Explore

1. Kelly's essay appears to represent a view informed by what some critics would call "technological determinism." Look up this phrase and transcribe its definitions from one or more sources. Based on your findings, explain why you agree or disagree that Kelly's views might be described as such.
2. Kelly makes the claim that in assessing the future of "the technium" it may be possible to "ignore individual inventions and chart long-term flows which enable them." And yet, many historians of technology would argue that each and every invention is shaped by social and cultural factors. Do some research on an invention—for instance, the refrigerator. How might this example be used to support or contest Kelly's argument?
3. Near the end of his essay, Kelly makes a comparison between caterpillars and worms. Research the biological differences between caterpillars and worms. Using this research, explain how Kelly uses these two organisms as examples to support his argument.

Neil Postman
"Five Things We Need to Know About Technological Change"

Neil Postman (March 8, 1931–October 5, 2003) was an American author, media theorist, and cultural critic who was a professor in New York University's Steinhardt School of Education. Best known for his 1985 book *Amusing Ourselves to Death*, in which he considers the impact of television on public discourse, he also wrote several other books and articles about education, technology, and relationships between media and communications and sociocultural practices and institutions. Although Postman's writings often address communications technologies that may seem somewhat dated, many critics have noted how applicable many of Postman's findings related to the culture of television are to today's "digital age." In this essay, Postman reflects on the social impact of technology and the things he has learned about technology from being involved in the study of media and communications for many decades.

Has a specific technology changed the way in which you engage in a specific activity or complete a specific task? What have you gained from using this technology? What has been lost?

First Idea

The first idea is that all technological change is a trade-off. I like to call it a Faustian bargain. Technology giveth and technology taketh away. This means that for every advantage a new technology offers, there is always a corresponding disadvantage. The disadvantage may exceed in importance the advantage, or the advantage may well be worth the cost. Now, this may seem to be a rather obvious idea, but you would be surprised at how many people believe that new technologies are unmixed blessings. You need only think of the enthusiasms with which most people approach their understanding of computers. Ask anyone who knows something about computers to talk about them, and you will find that they will, unabashedly and relentlessly, extol the wonders of computers. You will also find that in most cases they will completely neglect to mention any of the liabilities of computers. This is a dangerous imbalance, since the greater the wonders of a technology, the greater will be its negative consequences.

Think of the automobile, which for all of its obvious advantages, has poisoned our air, choked our cities, and degraded the beauty of our natural landscape. Or you might reflect on the paradox of medical technology which brings wondrous cures but is, at the same time, a demonstrable cause of certain diseases and disabilities, and has played a significant role in reducing the diagnostic skills of physicians. It is also well to recall that for all of the intellectual and social benefits provided by the printing press, its costs were equally monumental. The printing press gave the Western world prose, but it made poetry into an exotic and elitist form of communication. It gave us inductive science, but it reduced religious sensibility to a form of fanciful superstition. Printing gave us the modern conception of nationhood, but in so doing turned patriotism into a sordid if not lethal emotion. We might even say that the printing of the Bible in vernacular languages

introduced the impression that God was an Englishman or a German or a Frenchman—that is to say, printing reduced God to the dimensions of a local potentate.

Perhaps the best way I can express this idea is to say that the question, "What will a new technology do?" is no more important than the question, "What will a new technology undo?" Indeed, the latter question is more important, precisely because it is asked so infrequently. One might say, then, that a sophisticated perspective on technological change includes one's being skeptical of Utopian and Messianic visions drawn by those who have no sense of history or of the precarious balances on which culture depends. In fact, if it were up to me, I would forbid anyone from talking about the new information technologies unless the person can demonstrate that he or she knows something about the social and psychic effects of the alphabet, the mechanical clock, the printing press, and telegraphy. In other words, knows something about the costs of great technologies.

Idea Number One, then, is that culture always pays a price for technology.

Second Idea

5 This leads to the second idea, which is that the advantages and disadvantages of new technologies are never distributed evenly among the population. This means that every new technology benefits some and harms others. There are even some who are not affected at all. Consider again the case of the printing press in the 16th century, of which Martin Luther said it was "God's highest and extremest act of grace, whereby the business of the gospel is driven forward." By placing the word of God on every Christian's kitchen table, the mass-produced book undermined the authority of the church hierarchy, and hastened the breakup of the Holy Roman See. The Protestants of that time cheered this development. The Catholics were enraged and distraught. Since I am a Jew, had I lived at that time, I probably wouldn't have given a damn one way or another, since it would make no difference whether a pogrom was inspired by Martin Luther or Pope Leo X. Some gain, some lose, a few remain as they were.

Let us take as another example, television, although here I should add at once that in the case of television there are very few indeed who are not affected in one way or another. In America, where television has taken hold

more deeply than anywhere else, there are many people who find it a blessing, not least those who have achieved high-paying, gratifying careers in television as executives, technicians, directors, newscasters and entertainers. On the other hand, and in the long run, television may bring an end to the careers of school teachers since school was an invention of the printing press and must stand or fall on the issue of how much importance the printed word will have in the future. There is no chance, of course, that television will go away but school teachers who are enthusiastic about its presence always call to my mind an image of some turn-of-the-century blacksmith who not only is singing the praises of the automobile but who also believes that his business will be enhanced by it. We know now that his business was not enhanced by it; it was rendered obsolete by it, as perhaps an intelligent blacksmith would have known.

The questions, then, that are never far from the mind of a person who is knowledgeable about technological change are these: Who specifically benefits from the development of a new technology? Which groups, what type of person, what kind of industry will be favored? And, of course, which groups of people will thereby be harmed?

These questions should certainly be on our minds when we think about computer technology. There is no doubt that the computer has been and will continue to be advantageous to large-scale organizations like the military or airline companies or banks or tax collecting institutions. And it is equally clear that the computer is now indispensable to high-level researchers in physics and other natural sciences. But to what extent has computer technology been an advantage to the masses of people? To steel workers, vegetable store owners, automobile mechanics, musicians, bakers, bricklayers, dentists, yes, theologians, and most of the rest into whose lives the computer now intrudes? These people have had their private matters made more accessible to powerful institutions. They are more easily tracked and controlled; they are subjected to more examinations, and are increasingly mystified by the decisions made about them. They are more than ever reduced to mere numerical objects. They are being buried by junk mail. They are easy targets for advertising agencies and political institutions.

In a word, these people are losers in the great computer revolution. 10
The winners, which include among others computer companies, multinational corporations and the nation state, will, of course, encourage the losers to be enthusiastic about computer technology. That is the way of winners, and so in the beginning they told the losers that with personal

computers the average person can balance a checkbook more neatly, keep better track of recipes, and make more logical shopping lists. Then they told them that computers will make it possible to vote at home, shop at home, get all the entertainment they wish at home, and thus make community life unnecessary. And now, of course, the winners speak constantly of the Age of Information, always implying that the more information we have, the better we will be in solving significant problems—not only personal ones but large-scale social problems, as well. But how true is this? If there are children starving in the world—and there are—it is not because of insufficient information. We have known for a long time how to produce enough food to feed every child on the planet. How is it that we let so many of them starve? If there is violence on our streets, it is not because we have insufficient information. If women are abused, if divorce and pornography and mental illness are increasing, none of it has anything to do with insufficient information. I dare say it is because something else is missing, and I don't think I have to tell this audience what it is. Who knows? This age of information may turn out to be a curse if we are blinded by it so that we cannot see truly where our problems lie. That is why it is always necessary for us to ask of those who speak enthusiastically of computer technology, why do you do this? What interests do you represent? To whom are you hoping to give power? From whom will you be withholding power?

I do not mean to attribute unsavory, let alone sinister motives to anyone. I say only that since technology favors some people and harms others, these are questions that must always be asked. And so, that there are always winners and losers in technological change is the second idea.

Third Idea

Here is the third. Embedded in every technology there is a powerful idea, sometimes two or three powerful ideas. These ideas are often hidden from our view because they are of a somewhat abstract nature. But this should not be taken to mean that they do not have practical consequences.

Perhaps you are familiar with the old adage that says: To a man with a hammer, everything looks like a nail. We may extend that truism: To a person with a pencil, everything looks like a sentence. To a person with a *TV camera, everything looks like an image. To a person with a computer,*

everything looks like data. I do not think we need to take these aphorisms literally. But what they call to our attention is that every technology has a prejudice. Like language itself, it predisposes us to favor and value certain perspectives and accomplishments. In a culture without writing, human memory is of the greatest importance, as are the proverbs, sayings and songs which contain the accumulated oral wisdom of centuries. That is why Solomon was thought to be the wisest of men. In Kings I we are told he knew 3,000 proverbs. But in a culture with writing, such feats of memory are considered a waste of time, and proverbs are merely irrelevant fancies.

The writing person favors logical organization and systematic analysis, not proverbs. The telegraphic person values speed, not introspection. The television person values immediacy, not history. And computer people, what shall we say of them? Perhaps we can say that the computer person values information, not knowledge, certainly not wisdom. Indeed, in the computer age, the concept of wisdom may vanish altogether.

The third idea, then, is that every technology has a philosophy which is given expression in how the technology makes people use their minds, in what it makes us do with our bodies, in how it codifies the world, in which of our senses it amplifies, in which of our emotional and intellectual tendencies it disregards. This idea is the sum and substance of what the great Catholic prophet Marshall McLuhan meant when he coined the famous sentence, "The medium is the message." 15

Fourth Idea

Here is the fourth idea: Technological change is not additive; it is ecological. I can explain this best by an analogy. What happens if we place a drop of red dye into a beaker of clear water? Do we have clear water plus a spot of red dye? Obviously not. We have a new coloration to every molecule of water. That is what I mean by ecological change. A new medium does not add something; it changes everything. In the year 1500, after the printing press was invented, you did not have old Europe plus the printing press. You had a different Europe. After television, America was not America plus television. Television gave a new coloration to every political campaign, to every home, to every school, to every church, to every industry, and so on.

That is why we must be cautious about technological innovation. The consequences of technological change are always vast, often unpredictable and largely irreversible. That is also why we must be suspicious of capitalists. Capitalists are by definition not only personal risk takers but, more to the point, cultural risk takers. The most creative and daring of them hope to exploit new technologies to the fullest, and do not much care what traditions are overthrown in the process or whether or not a culture is prepared to function without such traditions. Capitalists are, in a word, radicals. In America, our most significant radicals have always been capitalists—men like Bell, Edison, Ford, Carnegie, Sarnoff, Goldwyn. These men obliterated the 19th century, and created the 20th, which is why it is a mystery to me that capitalists are thought to be conservative. Perhaps it is because they are inclined to wear dark suits and grey ties.

I trust you understand that in saying all this, I am making no argument for socialism. I say only that capitalists need to be carefully watched and disciplined. To be sure, they talk of family, marriage, piety, and honor but if allowed to exploit new technology to its fullest economic potential, they may undo the institutions that make such ideas possible. And here I might just give two examples of this point, taken from the American encounter with technology. The first concerns education. Who, we may ask, has had the greatest impact on American education in this century? If you are thinking of John Dewey or any other education philosopher, I must say you are quite wrong. The greatest impact has been made by quiet men in grey suits in a suburb of New York City called Princeton, New Jersey. There, they developed and promoted the technology known as the standardized test, such as IQ tests, the SATs and the GREs. Their tests redefined what we mean by learning, and have resulted in our reorganizing the curriculum to accommodate the tests.

A second example concerns our politics. It is clear by now that the people who have had the most radical effect on American politics in our time are not political ideologues or student protesters with long hair and copies of Karl Marx under their arms. The radicals who have changed the nature of politics in America are entrepreneurs in dark suits and grey ties who manage the large television industry in America. They did not mean to turn political discourse into a form of entertainment. They did not mean to make it impossible for an overweight person to run for high political office. They did not mean to reduce political campaigning to a 30-second TV commercial. All they were trying to do is to make television into a vast and

unsleeping money machine. That they destroyed substantive political discourse in the process does not concern them.

Fifth Idea

I come now to the fifth and final idea, which is that media tend to become 20
mythic. I use this word in the sense in which it was used by the French literary critic, Roland Barthes. He used the word "myth" to refer to a common tendency to think of our technological creations as if they were God-given, as if they were a part of the natural order of things. I have on occasion asked my students if they know when the alphabet was invented. The question astonishes them. It is as if I asked them when clouds and trees were invented. The alphabet, they believe, was not something that was invented. It just is. It is this way with many products of human culture but with none more consistently than technology. Cars, planes, TV, movies, newspapers—they have achieved mythic status because they are perceived as gifts of nature, not as artifacts produced in a specific political and historical context.

When a technology becomes mythic, it is always dangerous because it is then accepted as it is, and is therefore not easily susceptible to modification or control. If you should propose to the average American that television broadcasting should not begin until 5 PM and should cease at 11 PM, or propose that there should be no television commercials, he will think the idea ridiculous. But not because he disagrees with your cultural agenda. He will think it ridiculous because he assumes you are proposing that something in nature be changed; as if you are suggesting that the sun should rise at 10 AM instead of at 6.

Whenever I think about the capacity of technology to become mythic, I call to mind the remark made by Pope John Paul II. He said, "Science can purify religion from error and superstition. Religion can purify science from idolatry and false absolutes."

What I am saying is that our enthusiasm for technology can turn into a form of idolatry and our belief in its beneficence can be a false absolute. The best way to view technology is as a strange intruder, to remember that technology is not part of God's plan but a product of human creativity and hubris, and that its capacity for good or evil rests entirely on human awareness of what it does for us and to us.

Conclusion

25 And so, these are my five ideas about technological change. First, that we always pay a price for technology; the greater the technology, the greater the price. Second, that there are always winners and losers, and that the winners always try to persuade the losers that they are really winners. Third, that there is embedded in every great technology an epistemological, political or social prejudice. Sometimes that bias is greatly to our advantage. Sometimes it is not. The printing press annihilated the oral tradition; telegraphy annihilated space; television has humiliated the word; the computer, perhaps, will degrade community life. And so on. Fourth, technological change is not additive; it is ecological, which means, it changes everything and is, therefore, too important to be left entirely in the hands of Bill Gates. And fifth, technology tends to become mythic; that is, perceived as part of the natural order of things, and therefore tends to control more of our lives than is good for us.

If we had more time, I could supply some additional important things about technological change but I will stand by these for the moment, and will close with this thought. In the past, we experienced technological change in the manner of sleep-walkers. Our unspoken slogan has been "technology *über alles*," and we have been willing to shape our lives to fit the requirements of technology, not the requirements of culture. This is a form of stupidity, especially in an age of vast technological change. We need to proceed with our eyes wide open so that we may use technology rather than be used by it.

Analyze

1. Postman's first idea is that "all technological change is a trade-off." What specific technologies does he then discuss to explain this idea, and what does he point out about these specific technologies?
2. Postman refers to technology as a "Faustian bargain." Who was Faust, and what is a Faustian bargain?
3. How does Postman define "ecological change" compared to "additive change"? Why does he believe technological change is ecological and not additive?

Explore

1. Although Postman gives concrete examples to support the claims he makes in his discussion of the first and second things that we need to know about technological change, he does not do so for the fourth. Based on your experience, what might be appropriate examples to use in support of his fourth claim? Write a paragraph explaining how each relates to or illustrates the point he is making.
2. Rewrite Postman's five ideas in your own words. Look over them. If you were to present these five ideas, would you choose the order Postman did, or would you order them differently? Explain your rationale for this choice. Would you remove any of the ideas? Why? Would you add any? Why?
3. This essay was originally delivered as a lecture. There are specific attributes of the text as written that reflect this fact. What are they? Do these strengthen or weaken the piece as a written argument? Explain.
4. This talk was delivered in 1998. If Postman were delivering this talk today, what changes might he need to make to it? Explain what some of these changes might be and why they would be necessary.
5. Postman wrote this talk for an audience of engineers in the twentieth century. Rewrite this talk for an audience of your peers in the twenty-first century.

Forging Connections

1. In a short essay, reflect on some of the issues that Hughes, Schatzberg, and/or Marx discuss in relation to definitions of *technology*. What are some of the complications involved in defining this word? Why, according to one or more of these authors, do people often use the word *technology* without fully understanding it? Afterward, reread Murray's essay, and write one or two pages reflecting on how one or two specific issues discussed by Hughes, Schatzberg, and/or Marx are evident in Murray's essay.
2. Both Hughes and Schatzberg are academics, and both of these short essays are examples of academic prose. However, you will notice how different the style and tone of Hughes's piece are from Schatzberg's. Although this difference can be explained in part by differences between the writing style of each author, some of these differences emerge