And Yet It Moves

The Realization and Suppression of Science and Technology

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Contents

Introduction: The Death of Science

Of all the spectacles science is the least attacked. In a society where power is everywhere diffused and everywhere attacked, the appeal to science has become a final authority. All that power need do to prove this or that little point is to say that it is "scientific." From the technocratic justification of power as scientifically administered to the neo-Marxist scientific proof of the decadence of that power the last spectacular authority is invariably some appeal to science.

Science is a spectacle as well as a methodology of the spectacle. It is the alchemy of technocrats who see their flowcharts and algorithms as being a superior organization of knowledge and power. "Power is knowledge," and scientific knowledge is the atomized theory behind the power of technological capitalism. Science, from being the once revolutionary expression of the bourgeois class has become the spectacularized power which legalizes, regularizes and rationalizes their pseudo-victories.

It is a methodology because it appears to contain within itself the power of rational justification, which is no more than the justification of power. By being the logic of the irrationality of the spectacle it spectacularizes rationality.

By appearing to be rational, all it can do is to rationalize appearances. Or, as Stephen Jay Gould, one of the more sensible high priests of science these days, has noted, science validates bias precisely by appearing to remove it.

Science, however, is coming in for public scrutiny and its bias, like the contradictions it proves logical, is being questioned. Does the very structure of science, the way it defines its tasks and carries out its business, confine it to specific goals and applications? Could there be a completely different organization of scientific method and, if there were, would it be called science? These are some of the questions raised here. The answers will not suit all, but they are not meant to. This text may appear aggressive at times, but I make no apologies because it is not difficult to feel aggression towards a society that unquestionably values science as one of its most sacred spectacles and which may even blow itself up doing so.

"The purpose of science," Oppenheimer once said, "is no longer to differentiate between what is possible and impossible but between what is possible so as to determine what is ethical." Governments, like religions, follow this advice. The Pontifical Academy of Science, and its chief bureaucrat, Victor Weisskopf, have more sway over the Pope than the entire College of Cardinals. Scientific advisors pontificate about stabilizing and destabilizing progress and advocate policies. Governments call for more science to find out what is rotten in society. In its "vision" of the 1980s,

Japan's Ministry of International Trade and Industry calls for a "technology-based" nation, with more government support for research and development as a centerpiece. Why is it that everyone places such high trust in Science?

The organization of science and technology has become the double-headed language of first, the denial of the totality of social relations and second, the logic of the dictatorship of constant capital. From the ideology of the controlled laboratory experiment, science experiments with society. But there is very little that it can claim as progressive, as every piece of new knowledge is applied by a decadent social organization to the extraction of more surplus value. The drugs which have been produced to help physical discomfort or cure diseases might have been found long ago had creativity and not profit been the guide.

Some journalist has estimated that over 500 branches of science exist at present. With the quickening dissolution of traditional boundaries between the sciences, new sub-sciences are formed, but, unfortunately, sub-science wishes to look at its own little piece and is so convinced of its methods that it's like some modern-day academically trained Cremonino who wouldn't look through Galileo's telescope for fear of seeing something that might contradict him.

It is difficult and dangerous to criticize science. The mythical equation of "scientific research" and the "organization of knowledge" would appear to make science impermeable to criticisms from anything than some other pseudo-science which claims more objectivity, more proof, more method, more science. It is the trap into which Marx fell. Marx was agog with the Victorian idea of science and hoped to give the working class an edge on science, an idea which was repeated again by Stalin, himself somewhat of a science popularizer. Instead, what we are left with historically, is the miserable misunderstanding between Mr. Marx and Mr. Bakunin, the distrust between a so-called scientific and utopian socialism. At the tragic expense of utopia.

This booklet starts with a brief discussion of the history of science, its origins and development through bourgeois society up to the present day. It then looks at certain changes in information, robotic, and genetic engineering technologies, as well as some of the theoretical premises behind them, and asks what's in it for the proletariat? Some of the presentday myths such as the difference between pure and applied science and the manner in which scientific ideas are declared valid, are discarded. There is little concern here about whether some particular aspect of science has done humanity well or has a structural beauty of itself. Lenin was right to say that today's questions of esthetics were yesterday's questions of ethics. While there may be an esthetic quality to Einstein's theory of relativity, equal in its time (something C.P. Snow could never understand) to, say, Joyce's Ulysses, this sort of consideration is not what concerns us.

Nor is it a matter of the greater severity and fequency of science's local disasters or accidents (the gas explosions in Mexico City, the toxic leak at Seveso, Italy, or the methylisocyanate disaster at Bhopal, India, at the end of 1984 — both of which affected poor people most), but of the very global concept of Science (a particular form of the production of ideas — Historical Science; Science with a capital S). Marx proclaimed the limits of philosophy and the dadaists proclaimed the death of Art; what remains is to dare to look to a future where (to use Lautreamont) "science would be made by all and not by one."

Thus it is not a question of bad/good Science, nor bourgeois/proletarian Science. Let there be no illusion about it from the beginning. It is science as a particular historical form of the organization of knowledge, the form of modern science as it arose with the development of capitalism and which will die or become merely a memory of these bad old days with the abolition of capitalism and the creation of a classless society. There is no proletarian science, no more than there is a proletarian art or a proletarian state, which are merely attempts to occupy the bourgeois terrain without abolishing it. Stalin showed what the proletarian state was and proletarian science has already had its Lysenko. Nor is there any "science for the people," which is merely the cultural massification of bourgeois values, an attempt to make little "scientists" of us all through the dogmatic adherence to certain scientific "givens" in schools and scientific magazines. To advocate the suppression of science has seemed to mean advocating barbarism, whereas the realization/suppression of science is the only road which leads to the life-giving totality of unified proletarian theory. After that we can do as we please.

Chapter 1: A Little Bit of History

Most histories of science, Bernal's included, perpetuate the fiction that science has always been with us. They relate science to commerce and industry and work backwards from bourgeois society to find a relationship between science and the forms of production. In this way they try to bourgeoisify all of human history by positing the notions of bourgeois society as eternal (when really they are only as temporary as they are contradictory). They never look forward.

The science which developed in the transition from feudalism to capitalism in the 16th century arose from a coalition of needs of sections of that society: artisans, merchants, bankers, machine-makers, those who wanted and needed to overthrow the scholastic restrictions on commerce. Here, in this transition, for the first time knowledge and theory were placed in a dominant position in the production and reproduction of capital through the manufacture of goods, to their transportation and the opening up of new markets and the protection of these markets through defense and warfare.

This science was never based on the ideal of knowledge for its own sake, as most present-day academics would have us believe. Such a goal is eternal and is not related to any particular economy. What we refer to is a science based on profit. This is what someone like Georgeo de Santillana could never understand in 2000 pages of his work, in which his "Origins of Scientific Thought" (1961) must occupy an especially asinine position. Even Crombie's ridiculous book, "Augustine to Galileo" (1952), is a special example of such historians of continuity. Perhaps it was Koyrg who began to understand the importance of what took place beginning in the 14th century when he wrote ("Galileo to Plato": Journal of the History of Ideas, 1957): "What they had to do was not criticize and combat faulty theories. They had to do something different. They had to destroy one world and replace it by another. They had to replace the framework of the intellect itself, to restate and reform its concepts, to evolve a new approach to Being, a new concept of knowledge, a new concept of science and even to replace a pretty natural approach, that of common sense, by another which is not natural at all."

Another person who had made this point, though earlier and perhaps more forcefully, was Edgar Zilsel, a German who had gone to the U.S. in the 40s only to die there soon after. His "Sociological Roots of Science" (1942), as most of his work, has not been republished for almost two decades.

Most of the academic historians, while they may be useful for detailed study of specific documents and periods, are involved in what we could call (to misuse Kuhn) "normal" science history. They mystify science by extracting it from the totality of what was going on at the time and thereby perpetuate fictions as to what its importance really was.

The first secular rebellions against priestly-feudal learning were represented by ex-secretaries and officials of municipalities who had lost their official connection to become the so-called free literati of that time, hiring themselves out to whomsoever would take them on; nobility, merchants, and bankers alike. Just like many of those who preceded them, they were stylists, more influenced by neo-Greek classicism, where the striving after a perfection in style and the accumulation of classical knowledge was of foremost importance with no regard to scientific method or causal relations. They were forced to share the social prejudices of the nobility which patronized them, disdaining manual work and anyone who did it, in keeping with the Greek stylists. It is said that Archimedes felt ashamed at being asked to build battering rams as it was too much like manual work, and Aristotle once said that women had more teeth than men. Seemingly, he had never even looked. Writing and speaking in Latin, these free literati retained the classical distinction between liberal and mechanical arts, between mind and hand, between intellectual and doer, a distinction which was only to be modified but not destroyed by bourgeois society, one which we still live today.

Surgeons at that time, who carried out dissection work, were in the same class as barbers and midwives, while artists were no different from white-washers or stone dressers and, like all serious craftsmen, had to belong to guilds. This was still the situation at the time of De Vinci in 1500. They did not become detached from handicrafts until the 16th century, when they began to claim a different status through such arguments as that painting required a knowledge of geometry and perspective. It is generally forgotten these days that the artist is really a modern invention. That the scientist also is, is adamantly denied.

The first technical works were penned by craftsmen: Biringuccio's "De La Pirotechnia" (1540), Agricula's "De Re Metallica" (1556), and Ercker's "Beschreibung" (1574). Biringuccio's pamphlet is one of the first chemical treatises free of alchemistic speculation, while Durer wrote reviews (even manifestos) on descriptive geometry and fortifications. These craftsmen wrote in the vernacular and not in Latin, and they arrived at their conclusions through practical work. They wrote down what they observed, sometimes even in code, to protect their peculiar technology as much as to protect their own little hierarchy. Such pioneers of empirical scientific observation were workers and artisans; mariners, shipbuilders, carpenters, foundrymen and miners who worked silently and steadily on the advances of technology, giving us the compass, paper-mills, explosives, wire-mills, and blast-furnaces, and introducing machinary into mining. Most were uneducated, often illiterate, and most of the names from this period are unknown to us. The scholastics and the prattling humanists had little to communicate to them, had they even been able to read them.

They had no idea how to proceed systematically, so therefore trial and error and the rule of thumb had to be the guiding principles. Yet they were forming the groundwork for what later would be known as mechanics, acoustics, anatomy, astronomy, metallurgy, and chemistry. They were only craftsmen (there were very few craftswomen) and not scientists as such, so the limitations of craft organization and its guild mentality ruled. But, as bankers and merchants began to realize the potential wealth of the information and skills they possessed, the status of craftsman was raised; artists and scientists were emerging as respectable professions.

In those days intellect was left to the nobility — while observation and experimentation was left to the artisans. Even as late as 1697, a Dr. John Wallis is quoted (Mathematical Practitioners of Tudor and Stuart England, Taylor, 1954) as writing: "Matematiks were at that time scarce looked upon as academic studies, but rather Mechanical; as the business of Traders, Merchents, Seamen, Carpenters, Surveyors of land and the like." The first chairs in Astronomy and Natural Philosophy were established in Oxford only in 1619 and that of Mathematics at Cambridge in 1663, — where Newton would be the second occupant.

The increased power of the merchants and bankers were at odds with the classical universities and what was being taught there. Maybe Galileo and Francis Bacon best exemplify this.

When Galileo studied medicine at the University of Pisa, mathematics was not taught there and he had to take a course privately. When he moved to the University of Padua he set up a "university laboratory" in his own home, the first of its kind in history, spending much of his time visiting and talking with tradesmen of all 6*kills and inviting them to his home. His Discorsi is one of the first books to use both Latin and Italian (Latin for mathematical deductions, Italian for arguments and propaganda). Feyerabend correctly cites this eloquence in Italian as a key factor in the forcefulness of his arguments and as an example of how science progresses through subterfuge, rhetoric, and propaganda rather than the ideals of pure rationality. Calling up a whole reservoir of everyday experience taken from visits to the docks and what he learned from tradespeople he was able to solidify his arguments against the virtuosi and literati by insinuating that the reader had been familiar with his arguments all along. His books were popular because people could have them read to them and because they represented a popular yearning to ridicule the intellectuals. Galileo is in many respects the first bourgeois scientist.

England was to become the home of the first bourgeois revolution and things progressed more clearly there. Although William Gilbert was to be physician to Queen Elizabeth, he was able to write a book on magnetism (De Magnatej 1600) based entirely on laboratory experimentation and observation. His methods derived more from foundrymen and miners with whom he had personal contact. Most of his work was plagiarized from the work of the retired seaman Robert Norman, in any case, but Gilbert's importance was that he helped pave the way to a compromise between the aristocracy and the rising bourgeoisie in Britain, a compromise which was to last some 390 years up to the present day.

Bacon, however, best exemplifies the bourgeois as scientist. He understood the methodological importance of induction, the needs of the rising bourgeoisie, and attacked the humanists for their patronage by the nobility. Against them he posited the first technocratic vision of the State — his Nova Atlantis — where scientists became the rulers and the staff of the nine departments of this state. Scientific cooperation had certain aims: the control of nature, the progress of knowledge, fraternity in learning, cooperation in manufacturing skills, and progress through profiting from the control of nature. These goals are still, in general, the goals of modern science, as many editorials in Scientific American, Nature, or New Scientist attest.

Bacon's ideas and advice were taken seriously and led to the founding of learned societies with these practical goals. Others, like Campanella and even Descartes and that stupid Fransciscan monk, Marin Mersenne, had had similar ideas. In the masochism of Mersenne's cell at Mimins, Pascal was to meet Descartes and be stirred to the ideals of fraternity which would eventually lead to the setting up of the French Academy in 1663.

What all of this needed was to turn it into a business, and financing was no shortcoming since merchants needed scientists as much as scientists needed merchants. The little self-appointed bureaucrat, Henry Oldenburg, who founded the Royal Society in 1660 under the conciliatory auspices of Charles II, was to be its unpaid organizer. Radical bourgeois cells ("invisible colleges," Boyle called them) were being set up all over Europe. In 1647, two years before Britain became a (temporary) Republic under Oliver Cromwell, William Petty, who would help finance the setting up of the Royal Society, advocated in the name of Bacon "the establishment of a new college of tradesmen; incipient engineers (surveyors, millwrights, smiths and clock makers); incipient industrial chemists (metal smelters, assayers, distillers and pharmacists); tool makers (opticians, rule makers, gaugers)" (Science and Technology in the Industrial Revolution, Mussen and Robinson, 1969). Oldenburg began publication of the Philosophical Transactions through which he set out to unify all scientists "and those who delight in the advancement of learning and profitable discoveries ."

Through the Royal Academy and the French Academy and other institutions, information was organized in a way which would be useful for manufacturers, by setting out to gather and test it systematically. And so the spirit of modern science was born.

And yet despite its revolutionary goals and the fact that it had to displace religion as a hegemonic force in order to survive, it was born deformed, sustained and nourished by a class society. Kropotkin in his chapter, "Brain Work and Manual Work" (despite all its reformist educational goals so common to its time) points out that the early scientists did not disdain manual work. He decried the fact that "the man of science must discover the laws of nature, the civil engineer must apply them, the worker must execute in steel and wood, in iron or stone, the patterns devised by the engineer …the worker has lost the intellectual interest in his labor, he has lost his inventive powers." And he goes on to point out the inventiveness of early workers: "Smeaton and Wheaton surely were excellent engineers; but in their engines a boy had to open the steam valve at each stroke of the piston; and it was one of these boys who once managed to connect the valve with the remainder of the machine so as to make it open automatically, while he ran away to play with other boys…"

Marie Boas cites in her book (Robert Boyle and 17th Century Chemistry, 1958) that "useful chemistry was no longer medical but rather industrial and many members of the Royal Society brought in accounts of everything from mining to soap making and dyeing," although she points out that the Royal Society always had the atmosphere of a philanthropic aristocrats' club for "gentlemen and works of fancy." All that this meant, however, was that these goals were to be expressed elsewhere — in industry and in the universities. By the death of Newton the standards of science had been laid and were completely bourgeois.

The Science of Power and the Power of Science

While so many eclectics today fantasize about past scientific glories, the club of applied science keeps beating them over the head with spectacular humbug about progress and technological invention. The situation of the 1980s has much in common with that of the 1830s. We should understand the first industrial revolution better before we are swamped by the second. The discovery of the 1st law of thermodynamics and its application by capital was the single most far reaching theoretical event of the early part of the 19th century, one which transformed it utterly, both politically and economically. Count Rumford's discovery that work done in overcoming friction produced heat was to lead Joule, some 40 years later, to carry out the first experiments proving that a certain amount of mechanical energy could always be transformed into the same amount of heat. This theoretical study was used by Watt and James Nasmyth to develop the steam engine, which had such a profound effect on labor and society. Artisans were disemployed and, in England, a Luddite radical movement thrown up to smash steam machines wherever they appeared.

What the first theorists of thermodynamics were unable to understand in the practice of their class, the Luddites were unable to understand in the theory of their own. If bourgeois ideology thought of scientific theory as being pure and standing alone, without having to address itself to its practical applications, the Luddites seemed to think that they didn't have to fight that theory. Today, in the throes of the second industrial revolution, practice must never again be divorced from theory, and proletarian theory must never be divorced from practice. Reality too often remains hidden from our view because we are looking at it through the distorting lens of the separation of theory and practice; but when the refractive shutters are removed and reality opens up to us, we wonder why we had never seen what was really very obvious all along.

The twin roles of science as a force of production and social control developed over a long period, with some branches of science becoming fully industrialized in the 19th century while other branches, like biology and geology, remained in the stage of classification until this century. Even the classification still in use today — genus, family, order, class, phylum and kingdom — reflects 17th century society and its social order more than the 20th. Recombinant DNA for profit or genetic engineering is finding new uses in production, while the growing influence of psychobiology promises greater social control; these are aspects of biology developing into a science with industrial and medical applications.

Science in all fields in the 17th and 18th century still retained a spirit of philosophical adventure which sought to know, interpret, and control nature and hadn't yet become entirely a business. Its methodology was still philosophical, posing questions as to the nature of phenomena. Before Franklin's experiments, electricity was seen as a fluid that could be bottled in Leyden jars; astrology was a fundamental part of astronomy before Tycho Brahe and Kepler shifted methodological emphasis towards the telescope and mathematics; "calorific" and light were still considered as elements in Lavoisier's "Methods of Chemical Nomenclature"

before the energy conservation laws were developed, although Lavoisier did help banish the ghost of phlogiston. But calorific, phlogiston, mother nature, God, supply and demand, ether are all examples of philosophical concepts which, although serving a purpose in their time, would have to be overthrown before science would be able to proceed systematically. Seventeenth and 18th century philosophy was to begin as an ally of science in smashing the harmonious cosmos of religious power before it was to collapse under the weight of interpretation, unable to change anything. Through its application, however, Science was transforming the world, pushing its influence into business and commerce all over Europe.

At that time, as today, technological applications did depend on the state of science, but the state of science depended far more on the requirements of technology. Despite what scientists themselves may say, pure research has never been very pure, and it is those things which business needs that get done. Some will look to modern science and try to make a distinction between the theory and the application, the search for data and the misuse of it. They will try to distinguish between "pure" science and "applied" science, as though such distinctions meant a lot anymore.

In any case, while a 1960s study in the U.S. found an average 30-year lag between basic science research and technological application, today the boundaries between science and technology are almost totally dissolved. As a joint report of the American Academy of Sciences states, "Basic research is conducted predominantly in the universities; much applied research and development are carried out by industry. Overall, while industry does about 70 percent of the nation's research and development, only 4 percent of that effort goes to basic research (Frontiers in Science and Technology, 1983). The same report, which is something of an American 5-year plan goes on; "Scientific and technological change intertwine ever more closely. Opportunities are coming so fast, and competition for markets for advanced Technologies is becoming so intense, that success will depend directly on the ability to create and then to exploit the new knowledge quickly…The implication is that, more than ever, basic science will be vital to technological advance and in turn, to better productivity and enhanced economic growth."

In 1790, when Leblanc won the French Academy prize for a new method to produce soda lime, his method remained an industrial secret even although he had used Lavoisier's nomenclature (sodium hydroxide, sodium carbonate, sodium chloride). But 8 years later, the French Revolution in an act of bold rashness common to all revolutionary experiments, forced Leblanc to reveal his soda lime making process for the "common good" and seized his factory without any indemnity. Lavoisier, the declared father of modern chemistry but also an aristocratic tax collector, was less fortunate: he was to lose his head. His defense, that his taxes paid for his chemical research, should be a lesson to professors with cushy jobs and fat grants from the military-industrial complex; a fatal miscalculation.

In the 18th century chemistry had its share of aristocratic philosophers, although the producers dominated. Cavendish, born on the French Riviera to a rich widowed mother who died there soon after his birth, is in many ways an exception to the rule. He turned out shy and timid, writing little notes to his servants, never wishing to meet them. He even had his library moved 3 miles away from his laboratory so that he wouldn't meet anyone who came to borrow books. He never spoke to a woman in his life and was scared to look at them. Working silently away among the glass jars, he discovered hydrogen gas, though he was loath to tell anyone about it. A brilliant, lonely, and exremely rich madman making philosophy with weights and balances, he is remembered most for his experiment on the gravitation constant whereby he measured Newton's mathematical formulation and was able to weigh the earth.

But the tradition of the scientist carrying out research which would be used directly in production held sway well into the 19th century. It would change only with the emergence of the scientist as manager or technocrat in the 20th century. Bessemer is typical of the scientist-producer. In the midst of the Crimean War he opportunistically set about devising a way to make a form of iron which would be strong enough for large cannon, and discovered a new process for making steel in the blast furnace, an idea he tried, unsuccessfully, to market to the British and French monarchies. In 1860 he set up his own plant, introducing an era of cheap steel which opened the way for the big steel capitalists like Carnegie, Schneider, Krupp, and Vickers. Solvay, who invented a chemical process any schoolchild knows about today, made a fortune from his chemical inventions and spent most of the rest of his life endowing schools that others might receive the education he had never received. His system of economics was to include management by scientists — a formulation later to become known as technocracy.

The 20th century saw the emergence of the scientist-manager. With the development of Big Science, in which laboratory equipment meant a tremendous investment by industry or by the state, science was to become merged into an ideology of management. This became more critical with the development of particle accelerators in the 1940s and the large computers of the 1950s. Rutherford at the Cavendish Laboratory at Cambridge with his upper class school master ring to him, was exactly the old-boy type of manager that existed in British society at that time.

Faraday is generally credited with the discovery of electromagnetic induction in 1831. Following Oersted's lead, this member of a fanatic Protestant sect which eschewed all worldly vanity, refused to be knighted or even to be made head of the Royal Society and refused to help make poisonous gas during the Crimean War (although he did accept an invitation to have dinner with Queen Victoria). He was actually convinced that the facts of electricity and magnetism, as then known, led to atheism and materialism; he was almost forced into field theory just to give a place to his god. But the unification of electricity and magnetism really led to no new applications until the end of the century, and Faraday's importance for well over 20 years was more as an authority on science than as an applied scientist. He was the person always called upon to give expert opinions in Victorian society — much as scientific experts are invited to TV "talk shows" today. Faraday is an early example of the later political role of scientist-managers of the 20th century; — the need to appeal to a scientific authority. The actual word "scientist" was first used only in the 19th century, when William Whitwell (1794–1866), a Cambridge scholar, began to use it.

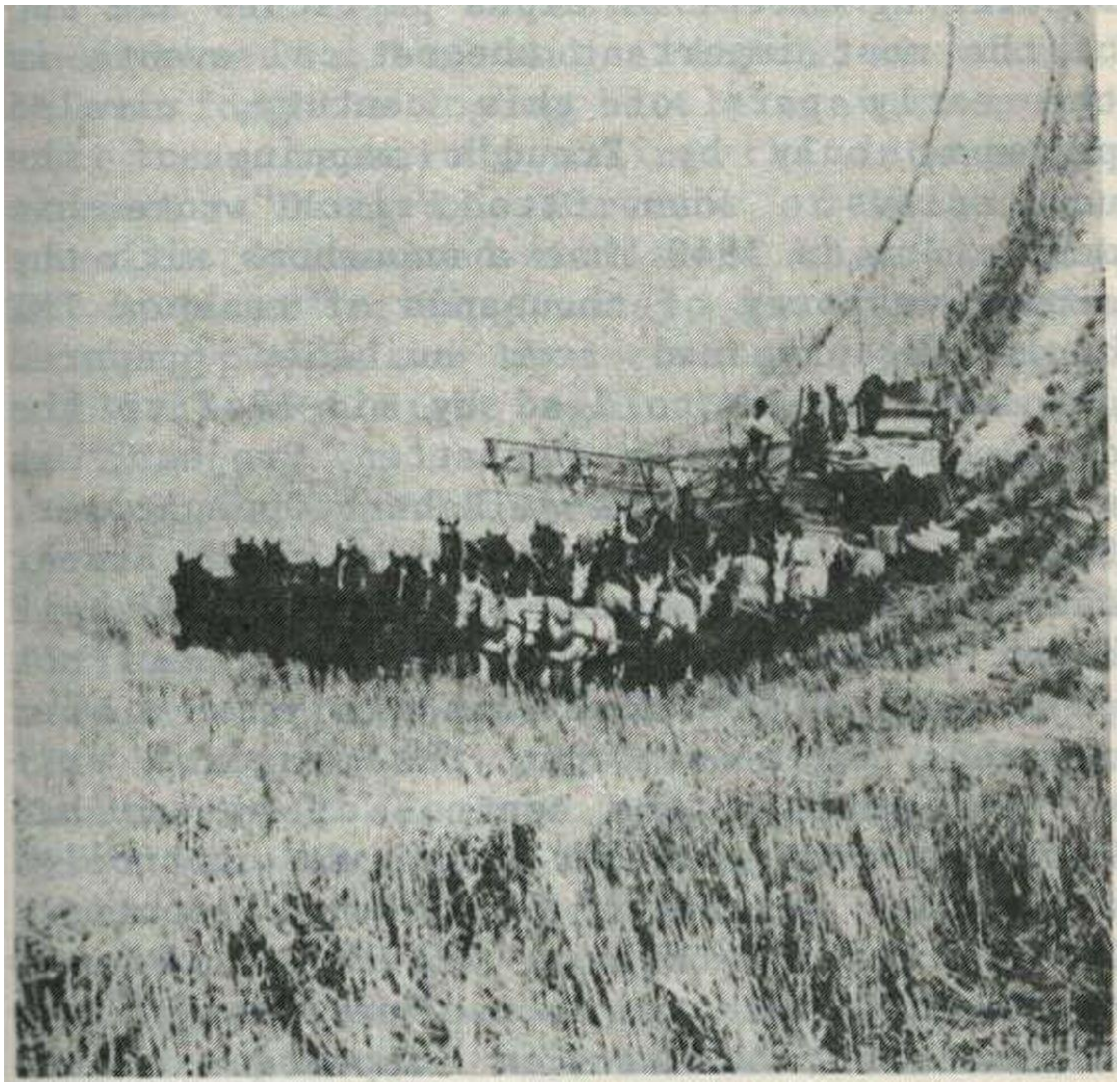
As the British "Council for Science and Society Report" (1976) states: "the opinions of experts must be capable of effective and independent expression…a deliberate effort must be made to maintain a corps of experts who are not committed to the project. The monitoring process no longer lies in the realm of hypothesis and intellectual debate: it has moved into the political arena. It therefore partly takes the form of a trial of strength between power groups. The experts are caught up in an adversary process." Scientific method, like it or not, had become a political debate among managers.

Einstein's mass-energy equation and Rutherford's chance discovery of the scattering effect of alpha particles are two of the most important theoretical events in the early part of this century, rivalled perhaps, only by Freud's mapping of the unconscious. When Otto Frisch wrote his memorandum in 1940 that a superbomb with the explosive power of thousands of tons of TNT could be prepared from suitably prepared uranium, it was to lead by mid-1942 to the development of the Manhattan Project, in which scientists like J. Robert Oppenheimer, Enrico Fermi, Arthur Compton, and Ernest Lawrence participated. The effect of the 2 bombs eventually dropped on Japan was not only the 120,000 dead and the same number injured; it meant that the original scientific goal of the control of nature had been met in a way that those who controlled nature now had to be given social control. It was not the killing effect of the new bombs that made their use necessary; low-level air attacks on Japanese cities achieved casualty rates much higher than that at Hiroshima or Nagasaki. The Compton excuse, "how to bring the war to an early end," is merely a technocratic justification: Germany had already been defeated and Japan was on its knees.

What they are really excusing is the dominance of an ideology of technological determinism, the idea that it is impossible to change anything except through technology, thus making it impossible for proletariat to assert itself over the cult of science.

R.R. Wilson, who had worked with Lawrence at Berkeley, bemoaned the passing of the old days of science, when "all you needed was a box and a bunch of wires." Wilson fought a losing battle against corporate team research, making the interesting comment: "Being the director of 20 or more physicists involved much more than physics, it involved raising money, getting people, finding places for them to stay, spending $1 million" (My Fight Against Team Research, 1972).

While Oppenheimer opposed research on the H bomb, whereas Lawrence supported it, the difference between them is merely the differences between two managers. It is said that Oppenheimer ran Los Alamos using the "committee" as a weapon, whereas Lawrence was absolute boss. Oppenheimer at least knew something of the impending decadence of science; his comment after the development of the atom bomb that "science has learned sin" shows that he realized the absolute power of science and the decadence of that power, although he was interested only in reforming it. Victor Weisskopf, who worked for Oppenheimer before he went on to run CERN and later became scientific advisor to the Pope, agreed with Oppenheimer that what the world needed was more science to distinguish between destabilizing progress and stabilizing progress.



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Whereas art under the conditions of the modern spectacle has become the terrain of pseudo-creativity, science has become the terrain of pseudo-progressiveness. The general idea goes something like this: "Isn't technology marvellous, just look at what it has given us," and we are given a list of inventions: the transistor (1940), terylene (1941), the nuclear reactor (1942), the atom bomb (1945), the computer (1946), automated manufacturing at Ford (1946), the H bomb (1952), videotape (1952), plastics (1953), Sputnik (1956), lasers (1960), the neutron bomb (1963), optic fibres (1972), the test-tube baby (1978), the artificial heart (1984), the Internet (1985), the "cloned lamb" (1996) or some other such list. The implication is that all problems can be solved; scientists are presently working on it, and we shouldn't really be worrying our little heads because they are sure to come up with something. Gone are the bad old days when suffering and starvation were necessary. Today scientists are working to eradicate these leftovers from a primitive past. Gone are the days when it was necessary to revolt. Just wait. Let us walk all over your face, take your money. It is for the good of mankind, peace, and progress.

Only more and more people wake up with a choking feeling and not only begin to wonder, but begin to question scientific certainties.

Chapter 2: The Informed Informer

Never it seems has there been a society with more information and less knowledge. It is quite remarkable that despite all the satellite communications, despite fiber optics which can transmit hundreds of millions of pieces of information per second, the Russian and American workers know less about each other today than they did a century ago.

Every regime in history has had to produce and diffuse the information it needed to survive, walking the tight line between keeping people ignorant and giving them just barely enough information to perform their tasks. However, it is always difficult to ensure that such information is not used against itself; gladiators may be trained to kill each other in the ring but every so often such training can be used to revolt.

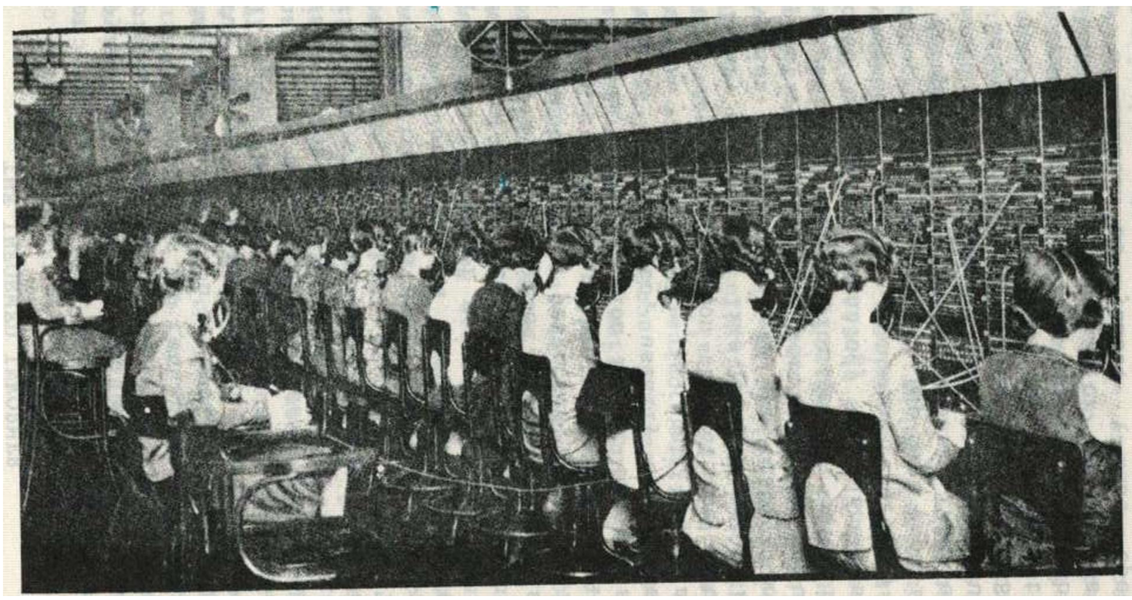
Censorship was the weapon that the bourgeoisie used in the 19^{th} century, but in the today's "information society" censorship has taken on new forms. By inundating us with mis-information it is hoped that real facts get battered on the rocks of trivia and forgotten. Information like communications (roads, air routes, sea routes) become available only when and where business needs them for profit or where people have, due to local conditions, threatened to cut off that profit. Information channels (the telephone, TV, computer data banks) work the same way.

"News policy," said Goebbels in his diaries, "is a weapon of war, its purpose is to wage war and not to give out information." That was in the dirty days of Be Isen and Dauchau, when they tried to censor something as big as the Holocaust and even succeeded to some extent for a time. In these cleaner days, information has become as much a spectacular weapon as a weapon of the spectacle.

The "information society" proclaims greater democratic access to information. But such trite journalistic science fiction omits the essential point that so much misinformation is carefully produced and its production carefully controlled. It also omits the fact that real information is controlled hierarchically. What is presented on the thousands of data banks (TV stations, magazines and newspapers, libraries, cable systems, computer data systems) is prepared within carefully measured parameters. Information provided through public systems (whether as a service or a commodity) is defined within certain misinformation parameters, while information needed for corporations or governments function very differently. Those who control the data banks are the real elite — not so much in the style of Big Brother spying on you, as like a Giant Sponge dripping out misinformation.

The democracy of the spectacle insists that more information be available while the true nature of hierarchical power locks it all up. The spectacle of democracy means that it is all quite useless — a two-paragraph synopsis of Goethe as a computer print-out over your home computer reduces Goethe and his time to a banality. The power of those who decide what information goes in or what is conveniently omitted equals the power of monopolistic owners of newspapers or TV stations. While some of this could be rectified within capitalism, as the technology is perfected, what remains is the hierarchical nature of information.

When misinformation is not enough, secrecy is resorted to, usually on military grounds. One example is that there are better maps of the moon than of the earth. Military authorities like NASA do not allow civilian earth orbiters to carry more sophisticated cameras, forcing them to use low-resolution sensors for fear of revealing secret military technology and land-based movements. And an economic report by a technocratic group (Space: The High Frontier in Perspective, Worldwatch Report, 1983) estimated that 75 percent of all expenditure on Science (by both the U.S. and the USSR) is used up on space projects. Over half the information gathered as a result of this expenditure is classified or not released for a number of years. What open-information society?

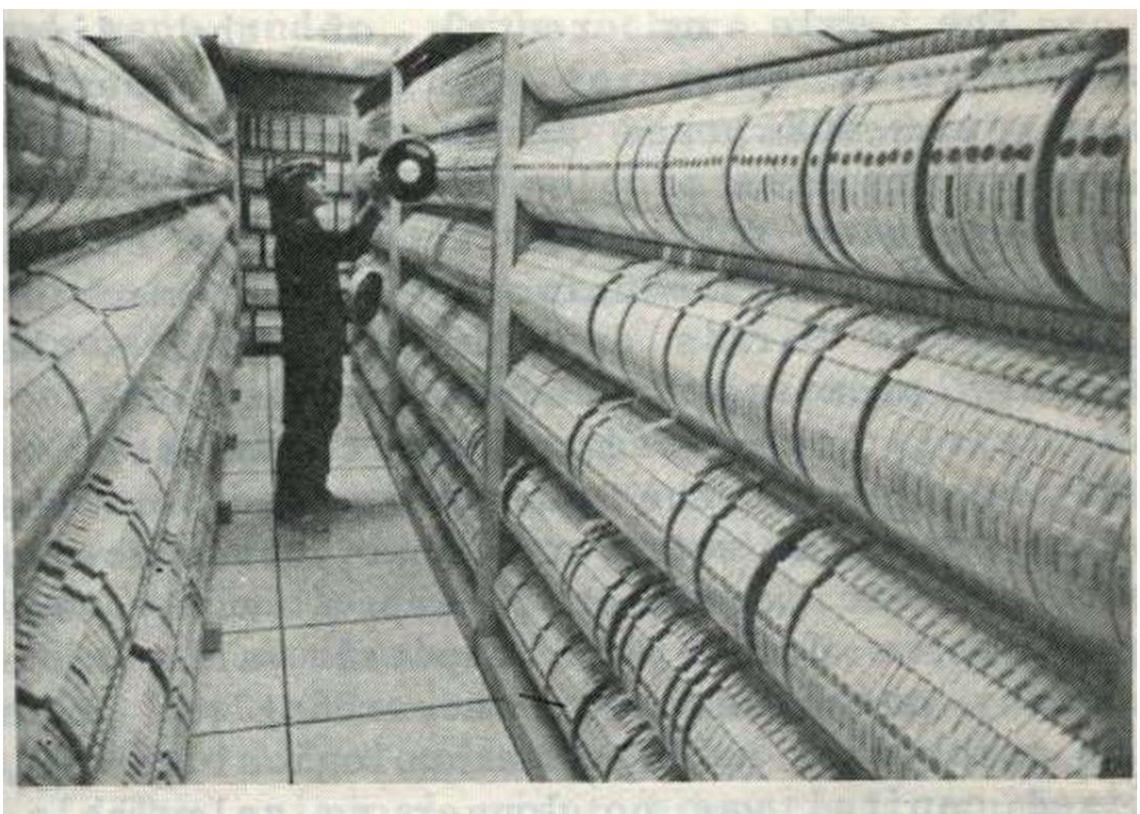


Sorry Madam but the Computer Is Down.

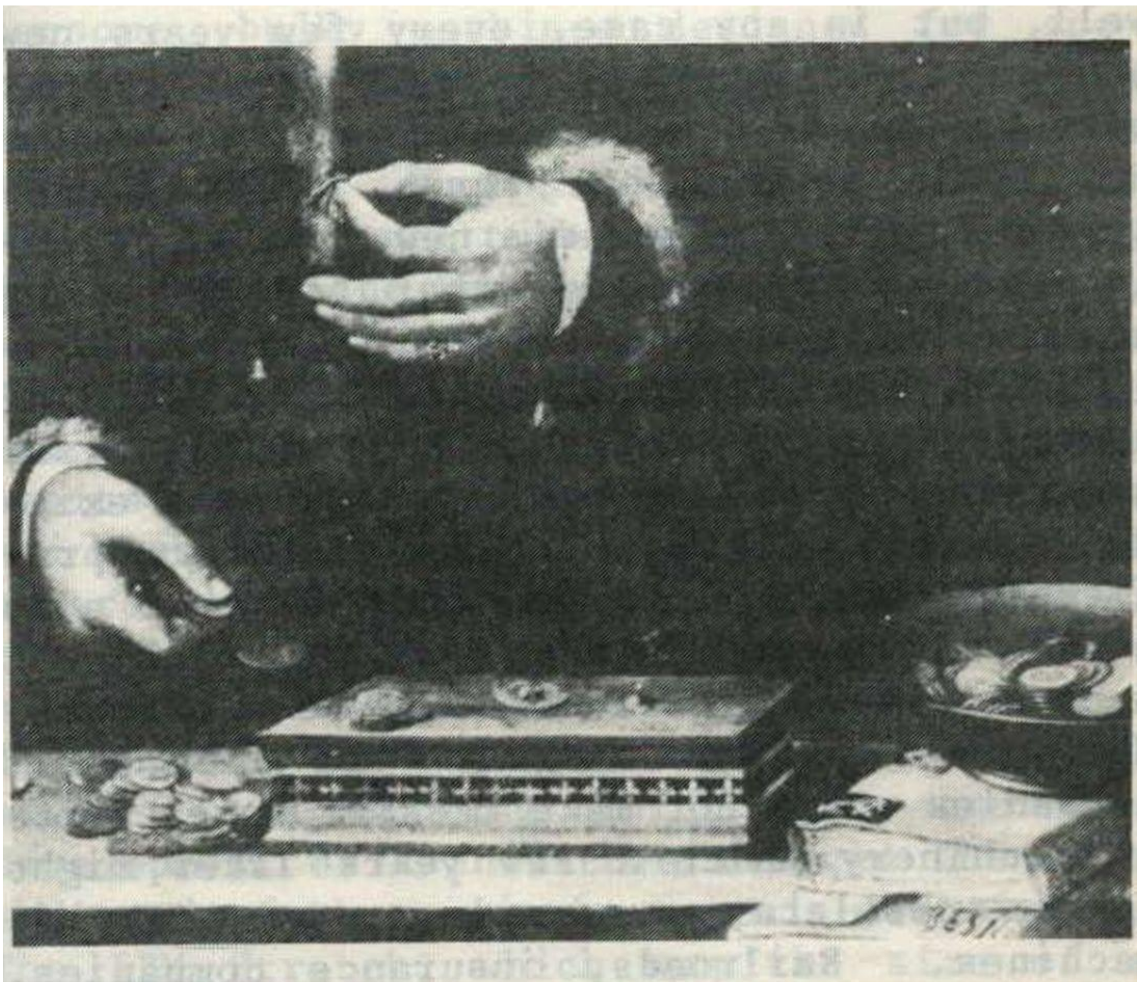
From the abacus to the 32-bit microprocessor the impetus for the design of these machines was always geared to counting money. La Pascaline, one of the first mechanical calculators, was designed by the Jansenist Pascal to help his father work out the property taxes he was going to charge his poor peasants. From the super-rich Babbage's Analytical Engine of the 1840s to Hollerith's Tabulating Machine in 1890 there is a fascination with making the task of calculating taxes and profits easier by the employment of number-crunching machines. Hollerith's punch cards (he says he got the idea from a ticket inspector who punched his destination on his ticket) had already been used, in 1805, by the manufacturer Joseph Jacquard, who used a moving belt of punched cards for weaving rugs, an idea that Babbage had intended to use for his Analytical Engine. Hollerith was later to assist the tycoon Watson set up the company (later to become IBM) which sold and rented thousands of these tabulating machines to small companies for the express purpose of counting money.

Of course, much of the efforts of mathematics — and this is still reflected in school text books — has been making the task of counting money easier. When the Belgian tradesman Simon Stevin

(1548–1620) wrote his “Table of Interest Rates” it marked a new era in banking because prior to this such tables were guarded as valuable capital equipment. His application of the decimal system to commerce (“The Tenth,” 1585) was a breakthrough for accountancy which would lead Jefferson in the U.S. to adopt it as a monetary system long before England. The invention of logarithms by Paul Napier, a Scotsman, made calculations all the easier but the attempt to design a machine for all this was a prize goal of bankers and merchants alike. Such predecessors to the computer were plagued by engineering problems. Babage’s machine was impossible to build because of the refined engineering skills required (he spent most of his large fortune and a larger fortune of the British governent in the effort) and never really got beyond the planning stages. Ada Lovelace (Byron’s daughter) used Babbage’s notes to publish her own account of the Analytical Machine (she is sometimes known as the first programmer and the U.S. military has recently used her name for their own computer language), her interest in the Machine being much in the same vein as Sherlock Holmes. Romanticism (Mary Shelley’s Frankenstein is a good example) had given up its revolt against the Dark Satanic Mills and tried to find ways to rationalize them — or at least make them run more smoothly — without the terrible displacements and horrible disfigurations of the peasantry and countryside. Within the space of a generation, a distrust of science and technology became a fascination with it.



The sale or rental of the first computers by companies such as IBM, Sperry- Rand, and NCR posed a new problem for all capitalists, the problem of temporality. It is a problem which has intensified today, especially for manufacturers of machine goods. In Marx’s day fixed capital



— the factory premises, machines, tools, etc. — was fairly long-lived. Banks could estimate and decide on the decrimentals over the years due to wear and tear, breakdowns, sabotage etc., so that it was a fairly easy process to decide the capital value of a company and give credit accordingly.- With the quickening pace of technological change, fixed capital was no longer so calculable. The first machines often didn't work very well, but in any case, every few years new and more efficient machines were brought onto the market, and the old machines became not fixed capital but scrap. Thus a new type of nervousness and a new type of calculation had to be made; that of predicting advances in technology.

IBM introduced one method of overcoming the problems of a constantly changing fixed capital. In the first years of IBM's existence, selling punched cards was more profitable than selling machines (Watson also owned a papermill) than selling machines, because these cards could only be used once. Watson was astute enough to see that small companies would not make massive investments in machinery which a few years later might become obsolete, so he began renting his machines. Railroads, insurance companies, and government offices were his largest customers. Some companies could not compete and went under, while others tried to prolong the working day for less money. This symbiosis — which is a permanent characteristic of capitalism — is even more acute today, so that without the overthrow of capitalism the introduction of new technologies such as robotics, containerization, electronic printing, or laser tools, for example, will all help prolong the working day. Most workers will be deskilled, have to work longer hours in less technologically advanced sectors in order to compensate. It is ironic that, under capitalism, the technology which can alleviate labor actually helps create more.

The original giant computers, such as the Eniac, Mark 1, or the Edsac were cumbersome, bulky machines designed for specific tasks. They could carry out this one task and no others and were scrapped when no longer needed. What's more, at least one of the 18,000 vacuum tubes of the 1946 Eniac, developed at the University of Pennsylvania, would burn out in an average of 10 minutes. The cost of these machines, both to produce and maintain, could be borne only by state capitalism. Von Neumann's idea (another one had been the H bomb) of building an internal program into the computer (the 1951 Univac), thus allowing multiple usage, saved large amounts of money for their owners. The development of magnetic tape for reading, writing and storing information and the development of transistors reduced the size and cost of these giants to main-frame size. The IBM Stretch, which was the size of a tall bookstand, could do 100 billion calculations a day when it was delivered in 1962.

But the first big "families" of computers, developed in the mid-60s, like the IBM 360, could use the same pattern of instructions and could therefore hook up to each other and provide direct linkage between different branches of the factory or corporation.

Computers were introduced to store information about workers, as well as to store information about commodity prices, inventory of stock, taxes, and the like. They became indispensable for larger-sized companies and especially those with rapid turnovers of raw materials (including workers). By 1984, an estimated 14 million computers had been sold, although most of these were leisure items for middle-class intellectuals rather than tools used by industry.

The development of memory devices has been a slow process. From the first uses of recording devices, (through cave paintings and the invention of tablets) up to the invention of paper there elapsed approximately 40,000 years (by current estimates). From the use of paper to the use of the printing machine (from say 105 AD to 1440) there elapsed 1300 years. It was to take another 500 years to develop magnetic storage. It has taken 50 years to develop laser storage.

In 1971, a half-million pages of technical reports, scientific journals, and books were being produced in the world every minute and the figure may have doubled since then. The paranoic fear of missing out on any of it drives some people to ridiculous lengths. In 1981 the Economist estimated that electronic libraries working from some 650 public data bases were sifting through 4 million articles and could give abstracts of them at an average cost of $75 per hour. There are systems as well for sifting through the millions of patents (the bourgeois seal of ownership) and through chemical, medical, and legal information.

When hackers broke into an electronic message ‘machine service called Telemail in October 1983 there was a lobby to change the laws on information and to protect information as property. Telemail, run by GTE Telenet Communications Corporation, was being used at that time by some 130 large companies (including about a dozen from the Fortune 500) for distribution of internal memorandums and reports and for listing inventories and price changes. Salespeople used it to file orders, and bosses posted notices of meetings. Telemail was an expensive service, even by business standards. The FBI found that some 15 teenagers in different places across the U.S. were using home computers and telephone modems to enter the message service by using a code of seven digits. Trial and error was used by some, but one, as in the movie “War Games,” wrote a computer program to test each possible combination of 7 digits until successful. The FBI said that some of the hackers “were able to manipulate the computers so that they could create accounts like those of the major companies and exchange messages among their friends as if they were business executives. They were able to create such turmoil among the commercial users that the Telenet Corp had to shut down the service at least once” (New York Times, October 16, 1983). The intruders changed the password of some paying subscribers so that they were temporarily unable to leave or collect messages. They also found other ways of blocking subscribers from using the service and even deleting information from some corporation accounts. The company suffered several hundred thousand dollars in downtime and repairs. In Detroit around the same time, police seized documents from the bedroom of a 14-year old boy who admitted entering Defense Department computers. Many other cases of intrusion, involving hospitals, nuclear power stations, and banks, have been publicized and many more hushed up.

Computers are vulnerable. A few commands and codes and passwords (or even a strong magnet) generally suffices to break into data banks, opening up new horizons for creative sabotage. Most military and corporation computers use back up systems, so this might not do any long-term damage; but it would certainly be annoying and irritable for them. And it would also be fun to do. New Luddite techniques of subverting computers, the electronic nervous system of modern capitalism, will have to be tried and passed on for use elsewhere. Workers will probably have to add such tactics to their other weapons, the strike, go-slow, flying pickets etc.

Under capitalism workers will have to subvert every attempt to use information against people until the day when people can collect and use the information they want for themselves.

Chapter 3: Say Hello to Your Friendly Robot

It has already been shown, moreover, and this forms the real secret of the tendential fall in the rate of profit, that the procedures for producing relative surplus value are based, by and large, either on transforming as much as possible of a given amount of labor into surplus value or by spending as little as possible labor in general in relation to the capital advanced; so that the same reasons that permit the level of exploitation of labor to increase make it impossible to exploit as much labor as before with the same capital.

Marx (Capital, Vol. 3, Ch. 14)

Although industrial robots were designed in the mid-1950s, there were only 200 industrial robots in operation in the US in 1970. By 1983, there were 6,000. Worldwide, although estimates vary, Japan had 30,000; West Germany had 4,000, with Sweden, Italy and Britain trailing. General Motors alone are to quadruple their robot population, putting 10,000 of them to work by 1988.

In Britain, in 1981, only three factories in ten were using microprocessors; by 1983, nearly half of all factories employing over 20 workers were using them. The Policy Studies Institute reports that of a sample of 1200 British manufacturing industries 69 percent were using micros for running individual machines, 48 percent for single processes and 18 percent for integrated control of entire manufacturing processes, ("flexible manufacturing systems," as the jargon would have it). Use on the production line, requiring greater capital outlay, was more common in companies employing more than 500 workers. The companies which most used them were in the mechanical and electrical engineering business as well as vehicle manufacturers, representing 7 percent of all manufacturing output in Britain in 1983. (Microelectronics in British Industry; The Pattern of Change, 1983).

The auto industry, the electronics industry, shipping, mechanical engineering, manufacturers of metal goods, etc, have all intensified their use of robots. Where production has not been suited to robotics, other uses, like material handling devices and computer controlled tools, are being found. Their advance has been halted only in those industries where workers' opposition has prohibited them.

The operating costs of robots vary, but current estimates put the cost of the most sophisticated kind now available (a so- called six-axis, servo-controlled, computer- driven robot) at four to five dollars an hour, amortized over eight years. The average automobile assembly worker's pay now is $16.50 per hour, not including the contributions the state makes to cover health, unemployment benefits, etc.

The effect on job numbers, relations within the job as well as the level of productivity and hence exploitation, is already tremendous. One study showed that some 54,000 jobs were lost in Britain as a result of micros over the period 1981–1983, while only 20,000 new jobs were created. The OECD estimated in 1982 that 20,000 extra jobs would have to be found daily for five years to reduce unemployment in industrial nations to 1979 levels — and this is even before taking technology into account.

Robots can work 24-hour shifts and can be trusted not to strike (though not to break down); by using these machines wisely, the capitalist can extract much more relative surplus value. Allowing the redesign of factories, robotics saves on the cost of fixed capital because concentration of the means of production cuts costs in all manner of buildings, not only workshops but storage space (through information on storage, deliveries and orders, transportation of commodities etc.). For example, by automating a warehouse using robotics for parts retrieval and reducing floor space required for storage, Hewlett-Packard was able to ensure that any product could be located at any time with 99 percent accuracy, as compared with the inventory counts that had been done previously every six months with a 25 percent error. Thus robotics intensifies the process whereby commodities are produced and recycled as capital.

Once the domain of sci-fi movies and books, from monstrous run-amok destructive devices (Romanticism) to labor-saving devices which reduce menial labor (Futurism), robots really represent the dominance of dead labor over living labor, of constant capital over variable capital. Andy Warhol, that well-known friend of variable capital, had a show called "Andy Warhol's Overexposed: A no-man show," starring a $400,000 computerized robot that holds press conferences by pre-programmed speech. Since a robot is only as intelligent as its designer, all it can do is repeat his usual load of banalities about art and money and cocktails iri^ the houses of his super-rich exploiter friends.

In Dagenham (U.K.) and Genk (Belgium) fifty Cincinatti Milicron T-586 robots are being employed for spot welding on six versions of the Ford Siesta. On average, more than 300 spot welds are applied to each body shell in a cycle that has the bodies leaving each of two identical production lines at a rate of 43 per hour. Each line includes twelve robots and a robot can be moved from a line and a backup provided in 30 minutes. A model identification code is carried by each body through the line, which enables the robot's computer to select appropriate welding styles for each shell. At the head of the line another computer controls the status of each station and decides which line is ready for the next body shell.

At the Wayne assembly plant, Ford has installed what they call a GCA/XR extended- reach robot for carrying instrument panels for installation in the Ford Escort and Her- cury Lynx. The robot, mounted on the ceiling, automatically moves materials from storage and is designed to remove plastic wrapping materials and drop them into disposable bins.

The American Robot Corporation (Pittsburgh) developed a robot in 1984 which is considered a prototype of a flexible manufacturing system. Even if it doesn't turn out to be everything it's supposed to be, there will be something else fast on its heels. Controlled by a 32-bit processor, it has three to six axes and can be manipulated by joysticks. The heavy duty model can have a payload of up to 22 kg. Software has been prepared for use in integrated, computer- aided manufacturing. There are three levels (a hierarchy of robots?): level 1 coordinates motion control and programming of tbe arms, level 2 incorporates a cluster controller supporting multiple robotic arms, and level 3 controls whole clusters. Level 4, when it becomes available, will be the fully automated factory. In actual fact Apple Computers has almost reached this level with their production of the Macintosh computer. So mechanized is the plant that only 90 workers are required to run it at top speed — one Macintosh every 27 seconds, almost a sci-fi version of computers reproducing themselves endlessly.

Deere and Company have invested $1.8 billion in a futuristic factory in northeast Iowa. GM has invested $1.2 billion in two giant plants, one near Detroit and the other outside St. Louis. The Orion plant is half-a-mile long and a quarter-of-a-mile wide. GM has plans to build the ultimate city — Buick City in Flint, Michigan, modeled on the Toyoto Motor Town, where most part suppliers are situated close to assembly plants to allow them to operate with low inventory levels.

General Electric has transformed its old dishwasher company in Louisville, Kentucky, into a futuristic showpiece which has been so profitable that management has decided to invest $1 billion to upgrade and automate the rest of its appliance division. A prize-winning journalistic description: "The outside of the dishwashing plant is virtually indistinguisable from hundreds of other factories in America — a sprawling giant of cream-colored brick. But inside are spotless assembly lines, flashing computer lights, smart machine tools, lasers and robots. A warning signal sometimes sounds if a human accidentally wanders too close to a moving piece of automated machinery …The myriad new technologies are all tied together by an electronic nervous system. At the top of the hierarchy is the control room computer, monitored by a technician in a second story booth that overlooks the entire plant, followed by 24 computer lieutenants at critical points on the factory floor" (The New York Times, March 13, 1984). The article goes on to describe how computers discover faults as the dishwasher goes along the assembly line; a laser eye reads a bar code and the dishwasher is routed back to the repair system. Machine tools can be reprogrammed to make different types of dishwashers or smaller dishwashers which meet the trend towards smaller housing units. These automated arms carry out 21 steps for the dishwasher tub and 13 for the door. GE cut production costs by redesigning their dishwashers, shedding four hundred parts in the process. The tub, which was once a metal piece to which struts and braces had to be applied by hand, is now a single piece of high-strength plastic costing much less to produce.

The International Union of Electronic, Electrical, Technical, Salaried and Machine Workers (who's not on this list?) ensured that there would be no workers' revolt against the GE plans. "They've gained market share, plus they've gotten new contracts. The automation had to be done, otherwise we would have lost the plant altogether," says Donald Bennett, chief shop-steward in the Louisville local. The senior vice-president agrees, of course. "Without these advances workers would ultimately lose jobs and if we did a good job of automation we would gain market share. With about the same number of people, we are now producing more product."

While the Teamsters "are leading the way forward in high-tech" (as the cover of their Fall 1984 bulletin proudly announced), even trying to organize Space Shuttle workers, other unions are less flamboyant though no less cooperative. "We're not Luddites," says Murray Seeger, Director of Information for the AFL-CIO in Washington (as though anyone ever thought they were). "It would be nice to have 29 people working in a shop instead of 5 but to have 5 people earning a good American union wage is better than having none."

At present all robots should be smashed whenever workers see them as machines sent in by the boss to intensify exploitation. One possible exception might be the introduction of robots into the mines, something well within the feasibility of the technology. But it has been opposed by the unions and by those who see the only possible future as being wage-labor. It may be the only exception. A professor of industrial robots at Berenschot Management Training Center in the Netherlands recently finished a study on the acceptance of automatons by workers in the Netherlands, where some 70 companies presently use them. He found that the most common form of sabotage was to slow down the machines by feeding parts in the wrong order, with the hope that management would be disappointed in robot performance. "In other cases, employees repaired the machines incorrectly, mislaid essential spare parts or put sand into the robots' lubricating oil. In one metal contruction plant, production was reduced for more than six months because of workerresistance." (Time, Sept 20, 1982).

Robots will affect all branches of industry even if robots are not applicable in all branches of industry. Developing the productive power of labor in one branch of industry, reduces the value and the cost of the means of production in other branches, because many of the commodities that emmerge from one branch as a product enter other branches as means of production.

The beginning of all activity which has no critique of capitalism and doesn't seek to abolish it is characteristically plagued by entrepreneurial capital. The rapid rise of technological change in computers, robotics, bio-tech, communications, etc., has created its own modern opportunists and entrepreneurs, which the culture industry spends so much time promoting. Many of these entrepreneurial skills were actually learned in the managemenent of food co-ops in the 1960s. Stephen Jobs and Stephen Wozniak, who started Apple Computers, sold their painted VW van to raise money but soon after were accepting Rockefeller limousines. Wozniak left the management of Apple in 1985, claiming that he "was tired of computers." Certainly he wasn't tired of tfie money. Morris Seigal turned the hippy taste for "herbal tea" into the multi-million dollar Celestial Seasonings. Nolan Bushnell, who wrote Video Pong while attending the Mormon College of Utah, went on to found Atari, the electronic games company, and Catalyst Technologies.

Capitalism survives by either opting for cheap overseas labor markets or else automating plants at home. Both options increase unemployment and mean an excess of capital over the working population. This has the double effect of raising wages in key areas (computers, robot handlers, repairs, etc.) and increasing relative overpopulation and misery — which under capitalism produces further explosions in popu- lat ion.

Most large companies are doing a little of both, automation at home and cheap labor in certain strike-free areas (usually with military backing). Most TVs and radios are made in low-cost labor areas of the world, and now some computer manufacturers are following suit. Tandon Corporation, the largest data storage and retrieval device manufacturers in the U.S., employs some 3000 workers in Singapore, and another 3000 are hired through a contractor in Bombay at wages of a dollar an hour. These low labor costs have helped Tandon win huge contracts from major computer makers, including some $300 million from IBM.

Of course there is a third option which is really a combination of the other two: low labor costs and automation. The exportation of technology to areas of cheap labor generally has the added advantage that safety and health restrictions are not so stringent, thus saving running costs. The December 1984 disaster in Bhopal, India, where over 2000 people were poisoned to death by a methylisocyanate gas leak and countless thousands of others were diseased, is the logical result of such cheaper running costs.

The American car industry, after losing one third of its domestic market to imported cars, mainly Japanese, spent a vast amount (some $80 billion) over 1980–1985 to reduce the proportional cost of labor in its cars through automation. It has also moved plants to cheaper labor markets, but it will be closing down many of these overseas plants when automation is completed in the U.S. This will create even further unemployment, already at an all-time high and unlikely to be reversed. This creates a division within the working class which will have to be dealt with carefully and with sensitivity, given the fact that a reduced number of workers are producing wealth and therefore control the weapons of strike action and eventually the transformation of the capitalist mode of production.

Under capitalism, robotics can never abolish labor: it merely changes the position of the workers. The abolition of wagelabor will mean the abolition of capitalism and of those who use profits (the result of current or former exploitation) to buy their co-ops, have maids, and "take holidays in other people's misery."

How much of robotics will we be able to use? Probably not a lot in its present form. In any case, there is no more reason why we should worry about the means of production than prisoners should worry about the color of their handcuffs. But most likely the modern factory (if we need them) will contain cleaner, better, and bigger robots which no one will have to sabotage, because they are making collective wealth. The day when menial work is abolished will come quickly on the day that wage-work is abolished.

A robot can never have the sensory or decision making abilities of a worker. It is capable of detecting only those things that it is programmed to detect, and this leaves the robot open to all forms of sabotage, both in terms of programming and in terms of the actual tasks it carries out. This lack of detection in robots has led to a proliferation of those robots of detection — guards, police, etc. — who must protect the robots from any outside interference. Modern capitalist factories thus become more and more like prisons, with reduced mobility, internal video control, and alarm systems everywhere.

Monitoring of a production line allows robots to respond to variances and changes in product sequences and to switch tasks among stations to reduce loss. But if variances occur in all lines at once then the whole system breaks down, as software is not yet designed to meet such crises. It is a fairly simple process for workers to experiment with maneuvers which halt robots and maximize idle time.

Chapter 4: Research Clones

The dictatorship of dead labor over living labor has reached pyrrhic proportions. Alongside the increased cost of fixed capital due to the need to invest in machinery and plant is the higher cost of certain commodities — oil is a central one — used to produce other commodities. Keeping wages to a minimum, capitalism seeks new ways to reduce constant capital. One way is to reduce the price of the raw materials used in production.

The period after the Second World War has seen a proliferation of new materials flowing from the greater understanding of organic chemistry and, more recently, of various branches of biology.

Chemists were able to rearrange the loops and chains of carbon, oxygen, hydrogen, and nitrogen in organic materials not only to create lighter and cheaper plastics but to induce properties such as conductivity and tensile strength. Recent commodities include plastic car engines, packaging materials, paper-thin solar batteries that can be peeled off a roll, and a host of other products. Plastics production surpassed that of steel in 1975 and has been increasing ever since, using only one tenth the amount of energy needed for steel production and half that required to make aluminum.

The field of biotechnology has opened up a whole new method to reduce the costs of raw materials. Of all the sciences, biology and geology were the slowest to progress. But with the greater understanding of atomic structure and the discovery of the genetic building blocks of DNA in the 1950s, biochemistry was able to surge ahead. Until the 1970s, molecular experimentation in biology was, with few exceptions, limited to bacteria. But with the development of recombinant DNA methods, or molecular cloning, the study of plant and animal genomes (data contained within the DNA) was made possible. Relatively short segments of DNA were isolated from the genome and inserted in bacteria or yeast to produce a sufficient quantity of chemically pure proteins.

The result has been that capitalism, having colonized the life of the worker for so long, has moved to colonizing life itself, turning living organisms into factories for the production of such commodities as drugs and fertilizers for profit. It is non-labor intensive and almost entirely dependent on investment in plant, machinery and research.

The gene coding for the growth hormone in rats has been transferred into mice, creating super or monster mice, nothing to do with the comic strip hero. The fused gene is inheritable so that big mice appear in the second generation. Genetic engineering research brings into question the whole nature of research programs and how they function, as well as the content and organization of knowledge in a class society. Rapid developments are likely to be made in such areas as the splicing of genes, the significance of movable elements, and the signals that turn genes on and off in response to genetically programmed changes. The production of artificially prepared plants and the regeneration of plants from single cells, as a production technique of cheaper raw materials, is also likely.

The idea that a single cell could regenerate whole plants dates from Theodor Schwann in 1859 (he later became a mystic). The German physiologist G. Habelandt had in 1902 already tried to culture isolated plant tissue and organs and correctly attributed his failure to his inability to supply the appropriate nutrient medium. But it was only following the discovery, in 1928, of the plant growth hormone (auxin) that isolated pl^nt organs were successfully cultured. This was the technical background to the "Lysenko Affair", where the Soviet biologist's fetishization of Engels's dialectics of nature and his belief in the socialist state was to cloud all technical judgement. Regeneration of single cells was achieved in 1971, when whole tobacco plants were regenerated from isolated cells. This led quickly to the regeneration of other plants.

Success so far is limited. Observedly different properties from the parent plant had been found, while yields have not proven greater. Over $20 billion will have been invested in this field before the end of the decade. As a capitalist magazine (The Economist) wrote in 1981, "To turn the base metal of biology into big profits will need not only a lot more basic research but also a lot more practical experience and larger investment. Risks will be high, patents hard to enforce, competition frenetic and most products, when they come, will be rapidly obsolescent." Since then, bio-tech in the U.S. and especially Japan has been applied to food processing, mineral extraction, the making of fertilizers, waste utilization, pollution control, drug manufacturing and, more recently, synthetic materials.

As recombinant DNA methods have become big business, governments have passed laws allowing companies to patent life itself. Plant patenting was first instituted in France in the early 1960s for certain types of roses, and this disease has spread to other varieties since then. Patenting implies genetic uniformity, as governments decide to allow only patented seeds — those listed in the EEC "Common Catalog" — to be grown. Diversity in agriculture is thus upset and defense mechanisms developed over thousands of years are undermined, thus creating an ever-greater dependence on pesticides. A passage from the U.S. Supreme Court decision (June 1980) making it legal for companies to patent new life forms (the decision was made in favor of General Electric's oil-digesting microbe) goes: "As to humans, constitutional problems would seem to afflict a patent granting someone the right to exclude others from reproducing a human being. A mord precise consideration is appropriately postponed until a case or controversy makes a decision necessary."

After robots, cloned workers? A New York Times editorial (October*5, 1984) poses the following question: "The likely source of any problems is not the deranged experiments of science fiction but some practical use with unforeseen results. No one is likely to create, even if they could, a sheep with a conscience or a pig that appreciates Stockhausen. But what if someone sought to sweep the robotics market with a monkey endowed with selected human characteristics? Would such creatures have rights? Could they sue to claim such rights?"

Some of the DNA research work under way may produce better crop yields and perhaps the possibility of particular plants suitable for poor agricultural land. It may also produce a greater understanding of certain diseases and help develop cures. But this type of research, research which might help other human beings, is minuscule compared to the research carried out by the war machine and for the god of profit. As the American Academy of Science suggested in its influential policy statement to the Reagan-Weinberger supply-side economists (Frontiers in Science and Technology, 1983), "The implication is that, more than ever, basic science will be vital to technological advance and, in turn, to better productivity and enhanced economic growth. Although basic science is not inexpensive — in 1983, the federal government will provide about $6 billion for basic research out of a total federal research and development budget of $40 billion — it still is the least costly component of technological innovation. And its value in the years ahead will be multiplied as the national economy, both its manufacturing and service sectors, is suffused by advanced technologies." In actual fact, it is much greater than this if we add that portion of the huge defence budget ($300 billion in 1984–85) which goes to develop basic science for weapons applications and lasers.

The elimination of disease is really secondary to the market, which points to the essential contradiction in scientific research and its inherent connections with capitalism. There are many drugs which if more widely available would alleviate human suffering and prolong life for those who want it. Some of these drugs can now be genetically manufactured. Some examples are Factor IX (used to cure hemophilia, and other blood clotting disorders): insulin (used to cure diabetes): human growth hormone (used to cure dwarfism): interferon (used against viruses and possibly cancer). Consider one of them, human growth hormone. Today, this hormone is generally extracted from the pituitary glands of dead humans. But in 1978 a leading supplier of human growth hormones, KabiVitrum of Stockholm, struck a deal with Genentech, a genetics engineering company in San Franscisco, to supply the hormone. Genentech took the gene from human DNA and inserted it into the genes of the bacteria known as *E-coli* to genetically manufacture the hormone. But because the product is not much cheaper than the existing market price of $60,000 a pound, no mass production which could aid the treatment of dwarfs everywhere has ensued. But if it is ever found that it can be used to sell larger chickens or giant pigs, mass production will inevitably follow. And you will find that most brewers (who have a large supply of yeast) will be suddenly very interested. The market determines research.

But the journalists of spectacular science fiction get so carried away in their claims of what science can do that they distort knowledge by shifting it to the pseudorationality of the spectacle. Human cloning may not yet be biologically feasible, but these idiots, cloned through their professional careers of defending capitalism, rarely ask about the quality of life due to these researches. Yet we are asked to believe in spectacular progress, where everything changes in order to remain the same and capitalist doubletalk is the norm. The better distribution of food worldwide turns out to mean fast junk food in advanced countries and the minimum nutrition required to work cheaply in poorer countries; better transit systems bring people to work and not to where they want to go; more machinery means cheaper wage costs and not the abolition of wage labor; progress is progress towards war and annihilation, increased mental stress, and the total denial of creativity for all.

If It Walks like a Duck and. Quacks like a Duck, Then It Must Be a Rabbit

Research decisions are completely politicized as the experts of the science of policy-making become the policy-makers of science. As many science policies exist as there are managerial styles. Scientistmanagers are drawn into the elaboration, testing, and selection of rival interpretations of data best fitted to their client's needs. Yet the fact that the debate is limited to the rules of scientific method, rules which the managers themselves make up, is what determines its policies.

The idea that genes determine social behavior is not new. Zola's Rougon- Marcquart novels, often praised for their "socialist realism," chronicle the two halves of the same family, descendents of one mother but two fathers. The descendents of Rougon, the peasent, are ambitious and hardworking while the descendents of Marcquart, the drunkard, are degenerate and alcoholic.

Dickens's Oliver Twist was raised in the parish workhouse and educated into a life of crime by Fagin but nonetheless developed honesty and gentleness and spoke perfectly grammatical upper-class English. This quick turn of events is explained by the fact that he is really the child of an English nobleman. On the other hand, George Eliot's Daniel Deronda is raised by an English nobleman but finds himself with a passion for all things Jewish which is all explained in the end by the fact that he is really the son of a Jewish actress.

The argument that genetics determines intelligence is very often "backed up" by IQ studies. The authors of IQ tests believe they are testing intelligence and not some other factor — such as social or class background — which might explain different scores. H. H. Goddard, one of the main architects of the hereditarian interpretation of IQ tests, carried out IQ tests for immigrants upon their arrival at Ellis Island, declaring 80 per cent of them morons, the southern Europeans below the Irish below the rest, none of them, of course, coming within hailing distance of the descendents of the Mayflower. From IQ tests a herita- bility estimate is taken which pretends to measure the proportion of variation observed in a given trait. Since black and white IQ scores differ so much, idiotic professors like Arthur Jensen argue that education for blacks is a waste of time.

Other researchers have tried to establish this connection by the study of identical twins reared separately. Sir Cyril Burt was a noted example. For years he was the researcher who had assembled the largest amount of data on this subject, and his study was apparently rigorous in its analysis of the figures. It was the study used by racists such as Jensen and others. Burt became somewhat notorious recently when a London "Times" report showed not only that the two coauthors cited in the study were figments of his imagination but also that he suppressed chance variance to make the data correspond to preconceived ratios. This was a case of cooking the figures deliberately to produce a biased result, but how many times does this happen unconsciously?

Stephen Jay Gould has repeatedly demonstrated the role that cultural bias has played in science. His essays have poked fun at such things as the conservative preference for gradual change, the correlation between brain size and intelligence, IQ testing, and the conscious and unconscious racism and sexism of many scientists. As one example he cites the 1909 Piltdown forgery, in which three men, the geologist Smith Woodward, the lawyer Charles Dawson and the future mystic scientist, the Jesuit Teilhard de Chardin, "discovered" a skull in the British countryside with an apish jaw and human cranium. In 1953, however, tests showed that it was a fraud. In trying to explain why such a fraud was so readily accepted by British paleontologists, Gould finds that his answers do not conform to "the usual mythology about scientific practice — that facts are 'hard[1] and primary and that scientific understanding increases by patient collection and sifting of these objective bits of pure information. Instead, they display science as a human activity, motivated by hope, cultural prejudice, and the pursuit of glory, yet stumbling in its erratic path toward a better understanding of nature" (The Panda's Thumb, 1980).

Piltdown was accepted because science, while claiming objectivity, is in fact often subjective and arbitrary. Piltdown helped buttress certain racial views with the appearance of hereditary trees based on Piltdown Man and affirming white supremacy. It also made God an Englishman — as had had long been suspected. And it certainly proves the pious opportunism of the Jesuit theologian.

As a science genetics is the child of 19th century determinism. With the rediscovery of Mendel's work (in 1900) renewed efforts were made to validate the idea that character and mental ability were genetically determined. A series of experiments in the 1940s proposed to show that genetic constitution determined epilepsy and that alcoholism might be genetically determined. In the 1960s ethologists extended this to a wider variety of social behavior and by the late 1970s sociobiologists had extended the conclusions of ethology to the human condition itself.

The author of "Socio-biology: The New Synthesis," E. 0. Wilson, a Harvard professor of biology, uses genetics to defend the status quo. The book contains 25 chapters on insect behavior; a final chapter, "From Socio-biology to Sociology", draws analogies with human behavior. It suggests a genetic basis for such phenomena as competitiveness, sex roles, cheating, and the free market economy. Male aggression is caused by the presence of the hormone testosterone, female passivity by the hormone estrogen. The torture of capitalism is no longer important — it's now all in your genes, so to speak. Faults and imbalances in society are rooted in the faults and imbalances in genes; the "cultural" transmission of learning is turned into its opposite, a genetic code for culture. The passage from nonhuman to human behavior is made by exaggerating small genetic changes over billions of years and ends up in the area of religion and speculative philosophy through the jump into ahistoricism. Like Hitler, who described his own methodology as "the final step in overcoming historicism and in the recognition of purely biological values," sociobiology will take its place in the hall of horrors, along with eugenics and cybernetics.

Sociobiology is only one example of a general trend in the decadence of science: the explanation of the apparent forms of things by simply regarding the forms as natural and fundamental when in fact they have been created by science.

At War With Science

Wars have always been fruitful periods for scientific research, as the needs of defense and aggression cause large amounts of resources to be spent in the development of technology.

In times of relative peace, research is geared to increased productivity whereas in times of war, which today is almost all the time, research is geared towards the destruction of some declared enemy. The cold war has produced the greatest research into destruction ever carried out in the name of rationality. Tremendous resources are squandered in nuclear submarines and spy satellites and sophisticated weaponry which could blow up the world a thousand times over. Although NASA keeps telling us that what makes it all worthwhile is that it has provided us with the non-stick frying pan. In the meantime Dioxin (the active part of Agent Orange) causes deaths 15 years after Vietnam, and the use of chemical and germ warfare continues.

For many scientists, the Second World War provided an opportunity for research that might otherwise have been difficult to carry out. How can you study the effects of chemical poisons, biological warfare agents, X rays, burns, freezing, and diseases such as syphilis, cholera, typhus, and plague? Oppenheimer and Fermi corresponded on the possible use of radioactive strontium 90 as a poisoning agent but Oppenheimer thought it would be worthwhile only if "we can poison food sufficient to kill half a million men." Churchill wanted more research into anthrax bacillus so that he could bomb German cities with it. How does this compare with the quack vivisections of the Nazi doctor, Menge le? The war is still a fresh experiment in many branches of science. And many of the researchs were to help the subsequent careers of those who carried them out.

One example of this is given by a recent Japanese book (The Devils' Gluttony, Sejichi Morimura and Mosaki Scimozoto, 1982). It tells the story of 3500 soldiers and civilians, including members of the Japanese Red Cross who, during W.W.II researched germ warfare and carried out experiments on live human beings which involved injection with plague, cholera, and typhus cultures, the freezing of limbs, infection with syphilus, prolonged exposure to X rays, and vivisection. In all, they are estimated to have caused the deaths of 3000 Russian Chinese and Mongols and a lesser number of Caucasians, all of them prisoners of war in Japan.

After the war, while ex-Nazi scientists were being sequestered by Russia and the U.S., there was also interest in learning from the research developed by Surgeon General Ishii and his team of medical researchers enlisted from Kyoto University. This team had found a way to mass-produce penicillin years ahead of the Americans. In the research of vitamins (especially B complex), work was done by finding

substitutes for human blood by draining

veins and filling them with horse blood,

while syphillus was studied by the vivisection of live babies born to infected

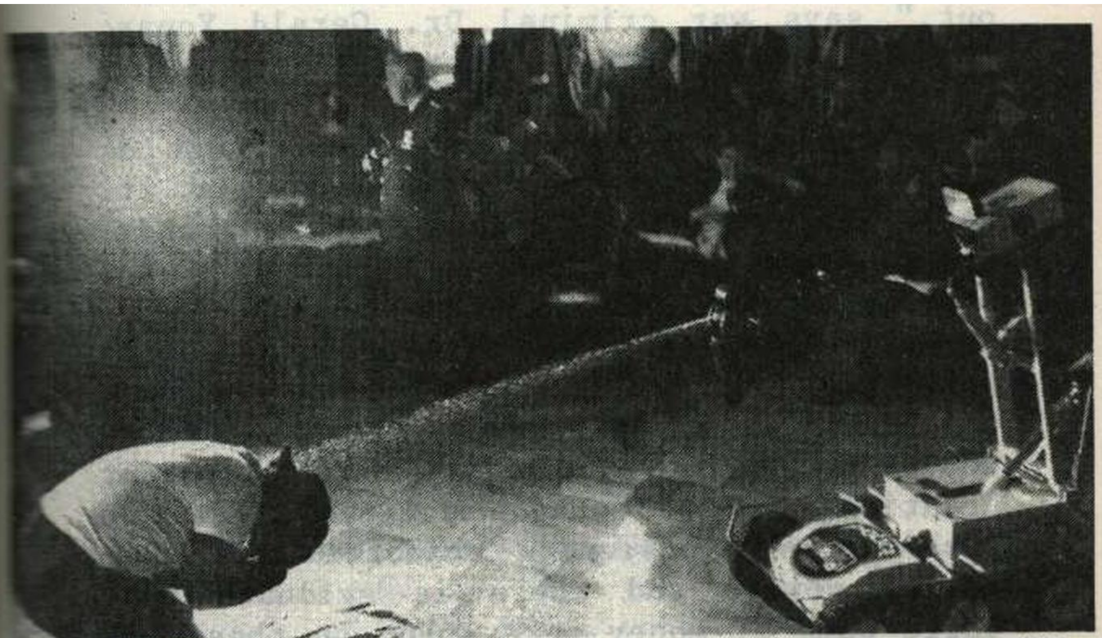
mothers. The most valuable long-term research (according to an American scientist who arranged the deal whereby the whole thing would be hushed up in exchange for the research papers) was the exposure of human skin to X rays. Of course, this experiment, which Roosevelt and Truman had anticipated in the uncontrolled city laboratories of Nagasaki and Hiroshima in 1945, was then very much in vogue among scientists.

All the top-ranking officers did well from this experience, and the data they collected aided their subsequent careers, some becoming part of the medical elite in civilian life. General Kitano became president, then chairman, of the Green Cross, a pharmaceutical company which in the 1950s developed the first artificial blood. Kitano, living in the bourgeois section of Tokyo, has handed over power to Ryoichi Maito, another leading researcher in Unit 731. Hisato Yoshimura was to become one of the world's leading authorities on human endurance to cold. At a conference of the Japanese Physiological Society in 1981 he proudly reviewed his life's research into comparative resistance of different races and age groups to extremes of cold. His data consisted of prisoners being soaked in cold water and put out in temperatures of minus forty degrees Celcius until the frozen limbs when struck by a short stick, sounded like "maruta" — a log of wood: "When these logs were soaked in hot water…the tissue crumWed." Much was learned about measuring skin temperatures, how long it takes to produce gangrene, how to treat frostbite. Yoshimura is, today, professor of the Hyogo Medical University and consultant for the Taiyo Fisheries Company. Some 450 members of the unit still hold teaching positions in medical universities. Scientific textbooks prepared during the Japanese "miracle of technology" were screened by at least two of the old Ishii unit.

An extreme situation? Non-normal science? A wartime aberation? Clearly not, since the U.S. government carried out radiation experiments during the 1950s on unsuspecting military personnel and even (it is suspected) on entire American cities?

Reagan's "Star Wars," which is supposed to make the nightmare of a nuclear holocaust impossible by the development of even more sophisticated weaponry, has opened up new possibilities in research. Even if vast amounts of wealth have been squandered on this and other destructive science-fantasies already, there is little reason to believe that such a program is feasible, even in the Administration's own irrational terms. "The hardware is at least 20 years away" says the president's 1984 science advisor. Yet Lockheed, TRW and Rockwell are all working with large budgets on this program (how to track targets, how to focus the intense light produced by lasers and how to build the laser apparatus). Much of the Pentagon's research work is being performed at Los Alamos and the Lawrence Livermore laboratories, where missile assembly, chemical manufacture and rocket engine construction is part of the normal day. *Taper tiger or spectacle?

Is this also non-normal science? Quackery? Yet this is present-day ruling class science. A director at MIT has estimated that 1000 space shuttle flights would be required to supply fuel alone for the 100 chemical-laser satellites needed to cover the U.S. and USSR. More money has been allocated to this stupid task than to any other major research proect in history — including the Manattan project and the Apollo moon proram. The small successes so far have included a new type of bullet that can't miss, fired from a so-called rail-gun. The bullet is about the size of a loaf of bread and would fly off the end of electromagnetic slingshots to zero in on fast-moving warheads guided by sensors and thrusters.



The New York Times/Neal Boenzi

Police Department robot simulating how Mace would be sprayed at a disturbed tenant in an eviction. The Emergency Service Unit demonstrated the new eviction procedures yesterday at a City Council hearing.

Panel Is Shown Devices for Use With Disturbed

"Would you like a cup of coffee?" asked the robot.

"I don't need coffee, leave me alone," the man shouted.

Suddenly the robot shot a stream of water in the man's face, and several officers rushed forward, knocked him down and restrained him. In a real situation, the robot would use Mace.

"There's no question of lethality. You can try to run away from them but there's no place to hide. They just keep seeking you out," says war criminal Dr. Gerald Yonas, the Pentagon's chief scientist for the entire Star Wars program.

This is still quackery even though it has all the money of the world behind it. While such fantasy occupies some minds, others are busy solving more urgent problems. The New York Times revealed in January 1984 that the Pentagon had been using psychics and ESP to evaluate the vulnerability of a plan whereby the MX missiles would be periodically shifted to different locations. The Pentagon believed that the Russians were screening children for paranormal powers and there is evidence that large sums of money were spent on these ESP researches by the CIA, the Armed Forces, NASA and the Defense Intelligence Agency.

Of course a more rational system could easily be imagined even under capitalism, and there are scientific bodies of well- meaning gentlemen, both east and west, who wish to reform the excesses committed in the name of research. Whatever the usefulness of their work, both as pressure groups and public educators, they have set themselves an impossible task because to succeed they would first have to destroy capitalism.

Chapter 5: Russian Roulette

> It's not a bad system. The bosses pretend to pay the workers and the workers pretend to work.
>
> Russian joke

Bogdanov and Science for the People

Scientists cannot ask if science is progressive if what is defined as scientific is called progressive. Marxists who claim a scientific means of understanding history are often powerless to understand their own history, especially when mistakes have been made. The rise of bureaucratic state power in the name of the proletariat meant that historical materialism had come to absolute power in the name of science.

Marx had absorbed much of the scientism of his own day into the body of his work and one of the main self descriptions was "scientific socialism", a term which both he and Engels used to distinguish it from Utopian Socialism. Marx's endorsement of science fits into the 19th century view of science as a progressive, even revolutionary force. Marx wanted to give the working class an edge on science; "Natural science will in time subsume the science of man just as the science of man will subsume natural science: there will be one science" (Manuscripts). But Marx also took the radical Hegelian view that the sciences "would be superfluous if the form in which they appear coincided directly with their reality." But essentially, most progressive 19th century thinkers, Bakunin as well as Marx, saw science as a welcome antidote to religious obscurantism.

Scientism was already in Marx's thinking, especially in his economism, and was certainly present in Engels, who helped spread an almost religious notion of dialectics — the quantity-quality dialectic. This implied that if there was enough science then capitalism would collapse, as though obeying some natural law. Such dogmatism, which was to be taken up by Lenin, although in a much more pragmatic way, wanted to realize science without suppressing it. This can be contrasted to the religious rejection of science, which would suppress it without realizing it. It was nevertheless disastrous for the old workers' movement that some of the utopianism (of say a Fourier, for example) was to be scientifically swabbed off as mere day-dreaming, though it often produced more humanely creative values than the rationality and scepticism of so — called scientific laws.

Alexander Bogdanov first posited the notion of proletarian science and his book "The Philosophy of Living Experience," (1910) laid the foundation for the Proletkult in 1917. In exile in Switzerland, Bogdanov eclipsed Lenin for a while inside the Party hierarchy. He was expelled from the Bolsheviks in 1909, most of the left Bolsheviks along with him. It was at this time that Lenin took the position of "partisanship in philosophy," rejecting and expelling all those with divergent views. The conflict with Bogdanov had already led to Lenin's main work on philosophy (Materialism and Empirio-criticism), a work which was to become the Marxist- Leninist bible on such subjects as objectivity, epistemology, dialectics, philosophy of science, etc. He returned to Russia in 1914. By 1917, Bogdanov not only had views on proletarian art and science but had organizational plans as well. Proletkult claimed upwards of 400,000 members. As an organization it sought to dictate in cultural matters as the party did in political affairs. While not opposed to the Bolsheviks, Proletkult agitated for a complete break with the bourgeois past by the establishment of "proletarian culture." The left challenge of Proletkult made Lenin assert the Party's rule in cultural matters. By 1920 Proletkult had been "attached" to the Commisariat of Education and virtually disbanded. Despite Bogdanov's obvious importance, his published work suffers from a kind of double censorship -the liberals censor him because he was a Marxist, while Marxist presses like New Left Books censor him because they are basically Stalinists. Since no English version of his work exists he is virtually ignored by those who repeat his errors.

It is the division of labor, writes Bogdanov, that causes knowledge to be broken down into its specializations. "The Science of the Future" (the title of one of his essays) would not be fragmentary, but unitary. Philosophy was incapable of the task of unification because it did not produce the experience it tried to organize. "No effort of thought can gather and organize the parts of a shattered body into a living whole." For Bogdanov, the task "was the unification and integration of practice itself and with that, the merging of the special methods of science, which directly serve production, into a single, universal scientific method."

Bogdanov sees the unification of practice and knowledge as already under way, and he sees proof of this in increased automation. "Direct labor is done by mechanisms which the worker guides, and man's role of control and direction becomes ever more the order of things." He is convinced that the difference between the "implementary" work of the worker and the "organizational" work of the engineer will disappear, arguing that "when the supervision of such machines becomes the worker's main occupation then every qualitative difference between worker and engineer will disappear and there will remain only the quantitative difference in preparation and experience…At this time, the worker will be more than an engineer, he will be a scientist." This science of the future, what he called the universal organizational science, would subordinate each division of science, specialties in knowledge drawing ever nearer to one another and universal methods. Labor could be unified only if the knowledge which labor used was unified. But this knowledge would be subsumed, along with the knowledge of natural processes, into a greater "organizational" science, a science of sciences. And the "organizing activity" was to be the task of the proletariat.

Bogdanov was writing at a time when many were still impressed with the achievements of technology, which he regarded as the surest sign of human fulfillment. Thus there is total faith in the liberatory power of technology and no clear sight of its content. Machines have not freed man to become the "supervisors of machines" but have made some work harder and others live a survival existence on welfare. Bogdanov is heavily influened by the strain of scientism and positivism which ran through Russian intellectual circles at the end of the century, one broadly influened by a positivist Marxism. Although he himself thought that he had gone "Beyond Marx and Mach" (the title of a book by K. M. Jensen, published in 1944, the only book in English which gives extensive quotations from his work), he clearly remained in that positivist cloak which, with Bukharin, was to supervise the crushing of the Russian proletariat. Although Bogdanov was one of the first theorists to argue that the Bolsheviks had become a new ruling class (his name was to become associated with the Workers' Truth group), his concept of "proletarian culture" remained wooden and intellectual. It was something decided for the proletariat and not by them.

Proletkult was too quick to deny the importance of the cultural inheritance of the past. The use of "laboratory methods" divorced from real everyday existence made it unreal. It became another ideology, not for Lenin's reasons, but because it didn't allow for autonomy and spontaneity in creation. Science for the People was precisely that; for but not by the people.

Bravo Comrade Lysenko, Bravo -Stalin (1935)

The kind of model which took over in the Soviet Union after 1919, in which all power was hierarchically vested in a particular group, was doomed to collapse into the paranoiac machinations of cliques struggling for power over the workers' movement, finally crushing it. Manipulation, deceit, and murder is the normal business of rival factions of politicians and their police. In Soviet Russia rival factions have always used "science" to justify themselves and even occasionally to justify historical aberrations.

The stupidities of the Lysenko gang (Prezent, Vilyams, Kaftanov) have been so well documented elsewhere that it is unnecessary to repeat them at length here. Their notion of proletarian science stems directly from their notion of a proletarian state and their power could be maintained only through political terror since it lacked all theoretical or technical foundations. The reign of terror inflicted on Soviet science was disastrous for it. For quite a number of years chromosome research was all but outlawed, relativity was declared reactionary and such important theoretical ideas, ideas which needed discussion at least, as Bohr's complementarity or Pauli's resonance were likewise one-sidedly rejected.

So much has been written about Lysenko, generally from a liberal standpoint, that it is often forgotten how rotten was the middle class dogmatism of the Soviet Academy (an institution which had evolved from Tsarism). According to Lysenko, classical genetics, by its belief in the fatality of hereditary phenomena, by its denial of the fundemental importance of selection by adaptation, by seemingly positing an "immortal hereditary substance" (chromosomes) which controlled the living organism, was idealistic since it apparently allowed no means whereby people could change themselves through changing their environment. For some, Lysenko appeared to be defending a radical Darwinism, ensuring that the capacity for change lay within the power of human beings and seemed to provide an alternative to gene theory, which had been used so often in favor of racist arguments.

From the Leninist "partisanship in philosophy" to "partisanship in science" Lysenko took a blind leap. While Lenin implied that historical materialism was a science, in the same sense as physics or chemistry, and believed that his theory (dialectical materialism) was some approximation to it, Lysenko was convinced of it. It is essentially the same viewpoint from which current Marxist-Leninism claims its own little paradigms: Engels's polemic against Duhring; Lenin's against Bogdanov; Gramsci's against Croce; Mao's against dogmatism. For the faithful there can be both historical certainty (science) and speculation (philosophy) though which is which is a question that can be resolved only by force.

Lysenko could find in Stalin's crude notion of dialectics a dialectic of evolution and a rush-job paranoic study of biology on the run. Ironically, Stalin's statement (with Lysenko in mind) that "the history of science will become a science as exact as biology" was to prove true, though not in the way he meant it. Lysenko really was the hick who tried to pretend he had palace manners. Like Mendel, he was from peasant stock, rising within bourgeois institutions, the one to become an abbot, the other to become director of an institute, both convinced that their roots in the land justified their ideas. Both the priest Mendel and the commissar Lysenko became victims of the very dogmatic world views which nourished them, Catholicism and Bolshevism.

What eventually triumphed was dogmatism and the denial of debate. Running science by experts in the name of the proletariat is not the same thing as the proletariat becoming investigators and researchers. By claiming that the debate was between proletarian and bourgeois science Lysenko was factional/zing but not going beyond science. There are no more two biologies than two chemistries or two physics; they are all a single science with respect to method and content and historical evolution. The Lysenkoist name-calling dogmatism (Menshevizing idealism, Trotsky-Bukharin conspirators, Mendelist Morganists etc.) was merely a demonstration of the lack of argument and hid the egocentric conviction that, as Stalinist Minister of Education Kaftanov put it, "there could be no hereditary diseases in a progressive socialist society, among the leading builders of communism." (The Rise and Fall of T. D. Lysenko, Zhores A Medvedev, 1969).

Khrushchev was to defend Lysenko even as late as 1963, (after the cracking of the genetic code and the discovery of the mechanisms of protein synthesis), calling him the "ideal Soviet scientist." Lysenko's claim to glory during the early 1960s was his attempt to raise milk production through the cross fertilization of purebred Jersey bulls with indigenous breeds (East Frisian, Kostroma, Kholmogory). Lysenko's farm at Lenin Hills sold bulls to collective and state farms in order to raise the butterfat content of cows throughout the Soviet Union. His farm was extremely fertile, well stocked, well funded by grants, mechanized (fifteen tractors, two combines, etc.) and did not have to produce grain for the state as it was a research center. The sale of low-pedigree bulls around the country ruined herds of higher purity and many had to be slaughtered. Yet Khrushchev was able to say, "When I want to find out about agriculture in the non-black-earth zone I go to T.D. Lysenko at Lenin Hills." Khrushchev had great praise for his Jersey bull programs and, in implementing them, almost destroyed Russia's cattle population.

Lysenko claimed practice as his ace in the hole (although he also fancied himself a theorist), and most of his critics were at a loss to criticize his prowess at farming (many had never gotten their hands dirtied). Liberal reformers like the chemist Semenov, or the physicist Sakharov, tried to bring reforms into the all-Union Academy of Sciences in the early 1960s. An article commissioned by the Central Committee and written by the petty reformist journalist Rapoport in support of genetics and so- called Mendel-Morganism was supposed to prepare the way for Khrushchev's forced resignation in October 1964. This article never appeared but within three months articles began appearing which disputed figures with Lysenko and led to an investigation of his data. Lysenko's methods were criticized for lack of controls, and it was discovered that butterfat figures had increased only through highly unnatural selection: the slaughtering or selling off of poor milk producers.

Having One's Cake and Eating It: Cybernetics

Any planned economy requires a steady flow of information between the planned units and the central planners. The question becomes, who should control this information and how to avoid bureaucracy? The Soviet economy, already large in 1917, had expanded to complex proportions by the time Stalin died in 1953, an accomplishment achieved only by a combination of political terror, Taylorism, and Stakhanovism, and the blood of millions of proletarians.

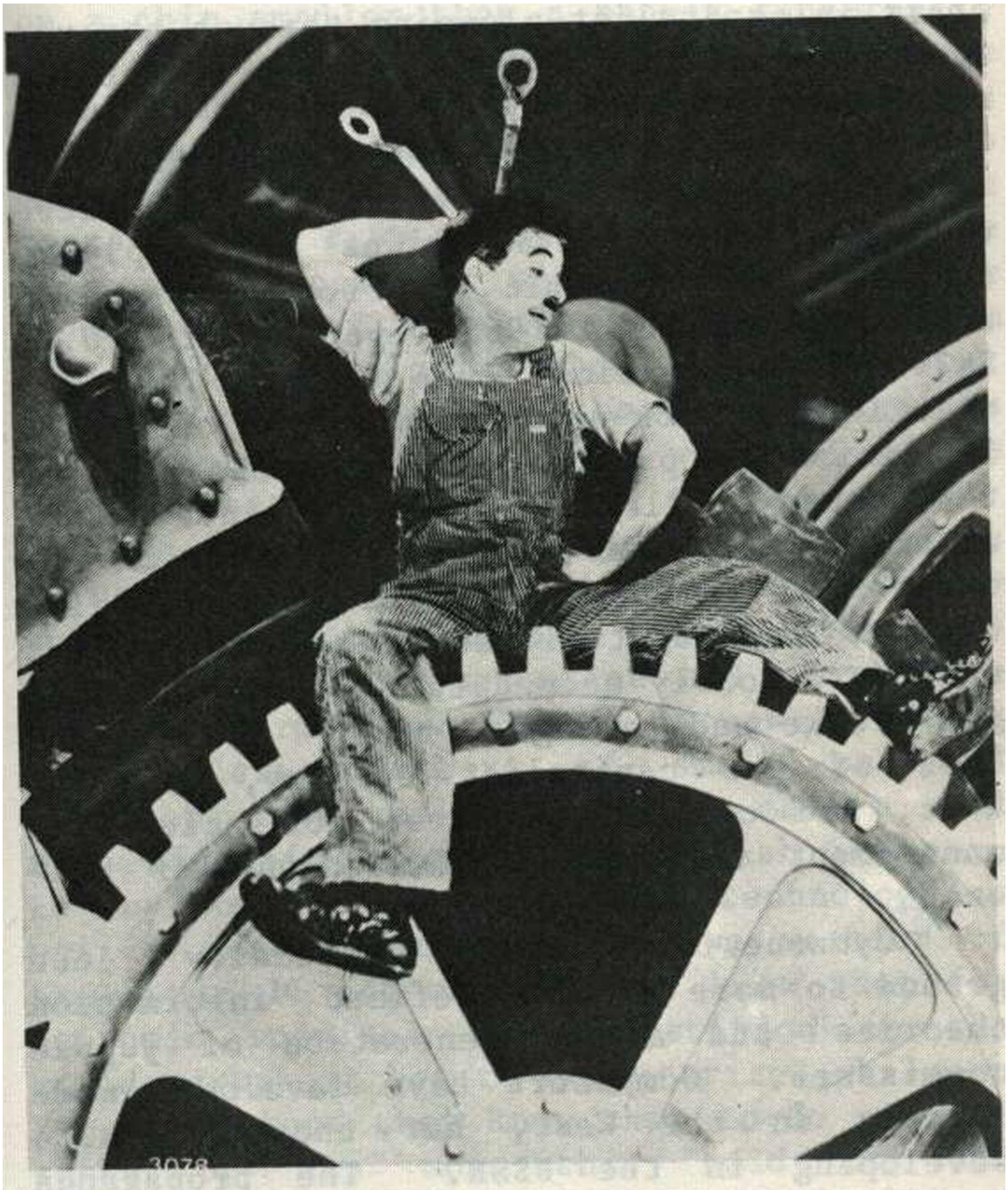
In the aftermath of Stalin's death a political struggle ensued as to what type of management Russia's economy was to have. The struggle was between two types of leadership, Party dictatorship or liberal technocracy. Malenkov, supported by a certain liberal intelligentsia, took over the government while Khrushchev took over the Party with the support of Party hard-liners. Khrushchev's Virgin Lands scheme, launched in 1954, involved sowing 32 million acres of wheat over two years by shipping 250,000 people, 120,000 tractors, and 10,000 combines to Kazakhstan and west Siberia. The people were mainly volunteers from the Komsomol, the Young Communist League. This was essentially a method of using the Party to attack the technocrats in the government, showing that the independent efforts of the Party (and therefore the people) were being obstructed by the bureaucracy of the Ministries. It was a struggle between two models of technocracy, one based on the historical scientific mission of the self-apponted Party and the other based on the principles of scientific management. Khrushchev temporarily won this battle over Malenkov but would finally lose out to a compromise situation, the Party absorbing the technocratic critique by 1964.

The decentralization reforms which took place in 1957 were accompanied by a growing ideological shift among Soviet planners both within and without the Party. In this background cybernetics appeared to answer some of the complexities of planning. Borrowing from the entropy laws of thermodynamics, cybernetics hoped to circumvent class struggle by seeking to measure and control the amount of disorder in a system. In a country which had already embraced Taylorism as a panacea — even providing a workers' orchestra made up of factory whistles and sirens — cybernetics appealed as a scientific method and tool. By 1961 the Party had endorsed cybernetics research, and academician, A. I. Berg, set up the Scientific Council on Cybernetics that same year.

Loren Graham in his "Science and Philosophy in the Soviet Union" (1966) made the very interesting comment that "while in the 1930s it was possible to speak of the Bolshevization of science, in the 1960s it was possible to speak of the scientization of Bolshevism." The age of the scientific manager had come to the USSR just as earlier it had come to the West. And, if in the West, there might be a feeling that "science had come to know sin," in the USSR science was shameless and seemed to provide the next logical step in the planning and running of the country. The debate on cybernetics served as an ideological cover for an unadulterated leap towards technocracy as a managerial technique. From 1958 on, the entire literature and apparent openess of the debate was merely a means to make what had already happened politically and economically appear to have a scientific basis. While this cannot be put down to silly theses like "the restoration of capitalism" (capitalism had long been restored), it did however represent a new shift in capitalist planning through the use of information systems and scientific management.

In the west, cybernetic high priests (Norbert Wiener, von Neumann, etc.) were working along similar lines and applying computers to economic and social planning and management. A 1963 report on the U.S. Sylvania Corporation could state: "In a revolutionary hook-up Sylvania has connected 51 cities to produce what a spokesman for the company called a step in 'administrative automat ion'…This form of integration secures many of the advantages of centralized control in decentralized locations, a feat which previously seemed tantamount to having one's cake and eating it too." The exigencies of the capitalist economy, East or West, had created the need for scientific management through the management of science .

Cybernetics would eventually lose ground to more clearly defined "information theories" and a new generation of yuppie commissars. Computers have developed more quickly in the West,



but they are also developing in the USSR. The propaganda section of United Technologies in the U.S. certainly understands the problems facing the Politburo. In an ad placed in many newspapers to bring in 1984 they wrote: "Orwell wrote at a time when computers filled large rooms. Only an army of experts could operate them. Only governments could afford them. If information is power then only governments would have the power the computer offered. What Orwell did not foresee was that information could be stored on a chip smaller than a baby's fingernail. Like ordinary beach sand chips are made principally of silicon — one of the earth's most abundant elements. That the chip has made the computer so widespread removes the fears coming from Orwell's belief that the power of the computer would rest exclusively in the hands of an elite few." Apart from the obvious banalities about the cheap cost of their sand castles, these propagandists have pointed to an essential weakness in the Russian system.

In response to pressure from various reformist bodies (both in research institutes and in education), the Politburo is being forced to computerize and share some of its information. Russia is now importing fairly large numbers of small personal computers from the West and has made a deal with Sinclair Research, a British company, to buy some of the production technology as well. Russia produces its own version of the Apple II computer. They know that for economic survival and competition in the world market it has to computerize, while on the other hand they know that to do so will shake up its monolithic hold on all information — even such basic statistics as food production, housing, etc., forcing them to share power with the younger apparatchiki of Silicon Valley. It will effect the production, storage, and even printing of information — the weak link in the Soviet chain. How this is introduced will decide whether the old elitist model of the

Kremlin, with its tight-fisted secrecy, will collapse or at least undergo extreme upheaval. It will have to bring its own version of pseudo-reality up to date so that, as in the West, they can say: they want information, then let them eat soap.

Historical materialism is one scientific expression of what is progressive (where what is progressive is historical material). Another expression, much more dear to Western academics, is the notion of falsifiability. Since academics believe their universities are outside of society, let us consider them separately.

Chapter 6: It's Only Academic

Much of academic history and philosophy of science shares the conviction that the central episodes in scientific development are revolutions. From Popper to Kuhn, from Lakatos to Feyerabend, through a host of lesser academics a lot of chatter can be heard about the concept of revolution in science. Against them are pitted those who defend continuity in scientific discovery, the idea that science merely adds more information and refines theories through a cumulative process. But what do these gentlemen mean by revolution?

Karl Popper

According to Popper, science grows by replacing defective theories and knowledge progresses by conjectures controlled by refutations, in this way creating new problems to be solved. All theories, he argues, must be falsified before they are replaced. Thus "progress in science, although revolutionary, is always conservative; a new theory, however revolutionary, must always be able to explain fully the success of its predecessor." Popper therefore is always in favor of the old theory, of the old world view, which, according to him, can be only replaced if crucial tests show that this is necessary. Confirmations count only if they make risky predictions which cannot be accounted for in the old theory, such as the orbit of Venus for Copernicus or the bending of light for Einstein.

Thus existing theory is taken for granted. Empiricism dominates because it is the test (which test? which jury?) that is crucial. Popper has really put the cart before the donkey in claiming that the onus is in rejecting new theories and defending old ones. He is the conservative who only changes when everything else has changed and there is no other choice but to accept it. What he provides is a program to test out the need for reform. His method is general and can be used for all theory; it can be used as an epistemology of reform. It is little wonder therefore that Popper has been so popular with political scientists and economists and has been used by Friedman, the economist who helped Pinochet's economy in Chile. It is interesting to note that the arch-ideologue of sociobiology, E.O. Wilson, dissociates himself from earlier biological determinists by accusing them of employing methods which generate unfalsifiable hypotheses, though exactly what this expert on insects would use as a Popperian test is still up for grabs. Like Bertrand Russell's chickens who woke up every morning to get fed but one morning woke up to have their throats slit, this pseudo inductivist might wake up one morning to a similar fate.

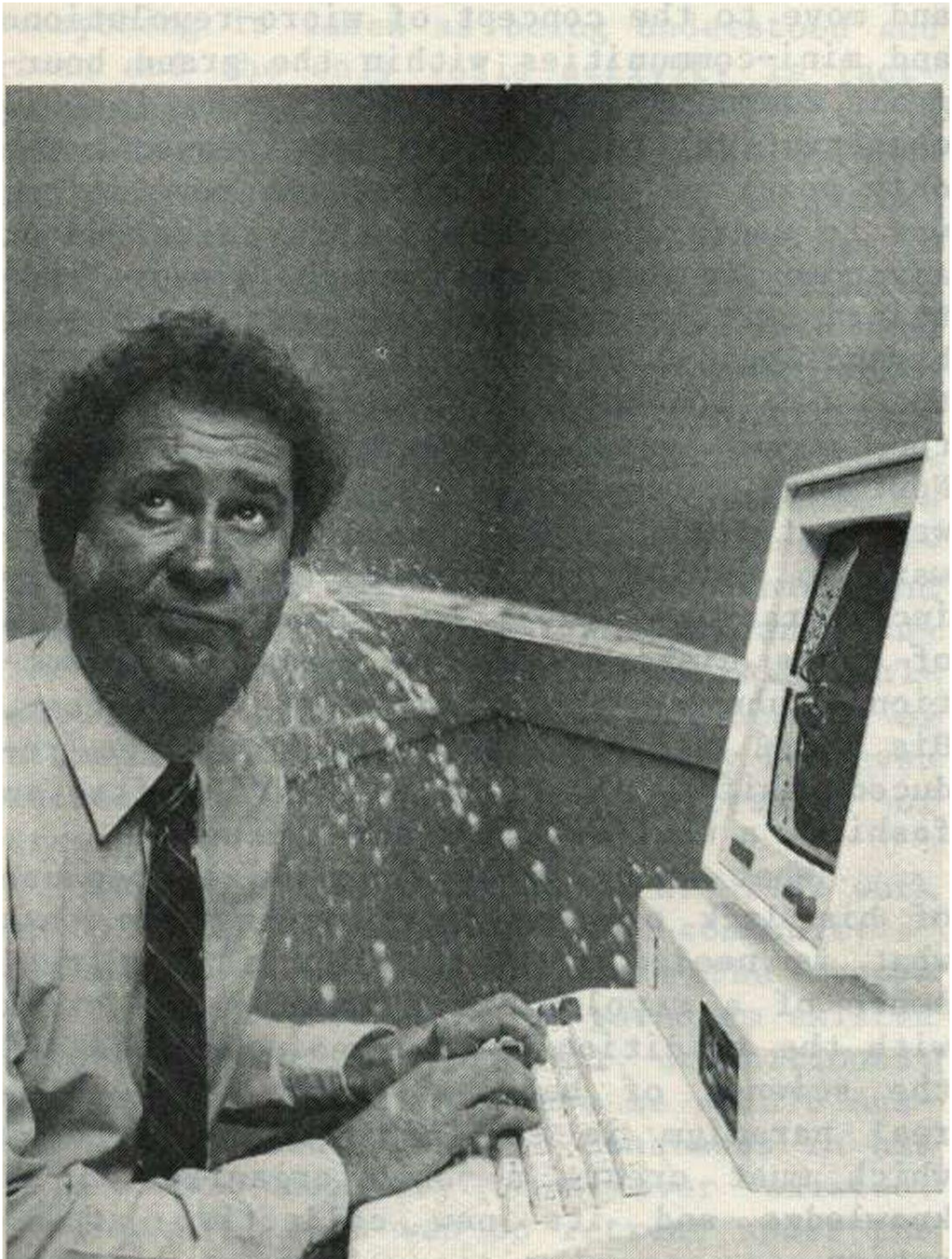
But even Popper had difficulties with the validity of the falsifying tests used and saw how, because of the tenacity of scientific theories (their tendency to evade falsification by the introduction of suitably introduced ad hoc hypotheses), simple falsifying tests might not be enough. So he had to move on from a concept of naive falsification to sophisticated falsification. But what we really have here is the tenacity of conservative criticism, which by adding suitable ad hoc tests would falsify all the more. It is like playing a game in which your partner can change the rules anytime you begin to win. Popper's lack of dialectics, which makes him scared of negation, makes him religious: "In destroying tradition, civilization also disappears and mankind returns to Adam and Eve," he writes, the stuff of the sermons of village priests.

T.S. Kuhn

If, for Popper, science is always in a state of conjecture and refutation, for Kuhn this takes place only in periods of non-nor- mal science, revolutionary periods. Kuhn's "Structure of Scientific Revolutions" (1962) posits the view that scientific questions are decided by a "totality of factors" (a paradigm) in which the meaning and direction of the questions are changed by a group of scientists, which then influences further courses of study. These paradigms are brought about by the necessity to resolve anomalies in the relation of existing theory to nature and are caused by changes of world view. Following these paradigms are periods of normal science, dogmatic interludes where everything is taken as being understood and given and the only valid activity is fact-gathering. In these periods the new world view slowly comes to dominate, as everyone is brought around to the new way of thinking. "The transition from one paradigm in crisis to a new one is not a cumulative process which merely adds bits into the picture," says Kuhn, "but a reconstruction of the fields most elementary theoretical generalizations." The conservation of energy as a theory could come into existence, he argues, only when calorific had been destroyed. Kuhn argues for far-reaching and drastic conceptual discontinuities and, unlike the continuists (Crombie, Hall, Toulmin, etc.), says that the development of science was not merely evolutionary but even punctualist evolutionary, a succession of paradigms.

Kuhn's 1969 postscript to his 1962 work was to react to the "scientific community's" criticisms. These ranged from the charge that no clear definition of paradigm existed (someone found 23 different definitions), that he was a romantic since he didn't analyze institutions, that no consensus in his "scientific community" had ever existed. Unfortunately Kuhn was to retreat under the consensus of his academic colleagues, who smelled something dangerous here, if not a defense of revolution (even a revolution of ideas) then at least the notion that the great instances of intellectual progress were beyond their control with the implication that these little academics might be involved in "normal" science. Kuhn was to posit a far less university-shattering view and move to the concept of micro-revolutions and mini-communities within the grand bourgeois community, thus allowing space for his conservative critics. In many respects the only point of calling paradigms revolutions was to underline the fact that the argument advanced in any breakthrough always contained certain notional elements which went beyond logical or mathematical proofs. With this new concept of "disciplinary matrix" the major paradigm changes (Copernican, Newtonian, Darwinian, Einsteinian, etc.) were watered down. Instead of moving forward to sharpen the concept of paradigm by incorporating into it the absent parameters of class history and the needs of production, Kuhn was to abandon it altogether. His final version of paradigm changes reduced shifts in science into shifts in fashion, a useless, lifeless concept.

What Kuhn failed to realize, because of his lack of historical daring, is that what is needed is a paradigm in the real sense of a revolutionary paradigm, a break with the tradition of bourgeois science and the science of bourgeois tradition. The real paradigm is the proletarian paradigm which must create a new organization of knowledge and its new collective application.



Imre Lakatos

In 1968 Imre Lakatos was to call student revolutionaries “contempory religious maniacs” although he never actually called the cops on them as did the Frankfurt school philosopher, Jurgen Habermas. Lakatos could not accept Kuhn’s critique of Popper that the decision to accept a new theory was not necessarily made by tests but by gestalt choices, even irrational psychological choices, because this could lead to the unacceptable view that major scientific changes had been the result of mob psychology. Lakatos introduced more piecemeal theory. Where Popper had spoken of a single theory, Lakatos now chooses to analyze a cluster of theories where each subsequent theory results from adding auxiliary clauses. “It is the succession of theories and not one theory which is appraised as scientific or pseudoscientific. But the members of such series of theories are usually connected by a remarkable continuity which welds them into research programs.” These scientific research programs are said to be progressive if they contain “excess empirical content” which unearths some new fact. In other words the history of science is conceived not as steady progress punctuated every few hundred years by a scientific revolution but as a succession of progressive research programs constantly superseding one another with more enlightened theories of ever increasing empirical content.

With this everything is reduced to a methodology of research programs. Lakatos that if Popper’s naive falsification criterion was applied to each theory it would never stand the test since new theories are usually inarticulate at the beginning. Thus, extending Popper’s sophisticated falsification over a period in which there are various problem shifts, Lakatos continues to falsify the new theory and defend the old, but he also ensures that options are kept open and nothing that might be of help later is thrown out. If Popper was the arch-conservative, Lakatos is an example of cautious crisis management. He can then justify the role of the academic (which is what all academics want to do finally) in solving small problem shifts. Thus they can get on with their business.

In any case, the victory of one methodological research program over another is generally the outcome of a political struggle outside the universities, generally a struggle between different political ideas of capitalist management about the utilization of resources, etc. Again which jury? which test? Lakatos appears to be introducing history here, but really it is a static sequential slice of history, a boring history in which no one would want to live, because no one could breathe in it. He appears to be refuting domatic methodological rules (hence Feyerabend’s praise for Lakatos as an “epistemological anarchist in disguise”) . But the rules are written into the institutional parameters of the research program in the first place. Companies and the state will not give out money indiscriminately for any old research program and certainly not for one that might challenge its power.

All of the above gentlemen have an epistemology which posits a scientific community socialized into the traditions of its discipline. This community lays down the rules and procedures whereby it may subsequently be modified in some reasonable way. The communities are bourgeois institutions, the state as guardian and the university as home. Like Kant they feel that reason imposes laws and regularities on the world a priori and that there are categorical reasons for everything. The revolutionaries of scientific change are really just continuists who ocasionally mention revolution.

Paul Feyerabend

Paul Feyerabend is in this tradition but stands out from it. This German ideologue has taken the debate from discontinuity to dadaism. “Kuhn’s paradigms are so much hot air,” he says, “and cannot be located precisely while Lakatos’s methodology implies that all methodologies are equal.” If Kuhn wished to incorporate out- of-date scientific theories as science rather than myth (after the style of Koyre), Feyerabend puts science into the world of mythology. In his main work “Against Method” (1974), he correctly demonstrates the propagandistic element that is a feature of all scientific discovery since Galileo.

So science is dogmatic and is political and has lost the philosophical adventure it once had, it has turned into big business. Feyerabend then must ask two questions: whether science is worthwhile at all and, if it is, what kind of science. Here he oscillates between throwing science out the window and treating it as one activity among many. Anything goes, he says, everything is equally valid; the idea that there is no knowledge outside of science is another fairy story. In a remarkably irreverent article, “How To Defend Society Against Science” (Radical Philosophy 2, 1975), he writes “scientific ‘facts’ are taught at a very early age and in the same manner in which religious ‘facts’ were taught only a century ago.”

But something is missing. Feyerabend has brought a healthy dose of dadaism to science and this allows him to be irreverent to rational being’s most sacred ideology. But he remains only a dadaist, and a technocratic dadaist at that, because while suppressing science he leaves other institutions, though reformed, standing — the state and the university in particular. The dadaist suppression of art was limited. It did not know that it had not only to realize and suppress it simultaneously, but also to do so within the historical task of the abolition of classes. It is not just the “dogmatism” of science and scientific ideas that needs to be attacked, so that anything goes. Science is concrete. It reaches out and throttles you. It exploits.

For Feyerabend, the separation of state and science means less state control but not the abolition of the state. With a neoNewman notion of the liberal university or research lab he asks to be left alone to do as he wants. “We shall develop and progress with the help of the numerous willing slaves in universities and laboratories.” “Ideally,” he says “the modern State is ideologically neutral” and, for all his quoting Lenin, Feyerabend doesn’t wish to analyze it as a particular, historical instrument of class rule.

If all ideas and methodologies are equal, then they are equally useless or equally valid. No doubt Feyerabend’s sincere aim is to avoid dogmatism and promote freedom. But here science must therefore be equal to voodoo, something which is true only in the repressive regime of Duvalier’s Haiti. Even in Brasil where it may serve some useful purpose it is generally powerless against the onslought of modernizing tendencies. We should use all methods, all ideas, says Feyerabend and not just a selection of them, but how can we use the ideas of military dictators or Stalinist parties? Dadaism was only useful as a shock tactic and then only in Berlin where it partook in proletarian uprisings. Dadaism in art was forced to give way to a Surrealist program for precisely these reasons.

Feyerabend sees rightly that modern science is an oppressive, chauvinistic business in the control of ants parading as experts and that it has created a hectic barbarism. However, his aim is not critically to go beyond it but merely to limit its influence. Today, R. Mutts’ urinal is not just any old urinal for pissing in. If his dadaistic “anything goes” is to be followed then capitalism goes, the organized obscurantism of religion goes, the power of capital goes. If modern science is Big Business, why should it go away and leave us alone?

Feyerabend's dadaism is really technocratic dadaism which, in the final analysis, is just technocratic liberalism and will revert back to technocratic dictatorship the minute any real non-spectacular attempt is made to change it. Then we'll see where Feyerabend goes. The road of ahistoricism is strewn with too many corpses already.

So if we are to find a way out of this dilemma there is no point in looking inside the universities. The realization and suppression of science must find its theoretical roots if we are to be rid of its tyranny. But no matter how hard we look we will not find it in the universities, at least not among the lecturers and professors who know full well that they are on to a good thing, no matter how sincere they may seem. When what was once revolutionary stays around too long, it is the crudest of masters, because it knows that it must now defend itself or be overthrown. Technocratic capitalism, and the theory which sustains and nourishes it, will find a hundred arguments to defend itself. And when there is no more argument it will find a hundred weapons.

Revolutionary theory will arise out of the practical struggles which are being fought and the many which yet have to be. Reaganomics, Thatcherism, and Mitterandism have put the proletariat on the defensive; the offensive and daring battles have still to come.

Chapter 7: What's In It For Us, Boss?

A great negation must be made of these things which smell of the grave. Say no to death and boredom, and you'll keep a little life left. A little, freed, is enough. It will grow into a new and magical apprehension of people and things. Life will touch life and flower where it touches more marvellously than our state imaginations can believe

Jack Common (1935)

Unfortunately, at least for the moment, the working class is divided, hierarchized, split into sectors and unions, with different pay-rates, perks, and benefits. It's me and you, fellow workers, pitted against each other. And all the time self-determination remains elusive.

The capitalist organization of technology is also external to the working class just as much as any attempt to reform it, which is the usual half-hearted reply to workers' demands. The failure of the old workers's movement was precisely the reliance on structures which did not arise within itself but were handed down as a means of emancipation by superiors. This heritage, bequeathed us by social democracy, Bolshevism, and anarcho-syndicalism, has to be destroyed as workers destroy the class system.

Knowledge really is power and power is knowledge, and the only way to ensure the defeat of the partialized power of capitalist knowledge is its total democratization. However, in the atomized conditions of today's world a little extra knowledge may mean no more than a few extra bucks a week.

The introduction of new communications and robotics technologies will intensify all of this. Aside from displacing thousands of workers from the workplace, it will create new relations of production, leaving only a specialized few with the power of destroying the economy from within the production process. Vast sections will become an undifferentiated, deskilled reserve army of labor and join the increasing ranks of the unemployed. Both groups will have to find new methods to work together, even coordinate actions. But we will have to find such methods in struggle and not accept anything handed down as some bureaucratic measure.

The 1983 IG Metall strike in Germany for the 35-hour week can hardly be called a victory. As a means to curb unemployment, the government had proposed to shorten the workers' lifetime by a system of compulsory early retirement. Some hundred years since the beginning of the struggle for a 40-hour week, the IG Metall union put forward the idea of shortening the 40-hour week because this was the only way it could sell itself to its members and get some sympathy. The strike ended in a compromise of a 38.5-hour week with no loss in pay. Most workers supported the strike, because they knew it meant an increase in hourly wage rates. Workers carried out overtime as before and the hourly rates were adjusted upwards, that's all. And in fact most plants retained the 40 hour week, giving extra holidays or winter holidays. The net effect has done absolutely nothing to ease the imbalance between employed and unemployed.

Under today's conditions hundreds of thousands are uprooted, pushed into a little bit of education, given some apparently classless culture and then forced out onto the modern death-ships of worklessness and meaninglessness. Many of the transplanted begin to see things more clearly than those left in their original soil.

Sometimes a wild guess is worth a hundred carefully prepared theses. But, as Galileo understood, a hatred well thought out is worth a hundred wild guesses. Science in the last century was what was needed against religious obscurantism; it helped break down the mystical tyranny of the upper classes. Yet today, with science everywhere, with scientific food, scientific architecture, scientific sleep, science in the cupboard and science down the toilet bowl what we need is less science.

Working in your back kitchens while you sip your cocktails or shop at Tiffany's or Harrod's we plot your demise. And if we don't, then more fools us for being voluntary slaves. The struggle for the 40-hour week is over 100 years old; one nuclear submarine could keep a clinic going for 15 years; but all of that means nothing; it's too logical, too simple, unscientific.

At present workers are considered an extension of the machine; in fact, more care is taken of the machines than of the workers. Workers are forced to do compulsory overtime so that maximum use can be made of the costly equipment; there is a definite drop in the quality of work life, with increased job pressures, more isolation, less control over work procedures or even the quality (or any other characteristic) of the product being made.

Under today's conditions, employed and unemployed eye each other nervously. There is the provocative example of the Spanish workers in the period 1976–1978 where unemployed workers were invited to factory meetings by other workers and given the power to vote. Such things do happen, but only in times of large offensive struggles. In times of reflux, there is the stony silence of separation. In 1981, spontaneous riots broke out all over the U.K. and the kids in Brixton rioted all weekend. When it looked like Sunday night's rioting would overflow into Monday morning's work itineraries, the police moved in quickly and with more force than they had ever used before. They realized that if employed and unemployed got together, then that was a major threat to their power.

The question is how the unemployed can reach the employed when the technology is keeping them apart. Technology will have to be subverted before any steps can be taken. In all occupations of factories, workers' control of industry will have to raise the problem of redesigning the means of production, probably by setting up proletarian information centers where new ideas can be tested and where there will be a rotation of tasks. The universities can easily be dismantled and much of their laboratories and equipment reassembled for use in these proletarian information centers.

Workers in the new high tech industries will have to begin to demystify these skills with all others, cutting out the jargon and other effects of specialization and explaining how things work so that tasks can be rotated, to transform the specialized skill of each so that it can be done by all who wish to react to the challange of redesigning machines to alleviate as much menial work as possible.

There is also the problem of redirecting design under the present social relations. Where to begin? At the metal goods factory Duarte-Ferreira in Tramagal in Portugal over the period 1974–1976 a similar sort of situation arose. The company was taken over by its 1500 workers and the production of Berliett tanks for the colonial wars was suspended immediately and some 500 army trucks were redesigned for civilian use. The actual design and the plans for the design were discussed in an open assembly of all workers. The design of a heavy duty tractor was also put up on the walls and all workers in each section, welding, riveting, etc., were asked to correct it and make suggestions.

There are many practical problems here. The experience of Lucas Aerospace in the mid 70s is a case in point. The company which supplied mechanical and electrical systems to the aircraft industry had a workforce of 13,000 in 1974, including 2000 engineers, draftspeople and technicians and the workers were generally highly skilled machine operators. After some 5000 workers had been fired over the years 1970–1972 due to both a decline in aircraft spending and the need to introduce labor-saving technology, the Lucas Aerospace Combine Shop Stewards Committee formulated a detailed multi-volume alternate corporate management plan. This plan demonstrated the differences between specialists and workers in no uncertain ways and points to the problem of attempting to redirect production within the prevailing capitalist social relations. Both must change at the same time if it is to be successful. Workers were asked to redesign life and machinery. Thrown unto the vacuum of classlessness for the moment, they didn't know what to do. The two aspects of work and getting out of work are contradictory, but we are all little boys and girls who want to run off and play.

Lucas Aesospace had little of this adventure and hardly any Luddism, which seem necessary given the social relations. The Committee sent out a questionnaire to every branch of the combine resulting in thousands of replies, which were finally watered down to 150 alternate commodities. Priority was given to use-value rather than the "market." Thus designs were forwarded ranging from a gas-fired heat pump to kidney machines and energy-saving devices — an ideology of alternative energy was running through the entire operation. Some of the pieces were carefully produced in the factory and were assembled and tested at North London Polytechnic where a center for industrial and technological alternatives was set up by the Combine Committee and the Poly. Links were established with Birmingham University, where "alternative" economics was taught by leftist lecturers. It was an affair of specialists, managers, and trade-union elite. Most workers, while they may have shown some interest at the beginning, soon lost it, the primitive fear of unemployment being more important than anything else. In the end, of course, the alternate plan had really nothing to do with workers' control of technology and was really designed to smooth out the necessary restructuring at Lucas. The American (IAM-AW) trade union plan "rebuilding America" is in a similar vein.

Mike Cooley in his "Architect or Bee: The Human/ Technology Relationship" (1980), written while the Lucas Aerospace struggle was still going on, writes: "We believe it is arrogant for aerospace technologists to think that they should be defining what communities should have. The Lucas Aerospace workers are deeply conscious that if the debate were limited to industrial workers of this kind, it would represent a new form of elitism…Therefore, we are seeking through trade unions, political parties and other organizations in each area, to get people to define what they need and to begin to create a climate of public opinion where we can force the government and company to act." Whatever workers thought they were doing the university lecturers like Cooley and others used this larger "we" to stifle grass roots creativity and dissolve it to nothing but a social democratic bad taste. The problem here is the kind of upper-class clout which the university lecturers and the "experts" have and which can result in a kind of fatalism for everyone else. The loyal bees must surely know what they are doing with so many years of study and so much expensive equipment given to them by the government. Surely the government wouldn't trust them if they didn't. We who run the machines know nothing about them.

The problem was that the workers were unable to face the specialists from a position of power and therefore had to lose from the beginning. Instead of taking the factory to the university they should have taken whatever expertise they needed into the factory. There they would have been on safer ground, would have had more selfconfidence and could have had more control. The organization mirrored the division of labor; the 2000 professionals had more input and the shop stewards elite ran the whole show. Bakunin had had the right inkling when he wrote: "In matters of boots I defer to the authority of the bootmaker; concerning houses, canals or railroads, I consult the architect or engineer…But I allow neither the architect nor the 'savant' to impose his authority on me…It is life, not science that created life and only the spontaneous action of the people can create liberty."

But the questions are very real and pragmatic and will arise again and again. What relationship could there be between those whose technical knowledge could help and those who want to change the world? Perhaps there is no hard answer here; in its own time the proletariat will know who its friends are; its enemies will surely know. Self-organization must exclude all those who care more about their own careers than the abolition of capital. In Spain the Assembly Movement threw out the unions and political parties from their assemblies (see "Wildcat Spain Encounters Democracy 1976–78," Lon- don/Lisbon, 1978–79). By insisting on their own ability and creativity workers subvert one of this society's basic tenets — the need for experts, whether they be experts in science or in revolution.

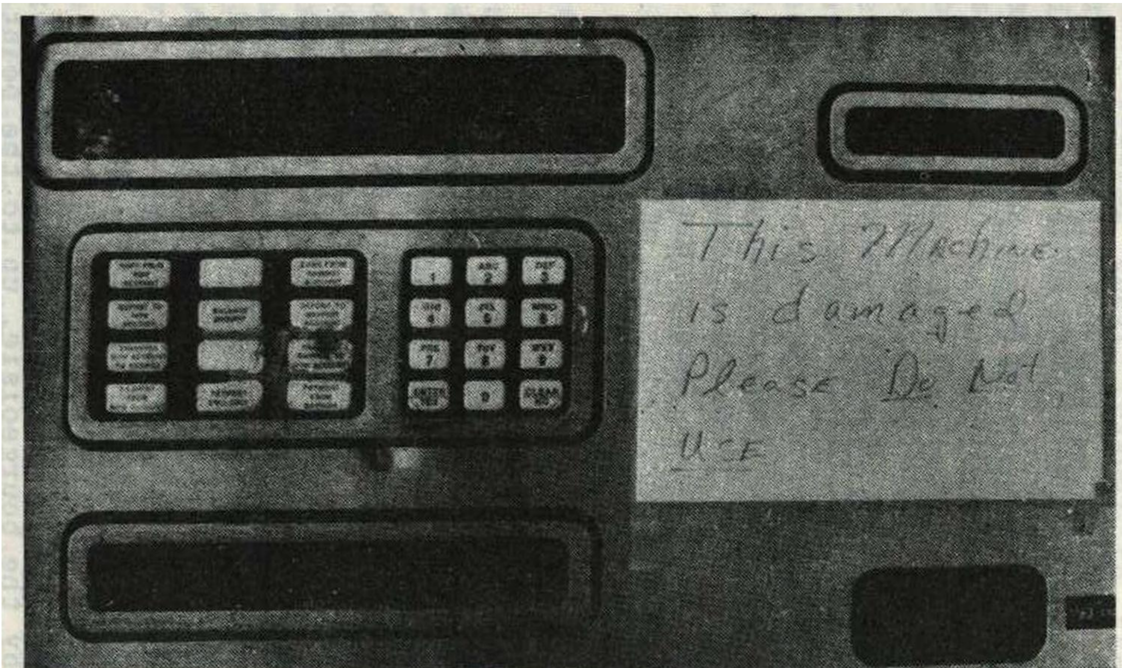
In Britain the TUC has been training specialists in technology for some time with the idea of having specialist negotiators. For them, the essential is getting the situation to run smoothly. This may require a little tinkering with the circuitry but no more. This, combined with the fact that the whole project seemed to have been taken over by experts at the universities, insured the disinterest of the Lucas work force.

It was not completely negative and some workers got a sense of autonomy and power, however temporary. Perhaps it would be worthwhile to start setting up these proletarian information centers already, or at least to start asking what would be fun to do at our own work and leisure. To dream a little with the machines which surround us so that one day these machines can let us dream softly. Today I think I'll go and make cars. Yet capitalism and wage labor must be abolished or made redundant before any such dreams can have real content.

Probably much of the design of the present machines would have to be changed to allow for more flexibility and communication among workers. It is only when people feel pride in their work as an extension of their pleasures that self-determination can reign.

Small signs give us an indication of the future sometimes. In Nicaragua, a "movimento dos innovadores," was set up whereby workers could bring in their own inventions and technical knowledge to a central pool. Of course, American or Russian workers, while they have much to learn and to gain from struggles in underdeveloped technologies, cannot base themselves on these experiences. To do so would be to ridicule these struggles. Even if a good portion of middle-class intellectuals in advanced countries might fantasize otherwise, you cannot mimic the past. You can only push out the limits of the present into the future, destroying these limits, where possible, attempting a future in which it might be desirable to live. If we are to respect the "impossible" attempts of Nicaraquan or Salvadorean or Filipino workers towards reinventing uses for an outdated and oppressive technology then we need to show that we can do likewise.

The day when workers can run away and play secure in the knowledge (our own knowledge) that the machinery is running because we have rigged it up to our own liking is the day when wage-labor becomes unimportant and the social impulse is to the creation of classless values. Only then can a machinist take over the machine as its author and not its slave. Only then are we all researchers and research works for us all. And we must begin somewhere.



Associated Press

Angry Over Seized Bank Card, Customer Blasts Automatic Teller

At a St. Petersburg, Fla., bank, an automatic teller lies idle, punctured by six rounds from a .32-caliber pistol. Thomas J. Morton, a bank customer, said he disabled the machine after it swallowed his plastic bank card and refused to give him the money he wanted to withdraw. "It was the second time it happened to me," Mr. Morton said. "I got a little upset." If damage exceeds $1,000, Mr. Morton could be charged with a felony.

Chapter 8: The Realization and Suppression of Science

The earth-centered approach to the problems of the planets is hopeless and the traditional Ptolemaic astronomy has not and will not solve that problem; instead it has produced a monster, there must be a fundemental error in the basic concepts of traditional planetary astronomy, Copernicus

The old workers' movement, molded by Social Democracy, Bolshevism, and Anarcho- Syndicalism, is dead. No amount of science will resurrect it. We know science will not and can not solve the problems of a modern proletariat; it is impossible for it to deal adequately with our desires, our goals, and our search for an organization of knowledge which would match the autonomous organization of a classless society. Instead, a monster has been produced.

From the introduction of the idea of progress by the bourgeoisie, up to the point where they were no longer a progressive force but rather a decadent one, many has been the philosopher or poet who has sought to unify art and science. From Leonardo (the craftsman who really did possess the knowledge and curiosity of both) through Ibsen (who mourned their separation without understanding their reason) to the modern art/science trained cadres in their specific fields, the historical project of science has been criticized from partial positions. Usually this has focused on some aspect of the theory of the "two sciences," an idea Bogdanov is responsible for. Like the development of art, from the Romantics to Lautreamont, which finally imploded in Dadaism and Surrealism this has followed a zig-zag pattern but can begin now to achieve theoretical coherence.

There is a unified proletarian theory, as opposed to science. But it exists only as a tendency. It does not exist outside the practice of the proletarian movement. It has a history, but that history has not yet been asserted and exists only as a fragmented memory, calling up little bits here and there. It distinguishes itself from science in its form and content and grows with struggle. It does not exist a priori in the realm of experts or in their training grounds, whether the unions or the universities. However sincere some of these experts might be, they will eventually be lost in its deluge.

The developing proletariat will have to realize and suppress the bourgeois organization of science, while at the same time creating its own organization of theory and a theory of organization, which it presently lacks. The call for the simultaneous suppression and realization of science must not be confused with anti-science. Nor is it a call for a "science for the people." Self-determination "for the people" can only leave the people as spectactors and not creators. Research will be necessary, but as an activity dictated by desire and proletarian needs, not by some interpretive careerism. When society is forced to change its priorities away from the extraction of surplus value, then its research needs will change accordingly.

Young hackers, those who feel a joy in subverting technology and using their own knowledge and very real creativity, have much to teach us. To hack with a sense of history, to put our minds to the real task of hacking away at capitalism, whether at work, at play, within miseducation or education: there are countless possibilities yet to be discovered. Putting our brains to work on those possibilities is a part of the modern creative process and one which some have already taken on.

Shock tactics may be necessary at the beginning. The constructivists and Workers' Truth group in revolutionary Russia shocked Lenin by saying that they would put all the old masters on the barricades to defend the revolution. In 1968, in Canada, a computer was thrown out the window during a student occupation. A small group of Maoist workers took over an experimental nuclear power plant in Portugal in 1975, surrendering it immediately afterward, basically because they didn't know what to do it. (Probably nothing could have been done with it, other than to resort to terrorism, something they did not want to do, or to dismantle it.)

This is not to advocate a "scientific" dadaism. Shock tactics can work in the short term but cannot win the war. The realization and suppression of science must create its own organization of knowledge. This is the road which leads to the abolition of classes and all class institutions, whether workerist or bourgeois (trade unionist or social work). The issue is dialectics and the cruel parameters, the everyday lack of autonomy. The understanding of why things happen about us, why what we want does not happen, and why we feel powerless to make it happen — and what forces are behind this? We should be our own researchers and investigatois in the immediate world about us. To love is also to know, and real learning takes place only when people are actively in control.

Academics should not find here any future for themselves. I expect them to treat this text with the same contempt I have for them. But proletarians — fellow animals — might feel freer to experiment and do their own type of research for the final undoing of this capitalism which has gone on for far too long.

Boy Igor, 1985

Boy Igor
And Yet It Moves
The Realization and Suppression of Science and Technology
1985

<files.libcom.org/files/2022-10/AndYetItMoves.pdf>
A situationist critique of science and technology published in New York in 1985. The scan of the original edition had pages 31 or 32 & 34 missing, so text has been added from the updated edition, but ideally the original text will be found and re-added. So, text has been added between (1) ”caught up in an adversary” and ”to assert itself over the cult of science”, plus between (2) ”the terrain of pseudo-progressiveness” and ”Chapter 2: The Informed Informer”.
<libcom.org/article/and-yet-it-moves-boy-igor>

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