“MACHINES OF COMMUNISM”: THE USSR, CYBERNETICS (AND THE CIA)[1]

Appendix to Wiener World

In his tribute to Norbert Wiener in the March-April 1966 issue of *American Dialog*, Dirk Jan Struik wittily observed: “Wiener is the only man I know who conquered Russia, and single-handed at that.” The influence that Wiener’s cybernetics revolution had on post-Stalinist Russia is simply astonishing. With the publication of Slava Gerovitch’s 2002 book *From Newspeak to Cyberspeak: A History of Soviet Cybernetics*, we are finally getting a detailed description of just how right Struik was.[2]

Because the history of Soviet involvement in cybernetics is so complex and so unknown, after a short general introduction, the rest of this chapter will be in the form of excerpts from key English-language texts on Soviet cybernetics.

CYBERNETICS: FROM CAPITALIST FIEND TO SOVIET HERO

In 1951 during the high point of late Stalinism, the Soviet Institute of Philosophy launched an attack on cybernetics entitled *Against the Philosophizing Henchmen of American and English Imperialism*. In one essay, a Soviet psychologist named Mikhail Iaroshevskii took Wiener’s remarks about the devaluation of the human brain due to automation to claim: “From this fantastic idea, semanticist-cannibals derive the conclusion that a large part of humanity must be exterminated.”[3] In 1953 another article by “Materialist” in the Soviet journal *Voprosy filosofii* entitled “Whom Does Cybernetics Serve?” declared that cybernetics reduced the activity of the human brain “to a mechanical connection and to signaling.”[4] Other Soviet publications denounced cybernetics for presenting a false vision of “technocratic theory.”[5]

At the same time, however, the Soviet military-industrial complex desperately wanted to get its hands on advanced Western research in computers and information systems. With such protection, a pro-cybernetics group of intellectuals began counterattacking all those who saw cybernetics merely as a capitalist plot. This pro-cybernetics group was led by Aleksei Andreevich Liapunov, often considered the father of Soviet

cybernetics. In the autumn of 1954, Liapunov organized a "seminar on machine mathematics" at Moscow University that also discussed cybernetics.[6] In March 1955 a Soviet government commission under the direction of Deputy Minister of Defense, Engineer Admiral and Academician Aksel' Berg – who would later lead a public campaign for cybernetics – put out a secret report entitled *On the State of Radioelectronics in the USSR and Abroad and Measures Necessary for Its Further Development in the USSR*. This report described cybernetics favorably. A small Soviet delegation was also allowed to attend the First International Congress on Cybernetics held in Belgium in June 1956.[7] Next, in 1958 two of Wiener's book, *Cybernetics* and *The Human Use of Human Beings*, were translated into Russian.[8] In 1959 Academician Berg secured Academy of Science backing for a new project to promote cybernetics inside the USSR. Soon cybernetic thinking began to influence many fields of science inside the USSR including linguistics.[9] All these developments set the stage for Norbert Wiener's triumphal 1960 visit to Moscow to attend a mathematics conference.

As for Berg, in 1961 he organized programs both on Moscow radio and TV on cybernetics and promoted countless lectures on the topic. At one 1967 meeting, he rather remarkably described the future this way:

> When the computer enters our home . . . there will be no need to call a doctor; the machine will tell you what to do. Students will not have to go some place and listen to hideous lectures of old pensioners, who know nothing; programs will be optimized and you will have connections with a machine, which will come to your home, as water and light did. . . . If someone does not believe it, let him commit suicide. This is the future, and we will fight for it, and we will weed out anybody who would interfere.[10]

Books with titles like *Cybernetics is Anti-Religion* and *Information Theory and Religion* also were published.

"ECONOMIC CYBERNETICS"

Sometime in the late 1950s and early 1960s, LaRouche first became aware of Soviet work in cybernetics especially once cybernetic ideas crossed over into the field of economic planning. In effect, LaRouche was exposed to a Soviet version of the Macy Foundation only this time it was the Soviet military-industrial complex and the KGB that was encouraging the radical rethinking of economic and social policy.

One of the intellectual leaders in the attempt to apply computers and cybernetics to Soviet economic planning was the Leningrad mathematician Leonid Kantorovich, whom Slava Gerovitch also describes as "the Soviet pioneer of linear programming." In 1939 Kantorovich also wrote a famous book entitled *Mathematical Methods of Organizing and Planning Production*.

In May 1957 Kantorovich presented a paper on mathematical methods in economic planning, a paper that helped open up a more general discussion on the role of computers in economic analysis. Soviet economists "were among the first in the world to apply mathematical methods to nationwide economic planning."[11] In the late 1950s, economists like Kantorovich, Vasilii Nemchinov, and Viktor Novozhilov began conceptualizing the Soviet economy "in cybernetic terms as a giant control system."[12] A debate also broke out between the economic "centralizers" and those economists who believed that cybernetics and computers should encourage the dismantling of the old "command from above" state planning model that Stalin took from the Trotskyist Left Opposition. Liberal Soviet economists (whom LaRouche dubbed "Liebermanites" after the Soviet economist Evsei Lieberman) argued for "the radical decentralization of economic planning and management and on the introduction of actual market mechanisms in the Soviet economy."[13]

Another leading East Bloc economist who took up the challenge of cybernetics and economics was Oskar Lange. In his book *Wholes and Parts: A General Theory of System Behavior*, Lange even devoted a chapter to "Systems of Higher Order" which he described this way: "Systems of a higher order can also be shown to have new properties, their own mode of action, which depends not only on the mode of action of the first-order systems forming the system of the higher order" which I take as a restatement of the idea of "manifolds."[14] In the same book, Lange writes: "The existence of ergodic[15] processes, of self-steering of the development of systems explains the phenomena, which through false interpretation has become the basis of metaphysical finalism in conceiving systems as a whole. . . . The motion of the system, its development, is therefore, *a self-generating dialectical process*, i.e. one in which *contradictions occurring within the system produce its continual motion and development.* . . . In this way, cybernetics is becoming an important auxiliary instrument for the precise presentation and solution of several basic problems of dialectical materialism."[16]

ENTER LAROUCHE

In the late 1950s Lyndon LaRouche developed an intense interest in Soviet attempts to integrate cybernetics into Marxist theory. At the same time, he had another reason to study Soviet developments that related to his "day job" as a business consultant. Sometime in 1957 or 1958, LaRouche left the May Company and tried to establish his own business consulting firm that specialized in applying computer models to business planning. In *Dialectical Economics*, LaRouche describes a research project he carried out in the late 1950s this way:

> This was the result of a project which accompanied and penetrated the author's analysis of the developing economic conjuncture during the 1956-1958 period. Its purpose was to determine the project application of computer systems of the

> types then emerging (1959-1960) and being planned to the administrative "control" functions of the management of individual firms. The project also involved assessment of Western and Soviet developments in mathematical economics. While it proved possible to predetermine coding procedures which could assimilate every possible future element in the operation of a firm (or national economy), and thus to establish "total computer systems" for entire economies as well as firms, it was impossible to predict the necessary or probable occurrence of the new elements to be coded in a comprehensive way. These elements had to be treated by the computer systems application designer as new elements "arbitrarily" introduced from outside the determination of any "mathematical simulation model."[17]

In another section of *Dialectical Economics*, LaRouche writes:

> Over a decade ago, while developing systems initially to be applied to "second-generation" computer design, the author developed a method of mapping a corporate "total system" in which each new event (or the absence of a predicted probable event) could be directly integrated (by "chaining") for its contribution to the overall rate of profit in terms of total corporate capital and corporate equity respectively. Approximations of this approach later appeared in some aspects of total-system design; some features were directly or indirectly obtained from the author's 1961-1962 model, and others were developed independently or *de novo* by others.[18]

LaRouche also provides some sense of what he was studying and reading at the time in a footnote to *Dialectical Economics* that lists a book edited by Tjalling C. Koopmans entitled *Activity Analysis of Production and Allocation,* L. V. Kantorovich's *The Best Use of Economic Resources*, and Oscar Lange's *Introduction to Econometrics*.[19]

LaRouche also writes in *Dialectical Economics*:

> Functionally, "mathematical economics" can be divided into two branches, a dichotomy which certified itself in a brief factional flurry just over a decade ago. The healthy faction is that associated with Wassily Leontief. The opposing faction is a group of admittedly clever fellows whose impressive potential is fatally marred by the affliction known as radical positivism; we might characterize this group as "pure econometricians." Outside the capitalist factions, there is the Soviet school of mathematical economics associated with L. V. Kantorovich, V.V. Norozhilov, and V.S. Nemchinov, whose pioneering work more closely resembles the approach of Leontief, despite Soviet priority on developing sophisticated mathematical procedures later independently replicated by leading U.S. econometricians. . . . Mathematical economics is justified for certain tasks of corporate planning and certain applications to a national economy, an approach best exemplified by the pioneering work of Kantorovich.[20]

Looking at LaRouche's statements in *Dialectical Economics,* then, it seems clear that he first became aware of "Soviet cybernetics" as a byproduct of his attempt to become an expert on computers and their application in business after he left the May Company. In so doing, he also was exposed to the broader Soviet spin on cybernetics and its relation to Marxism. Thus when LaRouche launched his own not so elementary class on "Elementary Marxist Economics," he directly incorporated cutting-edge Soviet ideas on cybernetics that emerged in the post-Stalin era.

CONCLUSION

When in July 1966 the first student radicals showed up at the Free University of New York (FUNY) to hear LaRouche offer his first class on Marxism they had no idea that what they were

getting was a creative mix of Marx and the Macy Foundation. They first encountered concepts and ideas that struck many of them as a new and more brilliant way of reading Marx for the modern age. If I am correct, they were right to be impressed. What they didn’t know, of course, is that many of the ideas that LaRouche advanced as his own first emerged out of discussions at MIT, the Macy Foundation, and post-Stalin Russia.

ON THE SOVIET UNION AND CYBERNETICS

(Note: Anyone familiar with LaRouche's early writings and lectures on economics will be immediately struck by just how similar his analysis was to the Russians. John Ford's description of Soviet ideas on cybernetics could have come straight out of one of LaRouche's early lectures on Marxist economics.)

From Loren Graham: *Science, Philosophy, and Human Behavior in the Soviet Union*:

But it quickly became clear that rather than choose between cybernetics and Marxism, certain Soviet writers wished to unite them. L.A. Petrushenko, for example, discussed productive labor as a series of processes performed on the basis of feedback. Two other authors discussed the succeeding stages of history according to Marxism as epochs containing progressively smaller amounts of entropy. 276-77

The possibility of an analogy or even a structural identity between entropy and information generated a heated debate among physicists, philosophers, and engineers in many countries. . . . Louis de Broglie called the link between entropy and information "the most important and attractive of the ideas advanced by cybernetics." If one could demonstrate that the relations between neg-entropy and information is more than a functional similarity, and is instead an identity, the construction of a general theory of matter by which all complex systems – inorganic and organic, including humans – could be mathematically described seemed at least conceivable. The more venturesome dialectical materialists tended to welcome such a possibility since it seemed to them a vindication of materialist monism. 282

I. B. Novik was one of the more energetic Soviet philosophers who attempted to define information in terms of dialectical materialism. In his book *Cybernetics: Philosophical and Sociological Problems,* Novik tried to present a systematic treatment of cybernetics from the standpoint of enlightened Marxism. From the outset he aligned himself with the partisans of cybernetics; he insisted there was no conflict between this new field and dialectical materialism. Wiener was to him an unconscious dialectician. 283

How tightly should the concept of information be tied to the Leninist property of reflection? If reflection and information were made identical, then it seemed necessary to conclude that all matter, even inorganic, contains information as an attribute. But some Soviet philosophers saw that this path led dangerously close to anthropomorphic, teleological, and even hylozoistic concepts. 288

As the years passed, however, specialists in cybernetics all over the world retracted their ambitions as they learned that the early claims that information could be equated with neg-entropy produced few actual results outside control processes; and, in the Soviet Union, the philosophers and ideologists wished to eliminate the challenge of cybernetics to Marxism as a universal explanatory scheme. 289.

A surprisingly large number of the important Soviet publications on cybernetics were translated into English by the Joint Production Research Service of the U.S. Department of Commerce. However, the quality of translation was very poor. 478

From Slava Gerovitch: *From Newspeak to Cybernetics: A History of Soviet Cybernetics*:

Kolmogorov and Wiener were intensely aware of each other's work. . . . While visiting Moscow in the summer of 1960, Wiener told an interviewer: "When I read works of Academician Kolmogorov, I feel that these are my thoughts as well, that is what I wanted to say. And I know that Academician Kolmogorov has the same feeling reading my work." 58

[In the early 1950s] "From an ideological perspective, potentially one of the most damaging associations of cybernetics was Wiener's reference to the work of the famous physicist Erwin Schrodinger. Back in the 1930s, militant Soviet philosophers who opposed quantum mechanics had made Schrodinger, a leading Western researcher in this field, a target of ideological attacks; they had accused him of "a deviation toward subjective idealism." His inroad into biology in the 1944 book *What Is Life?* further complicated the situation. . . . In the spring of 1948, at a meeting at the Institute of Physics, Aleksandr Oparin, the head of the Biology Division of the Academy of Sciences, called *What is Life?* "*adverse* to our ideology" and "harmful." Attacking Schrodinger became an essential part of the Lysenkoites' campaign against genetics." 110-111

Collecting information on American military scientific and technological projects, along with political espionage, was one of the chief priorities of Soviet foreign intelligence. One former intelligence officer attached to the Soviet consulate in New York has recently revealed that in 1942-46 he obtained more than 20,000 pages of classified documents . . .[which] contained scientific and technical information on radar, sonar, computers, and other electronic equipment. 133

The publication of the Russian translation of Wiener's *Cybernetics* was delayed for 10 years. . . . In 1958 an entry on cybernetics finally appeared in the additional volume 51 of the *Great Soviet Encyclopedia*. The article acknowledged Norbert Wiener's pioneering role in the development of cybernetics and effectively legitimized the field in the Soviet Union. The author of the work was none other than Andrei Kolmogorov. A separate article co-authored by Kolmogorov's student, was devoted to Wiener and his mathematical and cybernetic accomplishments. The change in Kolmogorov's attitude toward cybernetics, from initial rejection to later embrace, indicated a profound political and cultural shift in Soviet science – a shift from Stalinism to the Khrushchev era. 151

The head of the Soviet Cybernetics Council, Engineer Admiral Aksel' Berg:

mobilized his council to publish a volume, appropriately titled *Kibenetiku – na sluzhbu kommunizmus* [*Cybernetics – in the Service of Communism*] in time for the opening of the 22nd Congress of the Communist Party in 1961. His efforts paid off when a new Party Program adopted at the Congress mentioned cybernetics among the sciences called upon to play a crucial role in the creation of communism. . . . The popular press began to call computers "machines of communism.'' 256

Another [Soviet] author argued that, while negative entropy expressed the orderliness of matter, information referred to the orderliness of one of the attributes of matter: reflection. The inherent contradiction between negative entropy and information, therefore, confirmed the unity of matter, a basic postulate of dialectical materialism." 258

Philosophers employed by the Council on Cybernetics told the participants that cybernetics was “the most important element of the contemporary natural scientific foundation of dialectical materialism.” 259

“In July of 1962 the Academy of Sciences dispatched a group of experts to the United States and England to learn about the latest methods of industrial automation.” 270

Unlike central economic organs, Soviet military and intelligence agencies quickly realized the opportunities for large-scale information collection and processing that computer technology had opened up.” [So the KGB and the Soviet Armed Forces General Staff set up a new center] created on the basis of the Department of Scientific Institutions of the All Union Institute of Scientific and Technical Information. In 1963-68 this department complied dossiers on 70,000 foreign scientists, engineers, and executives and on 5,000 companies from Western countries. 282

Instead of exposing the limits on the free circulation of information in the Soviet Union, as Wiener had once hoped, the cybernetic analysis of social processes was now employed to rationalize the management of Soviet society and to ensure its stability. 285

After the end of Khrushchev’s “thaw,” the Soviet scientific community began to polarize. A group of cyberneticians at Moscow University, led by Sergei Iablonskii and Oleg Lupanov, took an openly anti-Semitic stance and almost entirely barred Jews from studying in the Faculty of Mathematics and Mechanics or publishing in *Problems of Cybernetics*, edited by Iablonskii after Liapunov’s death in 1973. 289

From Slava Gerovitch, "'Mathematical Machines' of the Cold War: Soviet Computing, American Cybernetics and Ideological Disputes in the Early 1950s," *Social Studies of Science*, April 2001.

In the 1940s, the Deputy Chairman of the Council on Radiolocation, Engineer Vice-Admiral Aksel' Berg, regularly received intelligence information on American radioelectronics, which he highly appreciated. 268. [In other words, Berg went from getting all the secret espionage data from America on computers to heading up the public Cybernetics Council in the late 1950s.]

THE CIA RESPONSE

In this section all quotes come from Flo Conway and Jim Siegelman, *Dark Hero of the Information Age In Search of Norbert Wiener the Father of Cybernetics*.

The Soviets' newfound affection for Wiener did not escape the notice of the U.S. government either. The FBI's informants at MIT were watching when visiting Soviet scientist gave Wiener his first copy of *Kuoephemuka -- Cybernetics* translated into Russian. And also by the early 1960s the Soviets' love affair with cybernetics had attracted the attention of the Central intelligence Agency. While Wiener was in Moscow, the CIA's foreign intelligence divisions were tracking the snowballing phenomenon Agency officials referred to as "Soviet cybernetics." 317

For some time, a team of CIA intelligence analysts, led by John J. Ford, a Soviet expert working in the Agency's Office of Scientific Intelligence, had been monitoring the explosion of cybernetics in the Eastern Bloc. . . .The year Sputnik went up, Ford began cultivating his sources and collecting intelligence in the Soviet Union. . . . Ford learned that the Soviets' conception of

cybernetics was much broader than the prevailing American sense. 317

According to Ford, the Soviet Cybernetics Council [headed by Berg] had outlined a massive experimental program to train the "new Communist man" using cybernetic methods. . . . Ford recognized the West's commanding lead in computer technology, but he saw signs that the Soviets were moving to narrow the gap. He even uncovered a plan to develop an archetypical, Internet-style, national information network, or "United Information Net," with projects already under way to coordinate industrial and economic activities across the USSR. Ford was not convinced that cybernetics would cure al the Soviets' economic and social ills, but as new intelligence came to his attention his early confidence gave way to a growing sense of concern. 317-18

The [126 page CIA] report also revealed that Soviet cyberneticists had begun research in the embryonic sciences of chaos and complexity theory, and that plans had been laid for the design of von Neumann-style cellular automata. 318

Soviet philosophers were developing an entire cybernetic worldview, and practitioners were already turning out prototypes of 'the New Soviet Man of the day after tomorrow' in special boarding schools throughout the USSR that had set a goal of producing two million young computer programmers. 319

Ford was no Chicken Little or anticommunist crusader, but he was becoming deeply concerned that his CIA superiors were not taking his team's findings seriously. Early in the Kennedy Administration, he began meeting periodically with the president's brother, Attorney General Robert F. Kennedy, and members of

his inner circle to discuss Soviet cybernetics and to consider steps American policy makers might take to close the widening East-West cybernetics gap. 319

In the days after his presentation at Robert Kennedy's Hickory Hill seminar, at the request of President Kennedy's Special Assistant Arthur Schlesinger, Jr., John Ford . . . had prepared a summary report on Soviet cybernetics that Schlesinger took personally to the president. Kennedy and his aides were deeply divided over its significance. 330

Conway and Siegelman report that in 1964 after much fighting, Ford's reports began to circulate to top government agencies including "the CIA's own office of counterintelligence and psychological warfare." But the military and other agencies now began funding projects on artificial intelligence, interactive computing, and industrial automation and turned quite hostile to cybernetics. Ford worried that by so doing, the U.S. might even more be outflanked by the Russians. Therefore Ford virtually recreated a kind of mini-Macy Foundation that included such Macy participants as Margaret Mead, Julian Bigelow, Warren McCulloch and others. So "in July 1964, Ford and his new cohort [McCulloch] formally incorporated and founded the American Society for Cybernetics. . . " 330

[In other words, the CIA helped establish the ASC.]

AMERICAN SOCIETY FOR CYBERNETICS

From the ASC's web site at /www.asc-cybernetics.org/organization/history.htm:

On July 31, 1964 the American Society for Cybernetics was incorporated in the District of Columbia for the purposes of fostering development of the discipline, anticipating the impact of

cybernetics, and providing current information on cybernetics. Paul Henshaw presided as chairman pro tem. The first directors were John J. Ford (CIA), Paul S. Henshaw (AEC), Douglas E. Knight (IBM), Robert B. Livingston, Donald N. Michael, William C. Moore (lawyer), and Walter N. Munster.

The first meeting of the Board of Directors was held on August 20, 1964. An inaugural dinner was held on October 16, 1964, at the Cosmos Club, Washington, D.C. The inaugural dinner chairman was Dr. Frank Freemont-Smith of the New York Academy of Sciences. The speakers were Warren McCulloch of MIT, Julian Bigelow of the Institute for Advanced Study at Princeton, and F.S.C. Northrop of Yale University. In addition to the foregoing, seven others were declared honorary founders: Herman Goldstine, Y.W. Lee, Oskar Morgenstern, Francis O. Schmitt, Hans Lukas Teuber, and Heinz Von Foerster.

. . . As a result of his work in organizing the Macy conferences, Warren McCulloch became the first elected president of the ASC. Heinz Von Foerster, who was co-editor with Margaret Mead of the proceedings of the Macy meetings, served as chairman of the Board of Directors of the ASC for a number of years.

THE CIA'S JOHN J FORD ON SOVIET CYBERNETICS

From: *The Social Impact of Cybernetics* edited by Charles Dechert. This is a compilation of talks given in November 1964 organized by the newly-founded ASC. (The first essay is by John Diebold, the author of *Automation* whom we have discussed in connection with *The Third Stage of Imperialism*.)

However all the quotes that follow come from a remarkable article by the CIA's top expert on Soviet cybernetics, John J. Ford, entitled "Soviet Cybernetics and International Development."

A brochure giving clear outlines of an evolving theory of development was published in Poland by [the famous economist] Oskar Lange in 1960 under the title *Totality, Development, and Dialectics in the Light of Cybernetics*. 168

From Ford's section "The Theory of Development" which tries to give a general summary of the Soviet approach from the Soviet point of view we quote excerpts from some of his sub-sections:

1. The most complex question connected with cybernetics is the problem of the direction of social change, and this question is equivalent to the question about the way in which the entropy of objects or phenomena in the surrounding world change. The world is not striving toward chaos and disorder; the predominant tendencies are toward systematization; toward increased levels of organization. Cybernetics is capable of giving the facts that foster this tendency. Together with philosophy, cybernetics is, therefore, the basis of the evolving theory of development. 171.

2. Relative to the tendency of the change in entropy, it is possible to indicate two tendencies in structures, objects, and phenomena: on the one hand, they are striving to increased complexity of organization, and on the other, to simplification of that organization. The tendency of complication is equivalent to the accumulation of information; simplification, the reduction of information and, correspondingly, the accumulation of entropy. The leading tendency is toward complication of organizational forms . . . . 171-72.

3. If development or progress involves reduction of entropy and increases of negentropy, the isolation of a comparatively small number of objects in the system from other objects of the same

type results in the processes in that system which will lead to the simplification of the form of organization, to increased entropy. . . . 172.

4. Development in biological evolution reveals the tendency toward complication in the organization of living systems and thereby facilitation of adaption to environmental changes. Species which cannot achieve a stable, dynamically equilibrated, interrelation with their environments retrogress. . . . 172.

5. Societies also develop by adaptation to changes in the environment, and like biological systems, social systems produce changes in the conditions of their environment which are propitious for continued existence. As Vernadsky puts it, the "biosphere" adapts to conditions of the inorganic world and also substantially transforms itself. In the development of biological species and to a much greater degree in the development of societies there is a tendency to replace the simple process of adaptation to external conditions by the creation of new forms of external conditions which are more propitious in terms of survival. 173.

6. The major tendency of social activity is toward the transformation of the environment in ways which correspond to human needs. The foremost component of this tendency is the social and production practices of the human members of the society, and in particular the production of tools with which to transform natural conditions to conform to the needs of society. . . 173

8. The variety of methods of behaving is equal to the store of information or negentropy. Thus the process of development is linked to organization, information, and negentropy. . . . 174-75.

9. There are no upper limits to the level of complexity a system of organization may attain because the history of the development of living systems and society shows that the process of complication is accompanied by the development of mechanisms that simplify or “automate” complex systems. Automation is, therefore, a universal law of development. . . . Automation is simplification, but it is that kind of simplification which, in and of itself, represents a complex phenomenon. 175

[1] In this entry, I will excerpt from five print sources as well as the web page of the American Society for Cybernetics. The print sources are:

1) Loren Graham, *Science, Philosophy, and Human Behavior in the Soviet Union* (New York: Columbia University Press, 1987).

2) Slava Gerovitch*: From Newspeak to Cybernetics: A History of Soviet Cybernetics* (Cambridge, MA: MIT Press, 2000).

3) Slava Gerovitch, "'Mathematical Machines' of the Cold War: Soviet Computing, American Cybernetics and Ideological Disputes in the Early 1950s," *Social Studies of Science*, April 2001.

4) Charles Dechert (ed.), *The Social Impact of Cybernetics* (Notre Dame: University of Notre Dame Press, 1966).

5) Flo Conway & Jim Siegelman*, Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics* (New York, Basic Books, 2005).

[2] For an overview of Soviet cybernetics see Slava Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* (Cambridge, MA: MIT Press, 2002). Also see Slava Gerovitch, "'Russian Scandals': Soviet Readings of American Cybernetics in the Early Years of the Cold War," *Russian Review*, 60 (4) (October 2001); Slava Gerovitch, "'Mathematical Machines' of the Cold War: Soviet Computing, American Cybernetics and Ideological Disputes in the Early 1950s," *Social Studies in Science*, 31 (2) (April 2001), Slava Gerovitch, "'New Soviet Man' Inside Machine: Human Engineering and the Construction of Communism," in Greg Eghigian, Andreas Killen, and Christine Leuenberger (ed.), *The Self as Project: Politics and the Human Sciences* (Chicago: U of Chicago Press, 2007); and Philip Mirowski's review of *From Newspeak to Cyberspeak* in *Journal of Economic Literature* 42 (1) (March 2004). Gerovitch's MIT dissertation advisor on the history of Soviet cybernetics was Loren Graham. Graham's chapter "Cybernetics and Computers" in Loren Graham, *Science, Philosophy and Human Behavior in he Soviet Union* (New York: Columbia Univ. Press, 1987) is a great general overview of Soviet cybernetics.

For earlier reports on Soviet cybernetics, see Maxim Mikulak, "Cybernetics and Marxism-Leninism," *Slavic Review*, 24 (3) (Sept. 1965); David Holloway, "The Case of Cybernetics in the Soviet Union," *Science Studies* 4 (4) (October 1974); R. David Gillespie, "The Politics of Cybernetics in the Soviet Union," in Albert Teich (ed.), *Scientists and Public Affairs* (Cambridge, MA: MIT Press, 1974); and John J. Ford, "Soviet Cybernetics and International Development," in Charles Dechert (ed.), *The Social Impact of Cybernetics* (Notre Dame, IN: University. of Notre Dame Press, 1966).

[3] Gerovich, *From Newspeak*, 121.

[4] 125.

[5] 285.

[6] 173-74.

[7] 193-194.

[8] 196-97.

[9] One influential figure in Soviet rethinking of linguistics was the émigré intellectual Roman Jakobson who first returned to the Soviet Union on a visit in May 1956. The Boston-based Jakobson had also been part of the cybernetics world of Wiener and Claude Shannon in the 1940s. 227.

[10] 255.

[11] 268-70.

[12] 270. As we shall see, LaRouche also mentions these economists by name as well in *Dialectical Economics*.

[13] Gerovitch, 277.

[14] Oskar Lange, *Wholes and Parts: A General theory of System Behavior* (London: Pergamon Press, 1965), 31. This book is a joint publication with PWN – Polish Scientific Publishers in Warsaw. Lange lived in the United States for some years but after the war he returned to Poland.

[15] Ergodic theory is a branch of mathematics that studies dynamical systems with an invariant measure and is used in the study of Riemannian manifolds.

[16] Lange, 69, 73-74.

[17] *Dialectical Economics*, 449.

[18] 442.

[19] 428.

[20] 54. LaRouche also says that Koopmans led the wrong anti-Leontief faction. LaRouche cites both Kantorovich and Lange in a list of a handful of authors to read in his guide to “political economy” on page 476 of *Dialectical Economics*. He also discusses some of Kantorovich’s work and mentions Oskar Lange’s reports about the

horrors of economic planning under Stalin on page 337 of *Dialectical Economics* but his endnote for his source does not appear in the endnotes for Chapter 10 of the book. There also appears to be another endnote mix up as well.