Philosophical Tools for Technological Culture

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In this essay I would like to begin by talking briefly about some of the things we are doing at the Dewey Center to make Dewey's work more accessible and Dewey Studies more interesting and fun. Then, I would like to discuss what I take to be a Deweyan perspective on technology as life-long learning.

This year, 2001, marks the fortieth anniversary of what at its inception in 1961 was called the "Co-operative Research on Dewey Publications" and now, since 1971, the Center for Dewey Studies. In 1961, just nine years after Dewey's death, when Jo Ann Boydston and George E. Axtelle began work on what they envisioned as a "Dewey concordance" they found that the situation was a mess: only a few of his major books were in print, and the ones that were available were paperback reprints.

Over the next thirty years or so, until her retirement, Jo Ann Boydston and her staff worked very hard to clean up the mess. By any estimate, they succeeded admirably. They published what is now the standard critical edition of Dewey's works in thirty-seven volumes, and this at a rate of better than one volume per year, with support from Southern Illinois University Carbondale, the National Endowment for the Humanities, the John Dewey Foundation, and private donors. In all, the *Collected Works* comprises about forty million characters, or about eight million words.[1]

Those of you who know Boydston will know that she has been a tough act to follow. We have, however, been working hard to keep up the pace she established. Since 1995 we have published *Works about Dewey*,[2] a five hundred page bibliography of secondary works about Dewey, in both print and electronic editions, as well as an electronic edition of the *Collected Works*.[3]

We have also been at work on an electronic edition of all known Dewey correspondence, which at the moment amounts to almost 18,000 items. The first volume of that edition, which covers the period from 1871 to 1918, was published in 1999.[4] We expect to publish the second volume of the Dewey Correspondence this spring, and the third and final volume during 2003.

All known Dewey correspondence has now been transcribed, although not all of the transcriptions have yet been proofread. Among other things, this means that Dewey's letters, as well as his published works, are now fully character-string searchable using both Boolean and hypertext tools. Visitors to the Center now have access to the entire correspondence, as well as the *Collected Works* and *Works about Dewey*, all in electronic form. I am pleased to be able to report that Dewey scholarship has entered a new phase.

Now that I have brought you up-to-date on some of the things we have been up to at the Center, I want to say a few things about what I take to be a Deweyan perspective on technology as life-long learning.

The philosophical critique of technology has had a brief, but complex and interesting history. One of the best accounts can be found in Carl Mitcham's 1994 book *Thinking Through Technology*.[5] Apart from recovering some long-lost texts and providing a remarkably thorough account of persons, places, and issues, Mitcham drew attention to a split that has run through the history of the field. That split — between the arts and humanities, on one side, and science and engineering on the other, is the very issue to which C.P. Snow drew our attention several decades earlier in his little book *The Two Cultures*.[6] More recently, in 1995, this theme was also taken up with considerable skill by Leonard Waks in his excellent work *Technology's School: The Challenge to Philosophy*,[7] and it is one that has also stimulated the work of my commentator today, Jim Garrison.

As I shall indicate in a few minutes, this split between the arts/humanities, on the one side, and the sciences/engineering, on the other, was one that Dewey thought regrettable. But he did not think that it was a phenomenon — either in the narrow epistemological sense or in the broader cultural one — that was inevitable or intractable. The real problem, he thought, lay in the existential split between what is dull and rote or the result of chance, authority, or tradition, on one side, and the processes and results of informed deliberation, on the other. And this split, he argued, although existential, is not irreparable. The lines of its division are constantly changing, and they are capable of being controlled by human imagination and effort. The means of such control Dewey sometimes called inquiry, and at other times technology. But what it really boils down to is education.

Dewey was therefore neither optimistic nor pessimistic regarding the problems and prospects of technology. He was instead hopeful: hopeful that individuals and communities would systematically examine what he called their prejudices and undertake programs that would involve the continuing reform of their modes of associated living.

Dewey's critique of technology has had to swim virtually alone against the current of accepted ideas about the central issues within the field. Even a glance at the standard philosophical accounts of technology reveals a pattern of gloomy analyses, dark warnings, and even unapologetic Luddism. Only now, with reappraisals by some of the heirs of classical phenomenology, and some of the heirs of Frankfurt School Critical Theory, is some of this dystopian thinking beginning to dissipate.

Within phenomenology, the case of Martin Heidegger is instructive. Because most philosophers have been unaware that Dewey was already working out a systematic critique of technology during the last decade of the nineteenth century, and that by the time of *Experience and Nature*[8] in 1925 the main lines of that critique were more or less in place, most of them have accepted Heidegger's 1927 *Sein und Zeit*[9] as the first major study within the field. In that work Heidegger did in fact present an illuminating study of tools and techniques, "existentializing" the phenomenology that was the bequest of his teacher Edmund Husserl, by rejecting what had been its twin safety nets, foundationalism and the transcendental ego.

As a part of his analysis of what he termed *Dasein*, or human situatedness, Heidegger presented brilliant analyses of tool-use that clarified the distinction

between tools as transparent in use, on one side, and tools as consciously engaged, on the other. Moreover, by means of an inversion of the Greek hierarchy that had located theory at its apex, followed by practice and production in descending order, Heidegger issued a potent challenge to accounts that located science as temporally prior and ontologically superior to technology, and that characterized knowing as divorced from, and superior to, action.

But some, including Don Ihde, have argued that the later Heidegger, the post-World War II Heidegger, suffered a failure of nerve — that under the pressure of circumstances he re-inverted his earlier inversion, once again giving pride of place to *theoria*. It is in the work of the post-war Heidegger that one gets the gloomy scenarios by which his work in the philosophy of technology is now widely known. Caught between what he regarded as the twin evils of Soviet Communism on the one side and American Capitalism on the other, Heidegger saw little reason for hope. Since there is no opening for concrete, practical action, all technology is in his late work absorbed into the abstractions of a highly romanticized form of poetry. In his now-famous *Der Spiegel* interview, he reiterated themes that had been at the forefront of his disastrous political experiments with the National Socialists.[10] He was still looking for an epiphany. But in this case, his earthly *Fuehrer* having failed, his thinking followed a path that was covertly religious rather than overtly political.

If the later Heidegger's depiction of technology can be compared to a prediction of meteorological disaster, invoking the prospect of unchecked storms and floods that may end life as we know it, then the picture advanced by the critical theorists resembles nothing so much as a slow, steady, and apparently endless downpour. Max Horkheimer, perhaps because he had witnessed the rise of National Socialism (although, it should be noted, on the other end of the political spectrum from where Heidegger found his home), was profoundly pessimistic about the prospects of technology. Foreshadowing some of the more recent postmodernist assaults on the philosophy of the Enlightenment, he saw technology as little more than a growing pattern of domination — of humans no less than non-human nature. Horkheimer and his colleague Theodor Adorno thought that the ideals of the Enlightenment had been irrevocably corrupted by a program of instrumental rationality, what Langdon Winner has since termed "straight line instrumentalism," which they thought has led to an "abandonment of thought," in which a "reified form of mathematics, machine, and organization avenges itself" on humanity.[11]

Herbert Marcuse, though not painting as dark a picture as his fellow critical theorists, was nevertheless by no means cheered by the prospects of technology. He argued against the possibility of piecemeal reform of technological culture, suggesting that there would have to be "the emergence of a new idea of Reason, theoretical and practical… expressed in Whitehead's proposition 'The function of Reason is to promote the art of life.'"[12] The technosciences would have to "arrive at essentially different concepts of nature and establish essentially different facts."[13]

There is thus at least a glimmer of hope in the work of Marcuse. What he perceived as a bare hint of blue sky visible through menacing clouds has during the past decade grown ever more luminous with the work of feminist critiques of

technoscience and, more recently, by Andrew Feenberg in his 1999 book *Questioning Technology*.[14] In that work Feenberg thoroughly remodels the central critiques of technology advanced by his teacher Marcuse. Although I cannot go into detail here, it is worth noting that Feenberg has moved perceptibly in the direction of the program laid out by Dewey during the early decades of the twentieth century, even though he does not seem to be aware of that fact.

Unfortunately, second generation critical theorist Jürgen Habermas has not made similar advances in his thinking about these issues. As near as I can determine, Habermas continues to hold to a distinction that he established earlier in his career and on which much of his later work is based, a position that splits off the strategic action of technoscientific rationality, on one side, from the communicative and emancipatory action of the arts and humanities, on the other. In his view, it is the job of the technosciences to determine the facts, and it is the task of the arts and humanities to determine values. The function of communicative and emancipatory action is thus in his view to form a bulwark against incursion into the life-world by the force of instrumental rationality, and perhaps, if practiced with sufficient diligence, even to drive that dark force back into its lair.

In sum, this is the situation with which the early- and mid-century phenomenologists and critical theorists left us (but which some of their "third generation" heirs such as Feenberg are now energetically revising). In their work the split between the arts and humanities, on one side, and the technosciences, on the other, remains. For Heidegger, this was a split between the predations of a technological attitude that treats Being as standing reserve, on one side, and the waiting watchfulness of *poetike techne* on the other. For Horkheimer and Adorno, it was a split between instrumental rationality and the expediency of contingent truth on one side, and critical theory and absolute truth on the other. For Marcuse, it was quantification and domination, on one side, and "the art of life" on the other. For Habermas, it has been the determination of facts by the strategic action of the technosciences, on one side, and valuation by means of the activities of communicative and emancipatory action, on the other. In each case, I ask you to note, there is a fact/value split. Each account is a kind of drama in which the technosciences, in their role as experimental fact-gatherer, plays the heavy — the insensitive lout incapable of grasping meaning.

Having provided an overly brief, but I trust not misleading account of the currents against which Dewey charted his lonely trajectory, it is now time to examine his contrarian move in a more detailed fashion. Just what did Dewey want to tell us about technology, and more specifically about the splits that have characterized most of the other philosophical accounts of technology?

In his 1930 essay "What I Believe," he wrote that

> 'Technology' signifies all the intelligent techniques by which the energies of nature and man are directed and used in satisfaction of human needs; it cannot be limited to a few outer and comparatively mechanical forms. In the face of its possibilities, the traditional conception of experience is obsolete.[15]

One of the interesting things about this remark is that he appears to beg the question of whether technology is good, bad, or indifferent. He seems to pack the answer to

that question right up front by claiming that technology is intelligent. And if it is intelligent, given Dewey's preoccupation with the cultivation of intelligence, then it must be good by definition. But given what we know about Bhopal, Chernoble, Arctic oil exploration, agent orange, ozone-layer-depleting chemicals, agents of bacteriological warfare, and the fact that children seem to have little difficulty getting access to assault rifles, it would hardly seem to be a defensible position to say that technology is good by definition.

Several generations of Dewey's critics have in fact interpreted him as blindly, or at least naively, ready to welcome anything that came off the engineers' drawing boards. Bertrand Russell accused him of celebrating the worst elements of American business boosterism and unbridled capitalism. As I have already indicated, Horkheimer and Adorno accused him of sacrificing big-T truth on the twin altars of scientism and expediency. The religious right has never tired of excoriating what they perceive as his devil-may-care relativism. (The vice president of a suburban Chicago school board has even gone so far as to claim in a recent editorial in the *Illinois School Board Journal* that Dewey's ideas were behind the Columbine shootings. After excoriating Dewey over several paragraphs, he wrote that "the seemingly mindless slaughter at Littleton, was the acting out of the pragmatic view. If it works, if it feels good, do it. They did."[16] (It is in any estimate remarkable that now, some fifty years after Dewey's death, there are still school board members who seem to think that he is not only alive and kicking, but horned and hooved as well.)

So what are we to make of what appears to be a *carte blanche* for technical innovation? The key to understanding this remark, I believe, lies in an appreciation of Dewey's hopes for the future of our technological culture and his ideas about what we will have to do in order to realize those hopes.

Dewey understood that technology defines our culture in much the same manner in which religious faith and doctrine defined the culture of the European Middle Ages. Beyond that, however, he believed that what technology produces and refines can be used to improve the conditions under which men and women live, and thus to improve the chances for individual and community growth. Dewey thought it empirically obvious that improved means of production and greater management of those elements of our environment that are not what we wish them to be are ends-in-view that are rooted in the history of human life on earth in ways that make them highly desirable. We might even go so far as to say that Dewey viewed technological development as a necessary condition for the growth of individuals and communities. But what, as William James might have asked, was the "cash value" of this idea? How was it to be worked out in practice?

The answer to this question, I believe, lies in Dewey's notion of inquiry. I am confident that I do not have to remind the members of this particular audience that inquiry — as the centerpiece of education — is for Dewey a natural process characterized by organic phases and rhythms. It begins with irritation: a breakdown or "hitch" of some sort. Some familiar habit or technique or tool has failed to work as usual. When such things happen, as they often do, then inquiry is called for. If inquiry does its job properly, it produces something new: a new conclusion, a new

habit, a new technique, a new tool that is more satisfactory than the one that caused the trouble.

So when Dewey wrote that technology is intelligent, he was telling us that technology involves inquiry, and that inquiry is a natural activity. He was naturalizing technology. He was telling us that technology is what we use to improve our tools and techniques — to tune them up. So technology is desirable, since subjecting old techniques and habits and tools to examination and finding ways to rework them is desirable. That is the force of Dewey's remark. That is why he is not begging the question when he calls technology intelligent, and therefore good.

Dewey's notion of inquiry thus honors a distinction made clearly enough in the French and German languages, for example — but that sometimes gets fuzzed a bit in English. The French and the Germans make a clear distinction between technique and technology, but we Anglophones are not always so clear about the matter. Just as the study of life — the logos of bios — is biology, the study of techniques, including tools, skills, and so on — the logos of *techne* — is technology. Dewey honored this distinction between techniques and their logos, which is to say, between techniques and techn-ology.

Of course these terms — technique and technology — are quite often misused in common parlance. An advertisement promises to "put technology in the hands of students." A computer company promises to deliver "the latest technology" in a box. Analysts of geopolitical matters talk about "technology transfer." In each of these cases, it is tools and techniques that are being promised, delivered, or transferred — not, of course, technology. We might even go so far as to say that the transfer of tools and techniques from developed to developing countries, in the absence of adequate technology, that is, in the absence of adequate inquiry into such tools and techniques, is one of the major problems afflicting the political and economic situations in many parts of the world today. The transfer of tools and techniques without technology is precisely what led to the famous cargo cults of the southwest Pacific, to take just one example.

There is something else interesting in this passage from "What I Believe." In addition to characterizing technology as intelligent, Dewey denies that technology has to do solely, or even primarily, with "outer and comparatively mechanical forms." There are two things that should be noted about this statement. The first is that technology does not have to do only or even for the most part with what is relatively external to the organism — with what we sometimes call hardware. The second is that when it comes to teaching and learning, function trumps ontology.

If technology is inquiry into techniques, tools, habits, institutions, doctrines, and so on, then the boundary between what is external to the organism and what is internal to it, gets rather vague. The great techno-prophet of the 1960s, Marshal McLuhan understood this well enough when he wrote of our media as prosthetic devices.[17] Tools that are concrete and tangible and tools that are abstract and intangible were treated by Dewey, and later by McLuhan, as analogs. Once we begin to treat our habits, institutions, doctrines, and so on, in the same way that we treat other sorts of tools — as interactive instead of fixed or transcendent, for example —

and to judge them in terms of their relevance and usefulness for inquiry, rather than in terms of their pedigree and longevity, then we will have begun to understand the power of Dewey's technological metaphor.

Much to the horror of some mainstream logicians, for example, Dewey treated logical objects such as *modus ponens* and the law of excluded middle not as absolute rules, universally applicable, but as regulative principles, as tools of discovery that are either applicable or not to specific cases, that is, that either serve to generate new data and help us to reach new conclusions, or fail to do so. Dewey treated political concepts such as equality and democracy not as fixed and finished concepts that could be exported from developed to developing nations, for example, but as tools that must be modified as they come to be utilized in conjunction with novel types of materials. As a form of government, democracy cannot be exported. As a tool or means of social inquiry, it can flourish in a variety of cultural environments.

There is something else at work in this remark. A key plank in Dewey's instrumentalist platform from early to late was his warning that we should not spend a lot of time puzzling over the ontological status of abstract terms. He thought that it is a waste of time to ask *what they are*. We should instead be asking *what they do.* We should be asking *how they are*. When we do this, then there are two interesting results. One result, as I have already suggested, is that abstractions such as physical laws (such as the law that says that the speed of light is 186,000 miles per second, for example) and mathematical laws (such as the law that says two plus two is equal to four, for example) begin to be viewed as regulative principles and hypotheses — in other words, as tools for gathering new information — and not as things that are so well defined that they provide the standards to which our experiences must conform. For Dewey's pragmatic technology, physical and mathematical laws do not determine our experiences. It is the other way around. When they are used properly, they can lead us to new and unexpected experiences.

When function trumps ontology, then, what we do as educators no longer involves attempts to define what our abstract tools are — to seek to determine their essences, as Plato thought appropriate, or to sort them out into rigid hierarchies, as Aristotle and his medieval heirs did. Instead, what we do will involve attempts to find out what our abstract tools can *do* — how they function, how they can be used in the process of knowledge-getting, and how those functions can be improved over time as new needs arise.

There is a good illustration of this point in an essay by the late physicist Richard Feynman.[18] Feynman opens up a first grade science book. There are three pictures. The first one is a picture of a wind-up toy dog. The second one is a picture of a real dog. The third one is a picture of a motor bike. Under each picture there is the following question: "What makes it move?" The answer is, of course, in the teacher's handbook. It's energy that makes each of these things move.

But is that the way to teach science? Feynman did not think so, and neither did Dewey. Energy is an abstract tool that is used to perform certain functions, such as getting additional data about some problem that we want to solve. It like a pry-bar for opening up new experiences. Or perhaps like a key that opens the door to lots of

new ideas and new data. It is *not* something whose definition students need to memorize so we can then tell them, "you see, all three of these experiences fit our definition." That is a good way to close down the excitement of learning about technoscience.

Feynman's alternative approach was basically the same as Dewey's. The reason that the toy dog moves is that you wind up the spring, which begins to unwind when you release the crank. As the spring unwinds, it runs the gears, and makes the toy dog's legs move, and so on. Feynman and Dewey are clear: it is a hell of a lot better for the kids to take the thing apart, to see how it works, than to memorize the definition of "energy." Taking the toy dog apart is a good way to teach and learn science. Getting the kids to memorize the definition of "energy" for a standardized test is not.

Here is another example from Feynman. In an interview with *Omni* magazine, Feynman was asked what he thought about the fact that the quest for the indivisible particle seemed to produce ever smaller particles.[19] He replied that he did not think that *that* was the quest at all. Physicists might talk about "ultimate particles," but what they are *really* doing is trying to find out how nature behaves — how it functions. For contemporary science, the question is no longer "what is it?" That is the old metaphysics. The question is "what happens?" "How does nature behave?" For Feynman, as for Dewey, when learning happens, function trumps ontology.

Dewey's first point in this passage, then, is that technology is a natural form of inquiry that crosses the boundary between what is relatively internal and what is relatively external to the organism in an effort to tune up our tools and techniques. And his second point is that as far as technology is concerned, function trumps specimen-case ontological exercises.

His third point is that anyone who takes these two points seriously will also realize that technology renders the traditional notion of experience obsolete.

What is this traditional notion of experience that Dewey says is rendered obsolete? There are two parts to this old idea. The first is the notion that you have to go outside of experience in order to get the norms by which to judge experience. This has been a feature of philosophical thought since the time of the pre-Socratics, and it was a feature of religious thinking long before that. What is the new notion of experience that Dewey thinks must take its place? It is the notion that the norms that we use to advance our knowledge are developed *within* experience, as means interact with ends-in-view in ways that alter the qualities of both and lead to new data, better tools, and more useful conclusions. Norms are the flower and fruit of experience.

I will give you what I view as a very timely example of what these two very different notions of experience mean in terms of current technoscientific education.

I recently picked up a copy of a very clever little book called *What's DARWIN Got To Do With It*?[20] It was published last year by InterVarsity Press, which is located not far from here at Downers Grove, Illinois. It is an illustrated book — with four or five little cartoons on each page — much like those little "for beginners" books — you know, *Freud for Beginners*, *Marx for Beginners*, *Foucault for Beginners*, and

so on, that you may have seen. My guess is that it was designed to be used by school students and college undergraduates, grades 9 through 16, as we might say.

I am going to read a little bit of the dialogue. For our present purposes we can ignore the pictures, since the dialogue is what is important. On page 13 the narrator says, "Let's listen in on the discussion between Professor Teller (the well-known Darwinist lecturer) and Professor Questor (a proponent of Intelligent Design)."[21]

On page 13, Teller and Questor attempt to come up with some ground rules for their little debate. At the bottom of the page, Teller proposes the following rule, "Since science is an empirical search for truth, any theory that includes a force outside of Nature is irrational — which means it's either religion or fantasy."

Now we turn the page. Questor shouts; "Hold on There! How can you call this a fair debate if your first move is to outlaw any point of view except your own?" Teller responds that whatever is outside of nature (say, an intelligent designer) is "not exactly available for study or experiments." Questor responds, "Neither of our theories is directly observable or provable by experiment, because nobody was there to observe how life originated." On the next page, Questor appears to make a rather important concession: "We're both stuck with trying to explain what we can observe in the present by referring to events in the past that we can't observe."

Next we skip to the dialogue on page 78. Teller: "Darwinism is still the best naturalistic theory we have." Questor: "Frankly, I'm not interested in whether it is the best naturalistic theory. I want to know if it's true. Did it happen that way?" Finally, on page 126, Questor says, "If life is the result of intelligent design, then giving up on trying to find a purely naturalistic explanation is like giving up on trying to turn lead into gold. It's progress, not defeat."

I will not attempt to defend the points made by the inept Teller, and I will not bore you with the list of informal fallacies that I made in the margins of the book as I read it. But I do have a couple of things to say about Questor's position. Simply put, her understanding of experience is an excellent example of what Dewey thought has been made obsolete as a result of the technological developments that have allowed function to trump ontology.

Questor claims that what she is doing is science. But is it? Of course not. There is a big difference between what Questor is doing and what scientists do. She is trying to solve one of the old "what is it" questions, whereas contemporary technoscience deals with "how does it function" types of questions. She is busy trying to prove the *existence* of an intelligent designer, whereas most evolutionary biologists are trying to find out *how* nature works. In order to get the proper answer to her *existence* question, Questor seems perfectly happy to step outside of the bounds of nature to get the support she needs. She does this at the same time that she says that what she is doing is science, and that she wants to be able to do it in a classroom in a public high school or university.

I have little doubt that this book will somewhere be offered to school boards and educators who make decisions about curricular matters as a legitimate alternative to the teaching of mainstream accounts of evolutionary biology. And of course there

is an *aroma* of science about it. Seen in terms of Dewey's claim in "What I Believe," however, that technology has made the old concept of experience obsolete, it is probably best described as science that is some 150 years out of date.

So the first aspect of the old notion of experience that technology has made obsolete is the idea that one has to go outside of experience to get the norms by which to judge experience. The second brings us full circle, back to the critiques of technology advanced by the phenomenologists and critical theorists that I discussed earlier. Simply put, it is Dewey's claim that the old fact-value split is a fake. Dewey taught that the *ought* is the *is* of action. It is no trick to get an ought from an is. I have a toothache, therefore I ought to see a dentist. I use a car to get to work, I am in good health, and my driver's license is expired, therefore I ought to visit the license bureau. Of course we can find exceptions to each of these cases. Maybe my toothache is the result of the too rapid consumption of a frozen margarita. Or perhaps I have just moved to an apartment in the Loop and so I no longer need a driver's license.

Some philosophers have argued that we can just keep adding conditions such as the ones I just listed until we get a justification of the traditional fact-value split. But that is not all the case. In the cases I just mentioned, the added conditions do not at all drive a wedge between facts and values: they merely change the situations into ones that call for different oughts. I ought not consume my margarita so rapidly. I ought to buy a Chicago Transit Authority card as soon as it is convenient.

The simple fact is that in our everyday lives we make decisions about what we ought to do based on what we determine to be the case. In our existential affairs, we routinely get an ought from an is. Dewey saw this clearly, and he never tired of making this point.

Further, the abstract fact/value split advanced by the philosophers I have discussed is no more tenable than the existential is/ought split I just discussed. Where the critical theorists, for example, saw an unbridgeable gulf, Dewey saw phases of a process of inquiry. Where they saw the tools and products of the technosciences in conflict with the arts and the humanities, Dewey saw the possibility of cooperation in ways that would advance inquiry and solve problems.

In this esay I have discussed some of the ways in which Dewey attempted to overcome the time honored fact/value split between the technosciences, on one side, and the arts and humanities, on the other. I have suggested that he presented his alternative view in a well-crafted passage in his little book *How We Think*, in which he identified technology as inquiry, and inquiry as an organic response that we utilize to tune up our tools and techniques, including our habits and our institutions.[22] In Dewey's view, one of the great lessons of technology is that functional "how does it work" type questions are more productive than ontological "what is it" type questions. Another of technology's great lessons is that the traditional notion of experience has been rendered obsolete.

Dewey's understanding of technology is thus positive without being positivistic and scientific without being scientistic. Here is my gloss on thousands of words that Dewey deployed in his discussion of the matter. *Technology is the invention,*

development, and cognitive deployment of tools and other artifacts, brought to bear on raw materials and intermediate stockparts, with a view to the resolution of perceived problems. By identifying technology with inquiry, as he did, Dewey was identifying technology with education — with the analysis and critique of existing traditions and proposed courses of action. What this means for our culture is that where there are problems, the fault does not lie with technology, but with tools and techniques that have failed us and that are therefore in need of being tuned up.

Dewey was unequivocal on this matter: short of luck, technology is the only means at our disposal with which to tune up our tools and techniques. It is the self-correcting method by which we are able to determine and secure what is good. Technology is thus for Dewey a form of life-long learning.

1. Jo Ann Boydston, ed., *The Collected Works of John Dewey*, 37 vols. (Carbondale: Southern Illinois University Press, 1967-1991).

2. Barbara Levine, compiler and ed., *Works about John Dewey, 1886-1995* (Carbondale: Southern Illinois University Press, 1996). Electronic edition (Charlottesville, Va.: Intelex Corp., 1996).

3. Larry Hickman, ed., *The Collected Works of John Dewey, 1882-1953: The Electronic Edition* (Charlottesville, Va.: Intelex Corp., 1996).

4. Larry Hickman, ed., *The Correspondence of John Dewey Vol. 1: 1871-1918* (Charlottesville, Va: Intelex Corp., 1999).

5. Carl Mitcham, *Thinking through Technology* (Chicago: The University of Chicago Press, 1994).

6. C.P. Snow, *The Two Cultures* (Cambridge: Cambridge University Press, 1993).

7. Leonard J. Waks, *Technology's School: The Challenge to Philosophy*, series ed. Carl Mitcham, suppl. 3, *Research in Philosophy and Technology* (Greenwich, Conn.: JAI Press, 1995).

8. John Dewey, *Experience and Nature*, ed. Patricia Baysinger and Barbara Levine, in *The Later Works, The Collected Works of John Dewey*, vol. 1, ed. Jo Ann Boydston (Carbondale: Southern Illinois University Press, 1981).

9. Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (New York: Harper and Row, 1962).

10. "Only a God Can Save Us," *Der Spiegel*'s interview with Martin Heidegger, trans. Maria P. Alter and John D. Caputo, in *Philosophy Today* 20 (4 April 1976): 267-85, quoted in *The Heidegger Controversy: A Critical Reade,* ed. R. Wolin (New York, 1991).

11. Max Horkheimer and Theodor W. Adorno, *Dialectic of Enlightenment* (New York: Continuum, 1987), 41.

12. Herbert Marcuse, *One-Dimensional Man* (Boston: Beacon Press, 1964), 158.

13. Ibid., 233.

14. Andrew Feenberg, *Questioning Technology* (London: Routledge, 1999).

15. John Dewey, "What I Believe," in *The Collected Works of John Dewey, The Later Works,* vol. 5, ed. Jo Ann Boydston (Carbondale: Southern Illinois University Press, 1984), 270.

16. *Illinois School Board Journal* (July-August 1999): 2.

17. Marshall McLuhan, *Understanding Media* (New York: Signet Books, 1964).

18. Richard P. Feynman, *The Pleasure of Finding Things Out* (Cambridge: Perseus Books, 1999), 178.

19. Ibid., 192.

20. Robert C. Newman and John L. Wiester with Janet and Jonathan Moneymaker, *What's DARWIN Got to Do with It? A Friendly Conversation About Evolution* (Downers Grove, Ill.: InterVarsity Press, 2000).

21. Ibid, 13.

22. John Dewey, *How We Think*, in *The Collected Works of John Dewey, Middle Works,* vol. 6, ed. Jo Ann Boydston (Carbondale: Southern Illinois University Press, 1978), 177-356.