay tuned.” (2)

Some scientists have already tuned in to the future. James Hughes, a sociologist, envisions a day not too far from now when we will unravel the genetic determinants of serotonin and dopamine, and be able to manipulate happiness genes—if not *5-HTTLPR* then something like it—with precise nanoscale technologies that marry robotics and traditional pharmacology. These “mood bots,” once ingested, will travel directly to specific areas of the brain, flip on genes, and manually turn up or down our happiness set point, coloring the way we experience

circumstances around us. “As nanotechnology becomes more precise, we’re going to be able to affect mood in increasingly precise ways in ordinary people,” says Hughes, who also serves as executive director of the Institute for Ethics and Emerging Technologies. It would be easy to conclude the redesigned human of the future will be able to pop a mood bot and live in bliss. But not so fast, say psychologists, sociologists, and neurologists who study happiness. Just because scientists have decoded some of the underlying biology of this ineffable state of being, paving the way for a drug to stimulate it, does not guarantee that our great-great-grandchildren will live happy and satisfying lives. Human nature is more than biology, the scientists assure us. And generations of happiness research offer a clear window into what it takes to live a long and satisfying life. The squishiness of the term “happiness” has long caused problems for those who study it. To gauge happiness and sidestep semantic problems, many of the psychologists who have tried to quantify it have used a measure called “Subjective Well-Being.” This measure, as its name implies, relies on individuals themselves to tell researchers how happy they are. Ed Diener, a University of Virginia psychologist nicknamed “Dr. Happiness,” pioneered the approach in the 1980s. Today, Diener serves as a senior scientist at The Gallup Organization, which provides a key survey used in happiness indexes put out by most groups compiling such lists, including the United Nations. But in recent years, a growing number of researchers have begun to acknowledge that this isn’t a particularly good fix; maybe a little more refinement is needed. What we really mean when we tell a researcher from a place like Gallup that we are “happy” can vary widely.

If you ask a teenager or young adult to rate his happiness, he's liable to base his answer on his weekend plans, how much money he has in his pocket, and how his peers treated him during lunch break. If you ask somebody with a little more mileage—someone with children, for instance—they are liable to look at a bigger picture, even if they have a bad back that's been acting up, no babysitter for Saturday, and a doctor's appointment that afternoon. (3)

Over the past decade or so, a growing number of researchers have begun to rethink exactly what happiness is and distinguish between two types: the positive mental high and welfare. Aristotle was referring to this second kind when he wrote 2,300 years ago: "Happiness is the meaning and the purpose of life, the whole aim and end of human existence." This is the kind of happiness that qualifies a life well-lived, time on this planet well-spent. Medical technology may soon be able to engineer a momentary absence of fear, or the presence of a moment-to-moment sense of well-being, but engineering this second kind of happiness would be far more difficult. Daniel Gilbert, a Harvard psychologist, suggests humans are already hardwired to raise their own hedonistic happiness, and we're pretty good at it, without resorting to mood bots. Gilbert has spent his career studying the way we convince ourselves to accept our external circumstances, and return to a hedonic equilibrium, no matter what comes. In his TED talk, Gilbert powerfully demonstrates this by displaying two pictures side by side. The picture on the left depicts a man holding up an oversized lottery check. He has just won \$314.9 million. The picture on the right displays another man, approximately the same age, sitting in a wheelchair. "Here are two different futures that I invite you to contemplate and tell me which one



you think you might prefer,” Gilbert says to the audience. Data exists, he assures them, on how happy groups of lottery winners and paraplegics are. The fact is, a year after losing the use of their legs, and a year after winning the lotto, lottery winners are only slightly happier with their lives than paraplegics are. The reason people fail to appreciate that both groups are equally happy is a counterintuitive phenomenon that Gilbert calls “impact bias,” a tendency to overestimate the hedonic impact of future events. We see this tendency, he notes, with winning or not winning an election, gaining or losing a romantic partner, winning or not winning a promotion, passing or not passing a college exam. All these events “have far less impact, far less intensity, and for much less duration than people expect them to have.” It’s that happiness set point again, returning to its base. (4)

But surely some things affect happiness? In fact, Gilbert suggests, “Much of our happiness is produced by things that have long evolutionary histories. I will place any wager that in 2045 people are still happy when they see their children prosper, when they taste chocolate, when they feel loved, secure, and well fed.” These are the “staples of happiness,” he continues. “This question could have been posed a few years ago, 300 years ago, 2,000 years ago. It would never have been wrong to say, ‘You are the most social animal on Earth, invest in your social relationships, it will be a form of happiness.’ ” It’s an answer that is so obvious that most people dismiss it. “There is utterly no secret about the kind of things that make people happy,” Gilbert says. “But if you list them for people, they go, ‘Yeah, that kind of sounds like what my grandmother has said all along. What’s the secret?’ The answer is there is no secret. She was right.” Perhaps the most compelling

evidence on the importance of relationships stems from a study of a cohort of people who are today mostly grandparents themselves. The information is stored in a cramped room in downtown Boston, lined with file cabinets that hold the details of one of the most comprehensive longitudinal studies on the development of healthy, male adults ever compiled: the Harvard Study of Adult Development. In 1938, researchers began conducting tests and interviewing carefully selected college sophomores from the all-male Harvard classes of 1939, 1940, and 1941. The men were chosen not because they had problems that made them likely to fail, but because they showed promise. (The cohort included, among others, future president John F. Kennedy.) The original intent was to follow these men, who seemed destined for success, for perhaps 15 to 20 years. Today, more than 75 years later, the study is still going. Thirty of the original 268 men in the study are still alive. In 1967, the files were merged with the Glueck Study, a similar effort that included a second group of 456 poor, non-delinquent, white kids who grew up in Boston's inner city in the early 1940s. Of those, about 80 are still around, though the ones that aren't lived, on average, nine years less than those in the Harvard cohort. In 2009, the study's longest-serving former director George Vaillant was asked what he considered the most important finding of the Grant study since its inception. "The only thing that really matters in life are your relations to other people," he responded. (5)

Afterwards Vaillant found himself under attack from skeptics around the globe. In response, Vaillant created what he called the "Decathlon of Flourishing," which included a list of 10 accomplishments in late life (60-80) that might be considered success.

They included earning a good income, recognition in Who's Who in America, low psychological distress, success and enjoyment in work, love, and play since age 65, good physical and mental health, social support other than wife and kids, a good marriage, and a close relationship with kids. High scores in all of these categories turned out to be highly correlated with one another. But of all the factors he looked at, only four were highly correlated with success on all the measures, and those all had to do with relationships. Once again, he proved that it was the capacity for relationships that predicted success in all aspects of life. However, Vaillant objects to the term "happiness." "The most important thing in happiness is to get the word out of your vocabulary," he says. "The point is that a great deal of happiness is simply hedonism and I feel OK today because I've just had a Big Mac or a good bowel movement. That has very little to do with a sense of well-being. The secret to well-being is experiencing positive emotions." And the secret to that, Vaillant argues, might sound trite. But you can't argue with the facts. The secret is love. "In the 1960s and '70s, I would have been laughed at," to suggest such a thing, Vaillant says. "But here I was finding hard data to support the fact that your relationships are the most important single thing in your well-being. It's been gratifying to find support for something as sentimental as love." Robert Waldinger, the psychiatrist and Harvard Medical School professor who currently leads the study, notes that it is not just measures of material success and psychological feelings of well-being that are linked to good relationships. It's also physical health. "The biggest take home from a lot of this, is that the quality of people's relationships are way more

important than what we thought they were—not just for emotional well-being but also for physical health,” he says. Marital happiness at age 50, he says, is a more important predictor of physical health at 80 than cholesterol levels at 50. “Close relationships and social connections keep you happy and healthy. That is the bottom line. People who were more concerned with achievement or less concerned with connection were less happy. Basically, humans are wired for personal connections.” People who feel socially isolated get sicker earlier, their brains decay earlier, their memories are worse, Waldinger says. Using brain-scan technologies, Waldinger and his team discovered that those who were most satisfied with their lives had greater brain connectivity. “The people who were most engaged were the happiest,” Waldinger says. “They could be raising kids, they could be planting a garden, they could be running a corporation. If you really care about something, if it means something to you, and particularly if you have meaningful engagement with other people when you do these things—those are the things that light you up.” Even Nicholas Christakis, a Yale sociologist, who coauthored the study of twins that demonstrated a 33 percent variation in life satisfaction could be attributed to the *5-HTTLPR* gene, agrees that the key component to happiness is social. “I’m very skeptical that technological advances will affect what I regard as foundational features of human nature,” he says. “So I don’t think that any technological developments or futuristic things are going to fundamentally affect our capacity for happiness.” Christakis, who studies social networks, says the influence of genes like *5-HTTLPR* on happiness is less direct than a subjective feeling of well-being (though that may be part of it). Instead,

he suggests, it's their effect on our behavior that may be key—and the effect that has on our relationships. “It's not just what genes do inside our body, but what they do outside of it, how they affect how many friends you make, or whether you will pick happy or sad friends, which also affects happiness,” Christakis says. “Even if you have genes that predispose you to pick happy friends, the unavailability of them may make you unhappy.” (6)

Generations of happiness research, stressing the importance of personal relationships, drops us into the middle of a surprisingly contemporary debate. We live in an increasingly networked society, and the rate of us in social networks, and the amount of time we spend online, continues to grow each year. Vaillant, of the longitudinal Harvard study, has no hesitation in saying what our lives online are doing to us. “Technology drives us away from our heart,” he says. “What makes the world go round is not technology. It's not having a better and better iPhone. The technology is just going to distract us back into our heads so that my daughter feels it's cooler to text someone than it is to talk to them on the telephone. That doesn't bode well for happiness in 2050.” The fears of a new world, where we all text at the dinner table and have problems making eye contact, were perhaps most articulately summed up by Sherry Turkle, professor of the Social Studies of Science and Technology at the Massachusetts Institute of Technology. She explores the paradox of how technology connects us, yet also makes us lonelier, in her 2011 book *Alone Together: Why We Expect More from Technology and Less from Each Other*. “Human relationships are rich and they're messy and they're demanding,” she argues passionately in her TED talk. “And we clean them up with

technology. And when we do, one of the things that can happen is that we sacrifice conversation for mere connection. We short-change ourselves. And over time, we seem to forget this, or we seem to stop caring.” Some of the earliest studies on the use of the Internet and technology supported the idea that the networked age was driving us toward a sad, lonely future. In a groundbreaking study (1998), Robert Kraut recruited volunteer families with high-school-aged children, gave them computers and Internet access, and then tracked their usage. The more his participants used the Internet, he found, the more their depression increased, and the more social support and other measures of psychological well-being declined. Since then there have been other negative studies and a spate of bad press. One widely cited 2012 study conducted by researchers at Utah Valley University of 425 undergraduates found that the more they used Facebook, the more they felt that others were happier and had better lives than they did. The researchers named the study, “They Are Happier and Having Better Lives Than I Am: The Impact of Using Facebook on Perceptions of Others’ Lives.” Even the Vatican has expressed concern. Pope Benedict XVI warned in one of his messages to the world that “virtual contact cannot and must not take the place of direct human contact.” (7)

But in recent years, a more nuanced consensus has begun to emerge—a consensus that suggests technology is not such a bad thing for human relationships. Kraut now argues that his 1998 study might tell us about the present. The problem, he says, was there were comparatively fewer people on the Internet at the time. The individuals who participated in his study were forced to communicate with people they did not know in far-flung places, what Kraut calls “weak ties.”

“What we realized is that by necessity they had to talk to relative strangers,” he says. “But that was the early days. Now virtually everybody you know is online.” Kraut’s more recent research has found that today most people spend their time online communicating with people with whom they already have strong ties. In those cases, he argues, the findings are unequivocal: online connection decreases depression, reduces loneliness, and increases levels of perceived social support. It does so by enhancing offline relationships. Online interactions, like offline ones, are more fulfilling if they are with people with whom we have strong ties. They mean a lot less if they are with strangers. But most of us use technologies to communicate with people we already know and that helps relationships grow stronger. “Communication online has the same beneficial effects that communication offline would have if we already know people,” Kraut says. Keith Hampton has conducted a number of studies measuring the effects of Internet use on relationships, democracy, and social support. The idea that we interact either online or offline, he argues, is a false dichotomy. Through his studies, he too has become convinced that social media and the Internet are drawing us closer together—online and offline. “I don’t think it’s people moving online, I think it’s people adding the digital mode of communication to already existing relationships,” he says. In fact, his research has found that the more different kinds of media that people use to interact, the stronger their relationships tend to be. People who don’t just talk on the phone but also see each other, and email each other and communicate through four or five different mediums, tend to have stronger relationships with one

another than those who communicate through fewer mediums, he has found. Facebook, he argues, is fundamentally changing the nature of relationships in ways that have been lost since the dawn of the Industrial Revolution, when people began leaving their native villages behind to head to cities for new opportunities, and lost contact with the people they grew up with. “Thanks to social media, those types of relationships are persistent,” he says. “Now we may be connecting with people over the course of life that we didn’t before.” Of course, Facebook and technology, Hampton argues, are not sufficient in their own right to fend off loneliness. But in conjunction with other modes of interaction, they can bolster existing relationships, contribute to diverse relationships, and keep dormant relationships alive. The overall effect of technology is to overcome the constraints of time and location that would have proven insurmountable before. Instead of Christmas cards, we get a constant stream of information. We can share in triumphs and know when to offer solace during tragedy. We are less isolated. (8)

Hampton has heard the assertions by Turkle and others that technology is killing traditional interactions. So he decided to examine that contention too. In his article in the journal *Urban Studies*, Hampton reported that he had studied four films taken in public spaces over the course of the last 30 years. For their study they observed and coded the behavior and characteristics of 143,593 people. They analyzed that behavior to see if, in fact, we really are “alone together” in a crowd. In fact, Hampton found the opposite. There was, in the same public spaces, a notable increase in the numbers of people interacting in large groups. And despite the ubiquity of mobile phones, the rate of their use in public was relatively small, especially when individuals were walking with



others. Mobile phones appeared “most often in spaces where people might otherwise be walking alone,” he wrote. “This suggests that, when framed as a communication tool, mobile phone use is associated with reduced public isolation, although it is associated with an increased likelihood to linger and with time spent lingering in public.” (9)

None of this surprises Amy Zalman, president of the World Future Society, who spends her days organizing conferences, conducting research, and speaking with people who try to predict what society might look like a few decades in the future. She expects that technological tools to pursue human relationships will continue to evolve in unexpected ways. But she doesn’t expect them to change human nature. Human relating, she argues, has always been a highly mediated activity—even language can be seen as a tool on the same spectrum as technologies like social media or cell phones, a spectrum of tools we use to interact with others. It’s just that we notice these tools more. But that too will change. “Technology is going to get closer and closer, it’s going to get invasive—we are going to wear it; it’s going to be inside of us—and then it’s going to disappear and we are not even going to notice it,” Zalman says. Some people believe we may plug into a matrix and communicate through a hive mind. Or perhaps we will relate through personal avatars, robots that resemble us, which we occupy remotely. Maybe our brains will be uploaded to computers. But whatever happens, in the end, the verities of happiness will remain the same as they were in the days of Aristotle. It’s never a mistake to go out and play, make friends, make love, and make an impact on society. Happiness is and has always been about our relationships with other people. (10) *Adapted from Nautilus.*

### **Exercise III.**

Find paragraphs, dealing with the following: makeup, gender, feel-good, triumph, birth, neuroscientists, psychiatry, random, bliss, tuned.

### **Exercise IV.**

Fill in the gaps.

1. There's no need to let it ..... beyond the problem it has already created.
2. Pull together an ..... of shapes, styles, materials, colors and dimensions.
3. Let's back up, it's hard to ..... a spaceship that travels faster than light.
4. Even a dozen back-up sites might not be enough to ..... a smart cyber-attack.
5. The Mazda looks like the best value, while the VW gets high marks for .....
6. Instead of a ..... network of signs, they propose to use mobile-phone apps.
7. As you look for ways to cut costs, don't ..... crucial functions.
8. His ..... work attracts interest from Congress and reporters worldwide.
9. Yuri Gagarin is, in a sense, the most ..... working class hero I can think of.
10. There are always users willing to ..... and arbitrate disputes between others.

### Exercise V.

Make up sentences of your own with the following word combinations:  
set point, to stay tuned, at birth , to make friends, to make love, to make an impact on, to plug into , to communicate through, taken in

### Exercise VI.

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

hardwired	involved in something
to ingest	give (someone) pleasure or satisfaction
undergraduate	untidy or dirty
to object	intervene between people in a dispute in order to bring about an agreement or reconciliation
to gratify	is not active or growing but has the ability to be active at a later time
messy	express or measure the quantity of
engaged	say something to express one's disapproval of or disagreement with something
mediate	a student at a college or university who has not yet earned a bachelor's or equivalent degree

to quantify	take (food, drink, or another substance) into the body by swallowing or absorbing it
dormant	a computer or electronic device that is hardwired is built to work in a particular way and you cannot change the way it performs with new software, etc.

### **Exercise VII.**

Summarize the article “What Technology Can’t Change About Happiness”

### **Part 2**

#### **Exercise I.**

Identify the part of speech the words belong to.

assortment, envision, executive, refinement, liable, counterintuitive, persistent, conjunction, contention, notable

#### **Exercise II.**

Form adjectives from the following words: genetically (1), happiness (1), absence (1), disappointment (1), base (1), totally (1), manually (1), presence (1), picture (1), approximately (1)

#### **Exercise III.**

Find synonyms to the following words. Translate them into Russian: in support (8), stranger (8), realize (8), participate (8), tragedy (8), triumph (8), journal (9), characteristic (9), resemble (10), predict (10)

#### **Exercise IV.**

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

constant (8), offer (8), traditional (9), observe (9), notable (9), pursue (10), continue (10), inside (10), disappear (10), happiness (10)

#### **Exercise V.**

Match the words to make word combinations:

compelling	satisfaction
clinical	pigeon
homing	psychiatry
work	mutation
life	evidence
genetic	association
happiness	genes
gene	status
strong	makeup
feel-good	indexes

## 4. Music is not for ears

### Part 1

#### Exercise I.

Say what Russian words help to guess the meaning of the following words: music, acoustic, phenomenon, separate, special, inscrutable, sphere, decades, demonstrated

#### Exercise II.

Make sure you know the following words and word combination:

forlorn, venue, smattering, hush, to lure, grind, overt, covert, to recast, akin

#### **Music is not for ears**

*We never just hear music. Our experience of it is saturated in cultural expectations, personal memory and the need to move (1)*

It's easy to think about music as just a sequence of sounds: an acoustic phenomenon that we respond to because of how it sounds. The source of music's power, according to this account, lies in the notes themselves. To pick apart how music affects us would be a matter of analysing the notes and our responses to them. Yet thinking about music in this way – as sound, notes and responses to notes, kept separate from the rest of human experience – relegates music to a special, inscrutable sphere accessible only to the initiated. Notes, after all, are things that most people feel insecure about singing, and even less sure about reading. In fact, the past few decades of work in the cognitive sciences of music have demonstrated with increasing persuasiveness that music

perception is deeply interwoven with other perceptual systems, making music less a matter of notes and more a matter of fundamental human experience. Brain imaging produces a particularly clear picture of this interconnectedness. When people listen to music, no single ‘music centre’ lights up. Instead a widely distributed network activates, including areas devoted to vision, motor control, emotion, speech, memory and planning. Far from revealing an isolated, music-specific area, the most sophisticated technology we have available to peer inside the brain suggests that listening to music calls on a broad range of faculties, testifying to how deeply its perception is interwoven with other aspects of human experience. Beyond just what we hear, what we see, what we expect, how we move, and the sum of our life experiences all contribute to how we experience music. If you close your eyes, you might be able to picture a highly expressive musical performance: you might see, for instance, a mouth open wide and arms lifting a guitar high into the air. Once you start picturing this expressive display, it’s easy to start hearing the sounds it might produce. In fact, it might be difficult to picture these movements without also imagining the sound. Or you could look – with the volume muted – at two performances of the same piano sonata on YouTube, one by an artist who makes emotional facial expressions, and the other by a tight-lipped pianist who sits rigid and unmoving at the keyboard. Despite the fact that the only information you’re receiving is visual, you’ll likely imagine very different sounds: from the first pianist, highly expressive fluctuations in dynamics and timing, and from the second, more straightforward and uninflected progressions. (2)

Could it be that visual information actually affects the perception of musical sound, and contributes substantially to the overall experience of a performance? Numerous studies have attempted to address this question. In one approach, the psychologist Bradley Vines and colleagues video-recorded performances intended to be highly expressive as well as ‘deadpan’ performances, in which performers are instructed to play with as little expressivity as possible. Then the researchers presented these recordings to the participants, either showing them just the video with no sound, or playing them just the audio with no video, or playing them the full audiovisual recording – or, in a particularly sneaky twist, playing them a hybrid video, in which the video from the expressive performance was paired with the audio from the deadpan performance, and vice versa. It turns out that participants tend to describe as more expressive and emotional whichever performance is paired with the more expressive video – rather than the recording with the more expressive sound. The separate experiment showed that people predicted the winners of music competitions more successfully when they watched silent videos of their performances than when they merely heard the performances, or watched the video with the sound on. Music, it seems, is a highly multimodal phenomenon. The movements that produce the sound contribute essentially, not just peripherally, to our experience of it – and the visual input can sometimes outweigh the influence of the sound itself. (3)

A musical experience is more than an audiovisual signal. Maybe you’re trying out a new band because your best friend recommended it, or because you’re doing your parent a favour. Maybe you’re experiencing a concert in a gorgeous hall with a blissed-out



audience, or maybe you've wandered into a forlorn venue with a smattering of bored-looking folks, all of whom seem to have positioned themselves as far from the stage as possible. These situations elicit markedly different sets of expectations. The information and inferences brought to the concert can make or break it before it even starts. Joshua Bell is a star violinist who plays at the world's great concert halls. People regularly pay more than \$100 per ticket to hear him perform. Everything about the setting of a typical concert implies how worthy the music is of a listener's full attention: the grand spaces with far-away ceilings, the hush among the thousand attendees, the elevation of the stage itself. In 2007, a reporter from the Washington Post had an idea for a social experiment: what would happen if this world-renowned violinist performed incognito in the city's subway? Surely the exquisiteness of his sound would lure morning commuters out of their morning routine and into a listening experience. Instead, across the 35 minutes that he performed the music, only seven people stopped for any length of time. Passers-by left a total of \$32 and, after the last note sounded, there was no applause – only the continued rustle of people hurrying to their trains. Commentators have interpreted this anecdote as emblematic of many things: the time pressures faced by urban commuters, the daily grind's power to overshadow potentially meaningful moments, or the preciousness of childhood (several children stopped to listen, only to be pulled away by their parents). But just as significantly, it could suggest that the immense power of Bell's violin-playing does not lie exclusively in the sounds that he's producing. Without overt or covert signalling that prepared them to have a significant aesthetic experience, listeners did

not activate the filters necessary to absorb the aspects of his sound that, in other circumstances, might lead to rhapsodic experiences. Even musicianship of the highest level is susceptible to these framing effects. The sound just isn't enough. Other studies also suggest a powerful role for context in the experience of music. We exposed participants to pairs of performances of the same excerpt, but told them that one was performed by a world-renowned professional pianist and the other by a conservatory student: people consistently preferred the professional performance – whether they were listening to the professional, to the student, or had in fact just heard the exact same sound played twice. And, in another factor unrelated to the sound itself, listeners tended to show a preference for the second excerpt that they heard in the pair. When these two factors coincided – when the second performance was also primed as professional – their tendency to prefer it was especially strong. (4)

It's not only our sense of the quality of a performance that is manipulable by extrinsic information; our sense of its expressive content can also vary. In a recent study, we told people that we had special information about the musical excerpts that they were going to hear: in particular, we knew something about the composer's intent when writing it. Unbeknown to the participants, we created the intent descriptions so that some were highly positive, some highly negative, and some neutral. For example, we could say that a composer wrote the piece to celebrate the wedding of a dear friend, to mourn the loss of a friend, or to fulfil a commission. We scrambled the description-excerpt pairings so that the same excerpts were matched with different descriptions for different participants. In each trial, participants read the composer-intent

description, listened to the excerpt, and answered questions about it. When told that the excerpt had been written for some positive reason, people heard the music as happier, but when told that the excerpt had been written in a negative circumstance, they heard it as sadder. Recasting the emotional tenor of an excerpt had important consequences for the listeners' experience of it. People liked the excerpts more and were more moved by them when they thought they had been written for a happy reason (intriguingly, another part of the same study showed that people liked and were more moved by poetry when they thought it had been written for a sad reason). The social and communicative context within which a performance occurs can imbue the same sounds with very different meanings. The right music can get a room full of people dancing. Even people at classical concerts that discourage overt movement sometimes find it irresistible to tap a finger or foot. Neuroimaging has revealed that passive music-listening can activate the motor system. The interconnection means not only that what we hear can influence how we move, but also that how we move can influence what we hear. (5)

Together, these findings paint an embodied picture of music-listening, where not just what you see, hear and know about the music shapes the experience, but also the way you physically interact with it matters as well. Music's interdependence on so many diverse capacities likely underlies some of its beneficial and therapeutic applications. Music cannot be conceptualised as a straightforwardly acoustic phenomenon. It is a deeply culturally embedded, multimodal experience. At a moment in history when neuroscience enjoys almost magical authority, it is instructive to be reminded that the path from sound to

perception weaves through imagery, memories, stories, movement and words. Despite sometimes being thought about as an abstract art form, akin to the world of numbers and mathematics, music carries with it and is shaped by nearly all other aspects of human experience: how we speak and move, what we see and know. Its immense power to sweep people up into its sound relies fundamentally on these tight linkages between hearing and our myriad other ways of sensing and knowing. (6)

*Adapted from Aeon.*

### **Exercise III.**

Find paragraphs, dealing with the following: persuasiveness, interconnectedness, distributed, music-specific, area, sum, guitar, display, muted, sonata

### **Exercise IV.**

Fill in the gaps.

1. Accordingly, many organizations ..... social media to the marketing department.
2. The reasons for this are both self-evidently actuarial and curiously .....
3. Freedman said his client would ..... that he regretted making such statements.
4. In other words, the game is very ..... about motivating kids to learn new words.
5. Within a few hours, a ..... of amateurish spamming attacks began to appear.
6. Its ..... comes from an elevation of realms rather than skills.

7. It gave us a breadth of experience with indigenous Australia which was .....
8. Heat and drought have made Russia especially ..... to wildfires.
9. So, now is the time to make sure the system works to its full .....
10. How should a company devise new meanings and create the designs to ..... them?

Exercise V.

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

to sweep up , to feel insecure , keep separate, to light up, to tap a finger

Exercise VI.

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

to scramble	a way or manner in which something occurs or is experienced, expressed, or done
capacity	be an expression of or give a tangible or visible form to (an idea, quality, or feeling)
precious	form (fabric or a fabric item) by interlacing long threads passing in one direction with others at a right angle to them
to testify	make a soft, muffled crackling sound like that caused by the movement of dry leaves or paper

rigid	the maximum amount that something can contain
to inflect	to put things such as words or letters in the wrong order so that they do not make sense
rustle	of great value; not to be wasted or treated carelessly
to weave	give evidence as a witness in a law court
to embody	stiff or fixed; not able to be bent or moved
mode	to slightly influence or show the slight influence of something

### **Exercise VII.**

Summarize the article “Music is not for ears”.

### **Part 2**

#### **Exercise I.**

Identify the part of speech the words belong to.

inscrutable, sneaky, exquisiteness, susceptible, artist, facial, expressions, pianist, rigid, visual

#### **Exercise II.**

Form adverbs from the following words:

separate (1), fundamental (1), emotional (1), visual (1), silent (1), typical (1), necessary (1), professional (1), exact (1), recent (1)

**Exercise III.**

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

signal (4), coincide (4), gorgeous (4), activate(4), excerpt (5), participant (5), celebrate (5), dear (5), match (5), grand (4)

**Exercise IV.**

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

favour (4), immense (4), break (4), stop (4), urban (4), hurry (4), meaningful (4), loss (5), irresistible (5), circumstance (5)

**Exercise V.**

Match the words to make word combinations:

facial	perception
perceptual	sciences
music	centre
cultural	systems
personal	sphere
cognitive	expressions
acoustic	expectations
inscrutable	memory
human	phenomenon
music	experience

## SUPPLEMENTARY READING

### Look up from your screen

*Children learn best when their bodies are engaged in the living world.*

*We must resist the ideology of screen-based learning*

A rooster crows and awakens my family at the farm where we are staying for a long weekend. The air is crisp, and stars twinkle in the sky as the Sun rises over the hill. We walk to the barn, where horses, cows, chickens, pigs, dogs and cats vie for our attention. We wash and replenish water bowls, and carry hay to the cows and horses. The kids collect eggs for breakfast.

The wind carries the smells of winter turning to spring. The mud wraps around our boots as we step in puddles. When we enter a stall, the pigs bump into us; when we look at the sheep, they cower together in a corner. We are learning about the urban watershed, where eggs and beef come from, and how barns were built in the 19th century with wood cauls rather than metal nails. We experience the smells of the barn, the texture of the ladder, the feel of the shovels, the vibration when the pigs grunt, the taste of fresh eggs, and the camaraderie with the farmers. As a parent, it is obvious that children learn more when they engage their entire body in a meaningful experience than when they sit at a computer. If you doubt this, just observe children watching an activity on a screen and then doing the same activity for themselves. They are much more engaged riding a horse than watching a video about it, playing a sport with their whole bodies rather than a simulated version of it in an online game. Today, however, many powerful people are pushing for children to spend more time in front of computer screens, not less. Philanthropists such as Bill Gates and Mark Zuckerberg have contributed millions of dollars to ‘personal learning’, a term that describes children working by themselves on computers, and Laurene Powell Jobs has bankrolled the XQ Super School project to use technology to ‘transcend the confines of traditional teaching methodologies’. Policymakers such as the US Secretary of Education Betsy DeVos call personalised learning ‘one of the most promising developments in K-12 education’, and Rhode Island has announced a statewide personalised learning push for all public school students. Think tanks such as the Brookings Institution



recommend that Latin-American countries build ‘massive e-learning hubs that reach millions’. School administrators tout the advantages of giving all students, including those at kindergarten, personal computers.

Many adults appreciate the power of computers and the internet, and think that children should have access to them as soon as possible. Yet screen learning displaces other, more tactile ways to discover the world. Human beings learn with their eyes, yes, but also their ears, nose, mouth, skin, heart, hands, feet. The more time kids spend on computers, the less time they have to go on field trips, build model airplanes, have recess, hold a book in their hands, or talk with teachers and friends. In the 21st century, schools should not get with the times, as it were, and place children on computers for even more of their days. Instead, schools should provide children with rich experiences that engage their entire bodies.

To better understand why so many people embrace screen learning, we can turn to a classic of 20th-century French philosophy: Maurice Merleau-Ponty’s *Phenomenology of Perception* (1945). According to Merleau-Ponty, European philosophy has long prioritised ‘seeing’ over ‘doing’ as a path to understanding. Plato, René Descartes, John Locke, David Hume, Immanuel Kant: each, in different ways, posits a gap between the mind and the world, the subject and the object, the thinking self and physical things. Philosophers take for granted that the mind sees things from a distance. When Descartes announced ‘I think therefore I am’, he was positing a fundamental gulf between the thinking self and the physical body. Despite the novelty of digital media, Merleau-Ponty would contend that Western thought has long assumed that the mind, not the body, is the site of thinking and learning.

According to Merleau-Ponty, however, ‘consciousness is originally not an “I think that”, but rather an “I can”’. In other words, human thinking emerges out of lived experience, and what we can do with our bodies profoundly shapes what philosophers think or scientists discover. ‘The entire universe of science is constructed upon the lived world,’ he wrote. *Phenomenology of Perception* aimed to help readers better appreciate the connection between the lived world and consciousness. Philosophers are in the habit of saying that we ‘have’ a body. But as Merleau-Ponty points out: ‘I am not in front of my body, I am in my body, or rather I am my body.’ This simple correction carries important implications about learning. What does it mean to say that I am my body?

The mind is not somehow outside of time and space. Instead, the body thinks, feels, desires, hurts, has a history, and looks ahead. Merleau-Ponty invented the term 'intentional arc' to describe how consciousness connects 'our past, our future, our human milieu, our physical situation, our ideological situation, and our moral situation'. He makes readers attend to the countless aspects of the world that permeate our thinking. Merleau-Ponty challenges us to stop believing that the human mind transcends the rest of nature. Humans are thinking animals whose thinking is always infused with our animality. As the cognitive scientist Alan Jasanoff explains in a recent Aeon essay, it is even misleading to idealise the brain independent of the rest of the viscera. The learning process happens when an embodied mind 'gears' into the world. Take the example of dancing. From a Cartesian perspective, the mind moves the body like a puppeteer pulls strings to move a puppet. To learn to dance, in this paradigm, a person needs to memorise a sequence of steps. For Merleau-Ponty, on the contrary, the way to learn to dance is to move one's physical body in space: 'in order for the new dance to integrate particular elements of general motricity, it must first have received, so to speak, a motor consecration.' The mind does not reflect and make a conscious decision before the body moves; the body 'catches' the movement. Philosophers have long attributed a spectatorial stance to the mind, when in fact the body participates in the world. It is common sense that the head is the 'seat of thought', but 'the principal regions of my body are consecrated to actions', and the 'parts of my body participate in their value'. People learn, think and value with every part of their bodies, and our bodies know things that we can never fully articulate in words. Surely, one could reply, this might be true for physical activities such as dancing but does not apply to all intellectual pursuits. Merleau-Ponty would respond: 'The body is our general means of having a world.' Everything we learn, think or know emanates from our body. It is by walking through a meadow, hiking beside a river, and boating down a lake that we are able to appreciate the science of geography. It is by talking with other people and learning their stories that we can appreciate literature. Buying food for our family infuses us with a conviction that we need to learn mathematics. We cannot always trace the route from experience to knowledge, from a childhood activity to adult insight. But there is no way for us to learn that bypasses the body: 'the body is our anchorage in a world'.

Merleau-Ponty would not be surprised if people showed him students learning on a screen. Students can project themselves into the world that they see on a screen, just as many people are capable of thinking abstractly. As long as children have had some exposure to the world and other people, they should be able to make some sense of what they see on screens. Still, Merleau-Ponty gives us reasons to resist the trend towards computer-based education. Proponents of personalised learning point to the advantages of having kids on computers for much of the school day, including students working at their own pace to meet learning objectives. However, from a phenomenological perspective, it is not clear why students will want to do this for very long when the experience is so removed from their flesh-and-blood lives. Teachers and parents will have to use incentives, threats and medication to make children sit at computers for long stretches of time when children want to run, play, paint, eat, sing, compete and laugh. To put it bluntly: advocates of screen learning sometimes seem to forget that children are young animals that want to move in the world, not watch it from a distance.

At the farm, my children learned from being around the animals, trees, pastures, streams, stars and other physical objects. Things became more real, more immediate, than they would have been if a screen had mediated them. However, the experience was as deep as it was because of the relationships we formed with our hosts. The farmers would hold my children when placing them on horses or look them in the eye when explaining how to move sheep from one stall to the next. Our children had fun with their children while playing by the stream at dusk before dinner. When we drove away from the farm, my young son had tears in his eyes; he didn't want to leave his new friends. For proponents such as DeVos, computer-based education empowers students to work independently at their own pace, including at home rather than in brick-and-mortar public schools. Based on my experience at the farm, however, I would argue that this highlights one of the problems of screen learning: it does not easily enable children to form human relationships that are crucial to a satisfying educational experience.

In his important book *Face-to-Face Diplomacy: Social Neuroscience and International Relations* (2018), Marcus Holmes explains the science that justifies this intuition. Drawing upon research in philosophy of mind, cognitive science and social neuroscience, Holmes argues that physical copresence is essential to generate trust and empathy among human beings. Though his research addresses the puzzle of why diplomats insist

on meeting face-to-face for important discussions, his work also explains the science of why people find it more satisfying to meet in person than to communicate by screens. According to Holmes, diplomats insist on meeting in person with their colleagues. Good negotiators have a 'feel for the game' that works only when they share drinks, go on walks, shake hands, or have private conversations with their peers. Diplomats know that they need to embrace, breathe the same air, and look each other in the eye if they are going to arrive at optimal outcomes.

Holmes draws upon neuroscience to explain why face-to-face meetings, as a rule, achieve better results. Researchers such as the neuroscientist Marco Iacoboni at the University of California, Los Angeles have diagrammed the 'mirroring system' that enables human beings to understand each other's intentions. Within the brain, there are mirror neurons that fire when we do an action or when we see another person doing the action. Folk psychology holds that when we see another person, we think for a moment before deciding how to react. According to the new 'simulation theory', we actually feel what the other person feels as mirror neurons fire in just the same manner as if the experience was happening to us. The mirroring system 'enables advanced neural synchronisation between individuals'.

Communicating in person enables people to 'pick up micro-changes in facial expressions' and detect other people's sincerity. Neuroscience shows that humans do a good job of reading other people's minds. People often deceive one another, but meeting face-to-face aids the detection of deceit. In games, people are more likely to trust one another when they play in person rather than when they play online. Likewise, there is greater rapport and 'coupling' when people get together in the flesh: 'Put simply, face-to-face interaction is an unrivalled mechanism for intention understanding.'

To what extent can new technology replicate face-to-face interactions? Holmes acknowledges that writing, calling or video-chatting often works fine for many forms of communication but insists that people must meet in the flesh to achieve a high degree of trust or social bonding. Citing the sociologist Randall Collins at the University of Pennsylvania, Holmes explains that people want to be in the physical presence of other people to generate emotional energy, 'a feeling of confidence, elation, strength, enthusiasm, and initiative in taking action'. Communicating via email or the internet makes it harder to read another's body language or perceive what is happening in the

background as the other person talks into the computer's camera. Communicating from a distance does 'not provide the same physical and emotional connection' as bodily coparticipation. We can transfer insights about social neuroscience from international relations theory to education theory. Placing children in front of screens enables them to access information, meet people around the world, play games, read things, purchase things and so forth that would otherwise be inaccessible. But as an 'interaction ritual', screen learning generates less emotional energy than sharing a physical space with other teachers and students. Students looking at a screen will not trust, or care about, their teachers or students to the same degree. People might speak their mind more freely when there aren't the same visual cues to hold their tongues, but this also means that people are more likely to be uninhibited and antagonistic. People will not have the same investment in an online education community.

A screen cannot provide the same emotional resonance as staying at a farm, participating in its rhythms, and forming bonds with the other people. Educators should be considering how to provide such opportunities to more students, including those whose parents do not have the time and resources to plan such trips themselves. For many young people, digital media, even when used appropriately, can make education and community life worse. Digital media is a mixed blessing, at best, and many young people would prefer to spend less time on screens. At some level, most of us already know this. When private schools advertise, the images are often of kids doing physical activities or hanging out with a group of friends. People are fighting common sense, philosophy and science when they argue for children to spend more time on screens.

One could reasonably reply that many young people enjoy being on screens, and gain efficacy by being on the internet. This is the claim of the report 'Children's Rights in the Digital Age' (2014), made by a team of Australian researchers partnering with the United Nations Children's Fund (UNICEF). The researchers interviewed children around the world and used their words and examples to conclude: 'Hearing the sentiments of children in eight different languages allows one truth to sound loud and clear: we need to take the necessary steps to ensure that all children can reap the opportunities of digital access.' The report describes the real benefits that children accrue from spending time on digital media. Children can gain access to information, get faster service delivery,

express themselves artistically and politically, have fun, and make and maintain friendships with others around the world. The report acknowledges the dangers of digital media, including exposure to violent and pornographic images, excessive use, and data-privacy concerns. But it argues that the ‘risk narrative’ is overstated. If children and their caregivers are responsible, it maintains, then they will likely reap the benefits of online access.

In a remarkable epilogue, however, the report quotes young people from around the world answering the question of what would happen if digital media disappeared. Here are a few of the responses from teenagers in different countries: ‘I’d spend more time doing things outside, not watching TV or my phone or anything, I’d find more productive things to do’ (Australia). ‘If I don’t have any digital media then I would read story books’ (Thailand). ‘It would not do any harm. In the end we are not hard-wired to digital media. We are not controlled by digital media’ (Turkey). ‘It would make other people more confident to be able to talk to other people face to face, not over the internet, actually be able to have conversations with them’ (Australia). ‘People would learn to live with other things, using other ways’ (Brazil). ‘At first it would be very hard just to get used to it, but since everyone would not have it, everyone would get over it. It’d be better as well ’cause everyone would be able to talk more, to work harder for friendship’ (Australia). If the move to digital learning continues, children will spend much, if not most, of their waking hours in front of screens. They will use apps before they go to school, spend their days in front of computers, do their homework online, and then entertain themselves with digital media. Children are losing opportunities to experience the world in all its richness. The gestalt of a farm transcends what pixels and speakers can convey. Screens drain the vitality from many educational experiences that could be better done in the flesh. This drift toward screen learning is only inevitable if people do nothing to stop it. So let’s stop it.

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