

Some Notes on Wiener's Concerns about the Social Impact of Cybernetics, the Effects of Automation on Labor, and "the Human Use of Human Beings"

I wonder greatly what will happen to our bottle feeding of all possible disruptive inventions. We have so tied ourselves up with...demands for goods as a hedge against a business depression that it will not be easy for us to move again at more reasonable levels....I dread to think of the amount of individual misfortune and desolation which may come of all this....It will be a long and arduous task to fit ourselves again into a system...adequate for our better understood needs. It must be done. Let us hope that it can be done.

—Norbert Wiener

"A Scientist's Dilemma in a Materialistic World"

Introduction.

In 1948, Norbert Wiener's book, *Cybernetics: Or Control and Communication in the Animal and the Machine*, set off a scientific and technological revolution. In less than a decade, his practical new science transformed the day-to-day labors of workers in every industry and unleashed a flood of dazzling devices on postwar society. In his mind's eye, he saw the technical promises of the new world that was dawning and modern marvels few could imagine at the time. But, alone among his peers, Wiener also saw the darker side of the new cybernetic era. He foresaw the worldwide social, political, and economic upheavals that would begin to surface with the first large-scale applications of computers and automation. He saw a relentless momentum that would pit human beings against the seductive speed and efficiency of intelligent machines. He worried that the new time and labor-saving technology would prompt people to surrender to machines their own purpose, their powers of mind, and their most precious power of all—their capacity to choose.

Wiener spent his later years tirelessly warning the leaders of governments, corporations, and the public about those far-reaching changes that were coming to work and daily living. He was the first person to sound alarms about intelligent machines that could learn from experience, reproduce without limitation, and act in ways unforeseen by their human creators, and he called for greater moral and social responsibility by scientists and technicians in an age of mushrooming productive and destructive power. He wrote:

Those of us who have contributed to the new science of cybernetics...stand in a moral position which is...not very comfortable. We have contributed to the initiation of a new science which...embraces technical developments with great possibilities for good and for evil. We can only hand it over into the world that exists about us....We do not even have the choice of suppressing these new technical developments....The most any of us can do by suppression is to put the development of the subject into the hands of the most irresponsible and most venal of our engineers. The best we can do is to see that a large public understands the trend and the bearing of the present work, and to confine our personal efforts to those fields...most remote from war and exploitation. ~

Prepared for 21st Century Wiener by Flo Conway & Jim Siegelman, authors of *Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics* (New York: Basic Books, 2005/2006). Text adapted from the book.



Wiener spoke passionately about rising threats to human values, freedoms, and spirituality that were still decades in the offing. Yet, even as his new ideas were taking hold in America and worldwide, Wiener himself wound up on the sidelines of his own revolution. His prescient warnings went largely unheeded, his moral stands were rejected by the majority of his peers and a gadget-happy consumer public, and his grim predictions were dismissed by many as the doomsaying of an aging, eccentric egghead. Still he soldiered on.

Wiener on the social impact of the cybernetics revolution & “the human use of human beings.”

When a djinee is found in a bottle, it had better be left there....If you are given three wishes, you must be very careful what you wish for....Any machine constructed for the purpose of making decisions...will be completely literal-minded. Woe to us if we let it decide our conduct, unless we have previously examined the laws of its action, and know fully that its conduct will be carried out on principles acceptable to us....The machine like the djinee... will in no way be obliged to make such decisions as we should have made, or will be acceptable to us. For the man who is not aware of this, to throw the problem of his responsibility on the machine...is to cast his responsibility to the winds, and to find it coming back seated on the whirlwind. ~

More than most scientific revolutionaries, Wiener took the trouble to tell us explicitly why he was so worried about the fate of his discoveries, and to leave behind some basic instructions and the ethical guidelines necessary to help us save ourselves. He made clear that our greatest tasks ultimately would be to determine those purposes and values we want to embrace as human beings, and how we choose to share our existence with the machines we have created in our image.

His first popular book, *The Human Use of Human Beings: Cybernetics and Society*, published in 1950, brought his concerns to the public. The book cut across all the domains in which the new science and technology were taking hold: computers, automation, telecommunications, biology, medicine, psychiatry, economics, mass communication, popular culture and the arts. It appealed to people who were concerned, as he was, about the impact of the new technologies on their jobs and their daily lives, and to others simply seeking to understand the fast-changing times. Above all, Wiener wanted to debunk the sci-fi scare stories about automation and bring to public attention the deeper threat the new intelligent technology posed to individuals and societies. He wrote:

The [automatic machine] is not frightening because of any danger that it may achieve autonomous control over humanity....Its real danger...is the quite different one that such machines, though helpless by themselves, may be used by a human being or a block of human beings to increase their control over the rest of the human race...by means not of machines themselves but through...techniques as narrow and indifferent to human possibility as if they had, in fact, been conceived mechanically....In order to avoid the manifold dangers of this, both external and internal...we must know...what man's nature is and what his built-in purposes are. ~



The Human Use of Human Beings became a bestseller. The warm public reception suggested that Wiener had succeeded in his mission to take his social concerns directly to the people, and to give cybernetics a fuller role as a science of communication in all its technical and human dimensions—and one with explicit moral imperatives as well. First among those imperatives, for Wiener, was the theme that gave the title to his book:

That we shall have to change many details of our mode of life in the face of the new machines is certain; but these machines are secondary in all matters of value...to the proper evaluation of human beings for their own sake.

Repeatedly, Wiener voiced his reservations about the potential impact of the new technology on working people in every business and industry, along with his deep-seated fear that, like the first industrial revolution, which devalued “the human arm by the competition of machinery,” the second, cybernetic, industrial revolution “is similarly bound to devalue the human brain, at least in its simpler and more routine decisions [until] the average human being of mediocre attainments or less has nothing to sell that it is worth anyone’s money to buy.”~

Wiener’s concerns about the impact of automation on labor.

It is perfectly clear that [automation] will produce an unemployment situation, in comparison with which...the depression of the [nineteen] thirties will seem a pleasant joke. This depression will ruin many industries—possibly even the industries which have taken advantage of the new potentialities....Thus the new industrial revolution is a two-edged sword. It may be used for the benefit of humanity, but only if humanity survives long enough to enter a period in which such a benefit is possible. It may also be used to destroy humanity, and if it is not used intelligently it can go very far in that direction. ~

The burst of knowledge and invention *Cybernetics*’ touched off has brought the world many of the benefits Wiener and his contemporaries hoped their efforts would bring: an abundance of affordable, mass-produced goods, an increased ease and convenience of daily life, unlimited quantities of information, and new biomedical technologies that have improved and extended people’s lives. The revolution has created millions of new jobs, whole new industries and professions, and collapsed borders and barriers to trade between nations. It has changed societies from within and without, and transformed the way people the world over communicate with one another. But Wiener never let those technical advances outweigh the human factors in the equation of cybernetics. From the moment he gave his new science to the world, he realized:

It gives the human race a new and most effective collection of mechanical slaves to perform its labor. Such mechanical labor has most of the economic properties of slave labor....However, any labor that accepts the conditions of competition with slave labor accepts the conditions of slave labor, and is essentially slave labor. ~

The looming prospects of automation in industry presented Wiener with a professional dilemma he felt personally. He wrote later, “I wondered whether I had not got into a moral situation in which my first duty might be to speak to others concerning material which could be socially harmful.”~ He weighed the pros and cons of coming changes he could only envision dimly:

The automatic factory could not fail to raise new social problems [as it] threatens to replace [human workers] completely by mechanical agencies....If these changes...come upon us in a haphazard and ill-organized way, we may well be in for the greatest period of unemployment we have yet seen. It seemed...quite possible that we could avoid a catastrophe of this sort, but if so, it would only be by much thinking, and not by waiting supinely until the catastrophe is upon us. ~



Early in the postwar period, Wiener began an active outreach to organized labor. He made contact with union leaders, but he could not impress union officials the seriousness of the challenges posed by automation. The experience left him frustrated and strongly suspecting that labor leaders had a limited view of the coming realities of automation and few tools for dealing with his larger questions about the future of labor itself.

In August 1949, Wiener wrote a long letter to Walter Reuther, president of the United Automobile Workers, America's largest and most powerful union, to alert him to the technical prospects of automation and its consequences for labor. He offered:

To show a sufficient interest in the very pressing menace of the large-scale replacement of labor by machine [and] to steal a march upon the existing industrial corporations....I am willing to back you loyally, and without any demand or request for personal returns....I do not wish to contribute in any way to selling labor down the river. ~

Neither Wiener nor Reuther had any desire to repeat the bitter nineteenth-century Luddite rebellion of textile workers in England, who smashed the automatic looms that threatened their craft and their livelihood. Both these modern men wanted to work cooperatively with industry owners and engineers to ease the inevitable transition to automated machinery in the workplace, and to cushion the impact on workers by retraining and upgrading their skills to enable people to work compatibly with the new machines as supervisors and troubleshooters on the shop floor. But neither Wiener nor Reuther wanted to see the basis for new technology and innovation in industry reduced merely to monetary factors.

It may very well be a good thing for humanity to have the machine remove from it the need of menial and disagreeable tasks, or it may not. I do not know. [But] it cannot be good for these new potentialities to be assessed in the terms of the market, of the money they save....The answer, of course, is to have a society based on human values other than buying or selling.... To arrive at this society, we need a good deal of planning and a good deal of struggle. ~

Wiener's outreach to labor never resulted in the coordinated planning and struggle he knew would be needed to prepare societies for the coming age of automation. And, beginning in the 1960s, the numbers of American industrial workers began their historic decline. In the first wave, more than a million factory workers lost their jobs to automation, including 160,000 members of Walter Reuther's United Automobile Workers union.~ With the advent of microchip technology in the 1970s, the push by industries to automate and depopulate became "a virtual stampede,"~ as one historian described it. Job losses piled up in manufacturing and, then, spread into service industries and professional and managerial positions, as American society veered down the road to the workerless future Wiener had foretold. There would be many turns and bumps along the way, including added challenges from the offshoring of American industries to countries where human labor costs were a fraction of union wages. But the "trend and the bearing," as Wiener called it, was set on a course of declining numbers of human workers in basic industries and irreversible "structural unemployment" in the world's developed economies

And those were only the first ripples of the global wave of unemployment Wiener foretold. Today, even in the most robust sectors of the information economy—computer programming and technical services—are themselves becoming subject to automated technology and programming techniques, and many highly educated, well-trained, technical workers are becoming superfluous and prohibitive in the new cost equations of global enterprise. This, too, was one of the many human dilemmas of automation Wiener saw down the road. As he forewarned:

The magic of automation [is] literal-minded....A goal-seeking mechanism will not

necessarily seek our goals unless we design it for that purpose, and in that designing we must foresee all steps of the process for which it is designed....The penalties for errors of foresight, great as they are now, will be enormously increased as automatization comes into its full use.~

For many industrialists the new age of the automatic factory and “machines without men”~ could not come fast enough. But Wiener’s views set him squarely in opposition to his fellow scientists, to their new patrons in government and industry, and to a younger generation of engineers who came of age in the Second World War.

Wiener’s warnings to young engineers, scientists, and computer industry professionals.

The lords of the present science...are nothing more than apprentice sorcerers, fascinated with the incantation which starts a devilment that they are totally unable to stop. Even the new psychology...becomes in their hands a way for obliterating the conscientious scruples of the working scientists, and for destroying such inhibitions as they may have against rowing into this maelstrom. Let these wise men who have summoned a demoniac sanction for their own private purposes remember that in the natural course of events, a conscience which has been bought once will be bought twice. The loyalty to humanity which can be subverted by a skillful distribution of administrative sugar plums will be followed by a loyalty to official superiors lasting just so long as we have the bigger sugar plums to distribute.~

Now Wiener began to address his fellow scientists and younger colleagues explicitly in the manner of an elder statesman with no vested interests, one who had consistently spurned the lucrative consulting fees and bids for public endorsements that continued to come his way, as his activism shifted to the philosophical plane of his new science and its ethical dimensions.

In a speech at Columbia University in 1957, he implored young Americans to embrace the conviction that their careers in science were challenging and worthy of their best effort, not for profit or any personal gain but as an “example of devotion and an inner call.”~ In a speech to the American Association for the Advancement of Science, he spelled out “Some Moral and Technical Consequences of Automation.”~ Looking back on the first decade of applied cybernetic processes and their social impact, he observed that many people had dismissed the dangers of the new cybernetic technologies with little understanding of their true risks. He warned of the perils inherent in the speed of the new automated machines, and in the swiftness with which they were proliferating in critical systems of the society.

But, again, Wiener homed in on the human factors in the equation. The growing hunger for government and corporate contracts he perceived among his peers and younger colleagues darkened his outlook by degrees. By the end of the 1950s, as the postwar “military-industrial complex” began to absorb America’s scientific enterprise, Wiener took to vehemently denouncing the new “megabuck” era of postwar science that he believed was having “an evil effect on scientific research all down the line.”~ He observed:

When human atoms are knit into an organization in which they are used, not in their full right as responsible human beings, but as cogs and levers and rods, it matters little that their raw material is flesh and blood. What is used as an element in a machine, is in fact an element in the machine. Whether we entrust our decisions to machines of metal, or to those machines of flesh and blood which are bureaus and vast laboratories and armies and

corporations, we shall never receive the right answer to our questions. ~

He had other reservations about the new direction of postwar science. The military was becoming a primary funder of basic and applied science. The great universities and technical institutes where scientists were trained and sheltered were forging permanent ties to government and making their own lucrative arrangements with the private sector, and he was leery of this new national science leviathan from the outset. Writing in the *Atlantic Monthly's* January 1947 issue, under the defiant headline, "A Scientist Rebels," Wiener became the first scientist associated with the new communication and control technologies who publicly refused to cooperate with the government and the nation's defense establishment. Two years later, in a tough follow-up piece in *The Bulletin of the Atomic Scientists*, he reaffirmed his moral conviction:

It is clear that the degradation of the position of the scientist as an independent worker and thinker...has proceeded even more rapidly and devastatingly than I had expected....This subordination of those who ought to think to those who have the administrative power is ruinous for the morale of the scientist, and quite to the same extent it is ruinous to the quality of the objective scientific output of the country...In view of this, I...see no reason to turn over to any person, whether he be an army officer or the kept scientist of a great corporation, any results which I obtain if I think they are not going to be used for the best interests of science and of humanity. ~

His check and balance on the system was the conscience of every scientist and engineer, the people he saw as the principal agents of change and control over the world's advancing technological societies. He implored his colleagues to exert more feedforward in their programming efforts and all their professional endeavors, and to act in every instance, not in their own self-interest, or in the interest of their employers and institutions, but in the greater interest of humankind.

Wiener on the moral pitfalls posed by man-machine interactions in the new age of intelligent technology.

If we want to live with the machine...we must not worship the machine. We must make a great many changes in the way we live with other people....We must turn the great leaders of business, of industry, of politics, into a state of mind in which they will consider...people as their business and not as something to be passed off as none of their business. ~

In several articles Wiener took aim at an emerging class of technophiles who, in his view, were falling "into the childish error of worshipping the new gadgets which are our own creation as if they were our masters."~ He opened fire verbally on the growing faction of professionals he now perceived as a "cult of gadget-worshippers" and voiced his increasing displeasure over the direction in which certain "eager beavers"~ in technology, business, and military circles were pushing the fledgling science of automation:

There is a sin, which consists of using the magic of modern automatization to further personal profit or let loose...apocalyptic terrors....So long as we retain one trace of ethical discrimination, the use of great powers for base purposes will constitute the full moral equivalent of Sorcery....In addition to the motive which the gadget worshipper finds for his admiration of the machine in its freedom from the human limitations of speed and accuracy there is one motive...which must play a very considerable role nevertheless. It is the desire to avoid the personal responsibility for a dangerous or disastrous decision by placing the

responsibility elsewhere: on chance, on human superiors and their policies which one cannot question, or on a mechanical device which one cannot fully understand but which has a presumed objectivity. ~

Wiener was becoming increasingly worried about problems he saw coming over the horizon. Repeatedly, he warned about the immense power innate in the new technologies, the new ethical standards they imposed on their inventors, and the responsibilities that now fell on every citizen, government agency and corporation to use the new knowledge and technology for the benefit of humankind. His concerns would form the subject matter of his final popular work, *God & Golem, Inc.: A Comment on Certain Points where Cybernetics Impinges on Religion*. And those concerns extended to every realm of society. Automated mechanisms and strategies were becoming embedded in the nation's military, governmental and economic systems. They were being programmed into high-speed digital computers equipped with the power to learn from their mistakes in accordance with instructions spelled out in the new artificial intelligence programs that were beginning to pour out of the nation's AI laboratories.

Wiener believed those theories and programs were fundamentally flawed in their most basic assumptions about human reasoning and decision making, and that people and societies that put their trust in electronic systems predicated on such principles were putting themselves at enormous risk. Moreover, many of those trusting gadget-worshippers were the same people Wiener had decried as cogs in the machinery of the expanding military-industrial bureaucracy, and the very ones whom he feared had cast their responsibility to the winds. He warned:

It is relatively easy to promote good and to fight evil when evil and good are arranged against one another in two clear lines....What, however, if we must ask, each time in every situation, where is the friend and where the enemy? What, moreover, when we have put the decision in the hands of an inexorable magic or an inexorable machine of which we must ask the right questions in advance, without fully understanding the operations of the process by which they will be answered?..~

His attacks were not personal but the beginning of a larger battle for the soul of his science and for human survival in the new technological age.

No, the future offers very little hope for those who expect that our new mechanical slaves will offer us a world in which we may rest from thinking. Help us they may, but at the cost of supreme demands upon our honesty and our intelligence. The world of the future will be an ever more demanding struggle against the limitations of our intelligence, not a comfortable hammock in which we can lie down to be waited upon by our robot slaves.~

On the legacy of Wiener's visions and his warnings.

[The new technology] is a two-edged sword, and sooner or later it will cut you deep.~

Half a century after Wiener's death, the accuracy of his warning shots has become clear for all to see: in the explosion of new technologies descended from prototypes he pioneered, in the conflicts rising within and between nations over the work performed by human beings and machines, and in the outbreak of human crises and spiritual turmoil he foretold as people struggle to survive and adapt to life in a new technological age.



Of Wiener's greatest concern—that the speed and complexity of intelligent technology would outstrip people's capacities to respond to their machines and to keep them fully under human control—that threshold has already been crossed with many electronic systems and programs operating in critical arenas: in automated weapons systems deployed in Middle East theaters of war that have killed and wounded Americans, their allies, innocent civilians, and obliterated countless “friendly” targets; and in new computerized trading programs that have pushed the precarious business of investing to warp speed and crashed financial markets around the world.

Today's technologies require new modes of thinking and new conceptual tools to grasp and subdue their technical and human complexities, and Wiener's scientific principles and ethical precepts provide a few of the new tools that are needed to do that work. The universal processes and principles of cybernetics—information, communication, feedback, “circular causality” or reciprocal influence, and “teleology” or purposeful, goal-directed action—apply equally to technology, biology, and all the complex systems of society. The broad biological and social dimensions of cybernetics were widely overlooked in Wiener's day and in the decades since his death, as the new technologies gleamed ever brighter. Yet those neglected aspects of Wiener's science hold some of the most powerful insights cybernetics has to offer, and they are as important as any technical tool for understanding the complex forces that shape and influence our daily lives and our societies.

Wiener's grim early predictions may still strike some twenty-first century observers as alarmist. Or perhaps, as one computer scientist reflected, “it was his timely warnings that saved us from some of the troubles that he foresaw.” Yet his most important warnings have gone unheeded. He knew that all the new technologies to come would not provide the solutions to the problems humankind would face in the future, but he laid a foundation that can enable people to foresee the hard choices that lie ahead. He showed us the limits of our knowledge and technology, and the flaws in the dominant institutions of our societies. He showed the errors of running an information society solely on the basis of matter-and-energy principles and economic values. And he left a clear directive to learn which of our uniquely human capacities must be preserved and protected in a world of intelligent technology.

Cybernetics, its sister sciences of information theory and system theory, and their descendants in still newer sciences of complexity and human communication, offer new ways to think systematically and strategically, solve problems, and identify potential trouble spots in systems before disaster strikes. As all the systems in our lives speed up and grow more complicated, acquiring those new conceptual skills and applying them to the myriad problems of the world's technologies, economies, and cultures are the first steps on the learning curve of the global society of the 21st century.

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