MEMORANDUM FOR: Debbie

For your Cherne file,
or wherever ———

Doris

(Delivered yesterday at that
Econ., etc. mtg. at Wash. Hilton
— I gather!

Date

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FINAL

ECONOMIC AND SECURITY IMPLICATIONS OF STRUCTURAL CHANGE

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Leo Cherne, Vice Chairman
President's Foreign Intelligence Advisory Board

"Structural change" is a particularly bloodless phrase for transformations that can change the destiny of nations, the welfare of peoples, and even the course of civilization.

The world is in the process of continuous change. This century, and much of the preceding one, have seen an extraordinary acceleration of change. Yet few of the events which have occurred, few of the ideas, discoveries and inventions that have arisen, are among those which produce "structural change".

Structural changes are those rare events in human history which redirect human affairs in a profoundly new way.

Structural changes irreversibly affect power -- economic, political, and military power. There are virtually no structural changes which do not have a disruptive effect on the stability of a society's value system. Most structural changes inherently alter the distribution of power among states, and the distribution of power and expectations within individual states.

Structural change, therefore, is essentially disruptive. These disruptions are felt in different ways in societies at different levels of economic development. Even in societies at essentially the same levels of economic development, the effects of a particular structural change will differ because of the

different distribution of resources and the effect of history, culture and geography on those countries.

The particular subject for this day is technology and structural change. The invention of movable type is an illustration of an essentially technological development which left virtually nothing unchanged thereafter.

Until the 19th century, developments which produced structural change occurred very infrequently. With the invention of steam and the introduction of the Industrial Revolution, the pace of profound change and alteration of world power picked up. However, it was not until the 20th century that the accelerating forces of technological change accelerated to an extraordinary degree.

In the past 25 years, we've witnessed vast demographic changes that are the outcome of medico-scientific developments, especially the enormous reduction of contagious disease and the incalculable impact upon the length of life and, hence, population.

The depletion of resources, amplified politically in the case of oil, resulted in the largest shift of wealth in the history of the world occurring in the shortest interval of time. This, in turn, helped set into motion a process of probably far greater ultimate impact: the transfer of those funds to less developed nations, producing debts of such magnitude that I simply want to seriously assert that those debts will not be repaid.

The effect of those unpaid debts and the changes they will induce in particular debtor countries produce turbulence and almost certainly set into motion effects which are structural in nature.

As these events have been unfolding, a structural changer of classic character began to exert an even stronger effect. The ultimate impact of that event can only be guessed at. It will alter the distribution of world power. It is the subject of a massive economic race between two major industrial powers at this very moment. It has already contributed to the most profound impact on every industrial power, particularly among the free nations, and it has produced substantial though clearly different changes among the less developed nations. That event which may generate the greatest process of change in the history of man is the invention of the microchip.

The race for the fifth generation computer (more flamboyantly described by some as the search for artificial intelligence), is but a way station along a still-to-be-traveled distance mandated by the microchip. It is not inconceivable that among the many consequences is the possibility that today's national enmities and friendships may be more crucially affected by a wafer less than an inch in size than they ever could have been by what until this age had been the most powerful discovery in the history of man -- the ability to harness nuclear energy.

Closely linked to the computer and the microchip, and

almost certainly unavailable without it, is an offshoot with the potential for profoundly changing the nature of the world, indeed the nature of life and death, and certainly man's eternal curse -- hunger. That structural changer is biogenetics and the new science, bioengineering.

It is tragically ironic that a vast demographic convulsion across virtually all of sub-Sahara agriculture is producing one of the great famines in world history even as an agricultural revolution is producing miraculously beneficial results in India. But even those beneficial results hold the prospect of altering agricultural patterns, markets and national dependencies in ways which are likely to be profound.

The potential of bioengineering is such that some serious economists advance the possibility that India, which had considerable difficulty in meeting its own food needs a generation ago, may yet be able to satisfy not only its own agricultural needs, but the food deficiency of the Soviet Union -- with all the profound changes that would set in motion.

I will try to identify some of the most important of structural changes now in motion, with the hope of stimulating our appreciation of the effects they will have on national power, on allied relationships, on societies across the world. I hope that some of the political, economic and military distress which lies ahead can be anticipated, with the possibility that we may reduce that distress, or be better prepared to deal

with the more painful consequences. We have already seen the following consequences.

It is clear that structural change has intensified the competition in the race for world trade.

In 1952, our share of world trade was 52 percent; in the sixties it was 40 percent. It is now 22 percent. Our current account imbalance is such that we are likely to be a debtor nation before the year is out. Last year alone, the increase in our trade deficit wiped out more than 500,000 jobs.

By 1990 (only five years from now), Japan will probably enjoy a current account surplus that may be larger than the one enjoyed by OPEC at that institution's peak.

Other major effects of the on-going structural change include:

- The decline or flight of manufacturing industries which remain labor-intensive, and the growth of radically new manufacturing systems which make maximum use of new computer assisted manufacturing technologies which involve low labor use.

- The displacement of skilled labor trained for traditional assembly-line manufacture. To this must be added the growth of those, especially the youth, untrained for any role in a post-industrial economy.

It is hard to exaggerate the importance of the fact that just one industry -- machine tools -- has increasingly been moving overseas. Machine tools are to industry what parents

are to a child.

Foreign firms today produce approximately 75 percent of all free world exports of high technology products. What the Soviet Union has not been able to buy, it has stolen.

And the growth rate of high technology industries has been twice that of total industrial output. They have contributed the bulk of technological advances to all sectors of the economy.

Information system use throughout business and industry is projected to grow very substantially in the next ten years. At the end of that decade, this one area of activity will account for nearly 1.5 trillion dollars of our Gross National Product. But the competition is fierce.

The U.S. and Japan are deep in the race which is expected within a decade to produce new supercomputers so powerful that they will, in fact, constitute a new and revolutionary form of wealth.

Hardly a month now passes without an announcement of extraordinary progress in specific structural change or changers (they are both).

On April 11, Fujitsu, Ltd., Japan's top computer manufacturer, announced that it was ready to market the world's fastest supercomputer, which it claims is capable of making more than 1 billion calculations per second, nearly double the speed of its fastest model up to now. A spokesman said the

new supercomputer would find a wide variety of applications in scientific research, such as aircraft development, weather forecasting, and nuclear power development.

Yet U.S. supercomputer development continues apace. Industry experts predict that ETA Systems, an innovative start-up spun off by Control Data Corporation, will deliver a 10 billion operation per second unit next year, with plans under way for a "super-super" to triple that number crunching capacity.

On May 9 the announcement was made that a team of scientists at the Bergische University, Gesamthochschule Wuppertal, is working on the new technology, supported by a grant of about DM one million from the Volkswagen Foundation. The first equipment, for the production of microelectronic switches by means of x-rays, has been completed. The x-ray element allows the production of structures in the chips whose size is of the order of a thousandth of a millimeter.

The human consequences of these extraordinary leaps into the Information Age are, by definition, central in the exploration of the significance of these structural changes.

It is important to recall that with the introduction of the computer in business and industrial use in the early 1960's, dogma and logic both led to a nearly universal expectation that mass unemployment would accompany the computer. But the contrary proved to be the case. The far more advanced application of high technology of very recent years, which has

led to the loss of comparative advantage of several of America's major basic industries, has, according to the Bureau of Labor Statistics, not been accompanied by all the adverse effects in human employment which one might reasonably expect.

During this entire period in which high technology began changing the character of American economic life, the total American economy experienced one of the most remarkable achievements. In the midst of growing unemployment, excrutiating inflation, intractable and unbearable interest rates, the American economy created more than 24 million new jobs. At the same time, Europe lost a million jobs. That's an American miracle!

Yet many of those new American jobs have been created in the burgeoning service sector. And there is a disconcerting fact about service economies. They cannot mount a national defense.

What is the probable impact of the major structural changes on the industrial nations? It is urgent that we understand the changed relationship which will occur among allies as a result of these changes.

The subject is, by definition, subject to both prejudice and politicalization, neither of which are helpful as we seek to shelter the national security or most usefully advance the national welfare.

There are two essentially different but indispensable

national purposes: to protect and increase the national security; and to serve the national good. The nature of the structural change which is taking place and the far greater change (much of it as yet indiscernible) which will occur, create urgent new needs for intelligence.

Some of the intelligence needs fall within the traditional province served by the Intelligence Community. Others involve areas of inquiry and analysis, which can be best performed by other agencies of government.

I offer the following partial list of forces which will create substantial urgency for complex, urgent and often new kinds of intelligence.

1. There are the economic, political and social changes which are the consequences of the more than 800 billion dollars of unpaid debts, most, though not all, owed by the less developed countries. It is important to realize, however, that the United States is also an international debtor of major size.

2. There are the international changes which have in part already come about as a result of the depletion of vital resources, especially oil. In a period of relative quiescence, it is useful to speculate that we are yet to see a host of profound effects which will flow from the further exhaustion of the world's oil resources, in turn deeply stressing the political and economic stability of many countries.

3. Thereare somewhat similar changes whose effects are

more limited but dramatic in their impact upon particular countries. Thus, for example, new technology, which has produced materials which substitute for mined products like copper, are likely to have a convulsive effect upon those nations dependent upon the export of copper and, in a different way, an impact upon those nations utilizing the newly invented materials -- the ceramics, the fibre optics, the other products of modern laboratories.

4. There are the changes which have already resulted in a transfer of important industrial activities to areas of the Third World. In some instances, these have not only resulted in a major shift of manufacture but have already brought some of the more advanced of the Third World countries into high technology assembly, and are likely in fact to carry them well beyond simple assembly of high technology. Since one of the driving forces in this direction is the existence of an easily trained, manually dexterous, highly motivated, poorly paid work force, it will be important to determine whether or not this is purely a transitional change. Further advances in technology may well enable the industrial countries which have lost competitive advantage to the low labor cost areas to so sharpen their high technology responses so as to make the existence of a low-cost labor force of marginal importance.

5. A widespread replacement of the use of simple, one-function robots by the highly complex "flexible manufacturing systems" which are beginning to be employed by the industrial

countries will not only affect the nature of employment, but will as well affect where it is that manufacturing institutions are located. If competitive capability is to remain at a sharp edge in the United States, it is urgent that knowledge of what is happening in Japan, what is happening in Europe, at a minimum stimulate an adequate response within the United States. But where within our government does the responsibility lie to stimulate that response by our private manufacturing community?

This is one of the areas in which the traditional Intelligence Community is not by definition either the most informed or necessarily the most useful source of analysis. It is also not the instrument which is authorized by its charter to propagate vital information and guidance to the host of businesses which must be prodded into increased capability in the period ahead if we are to restore our competitive edge. To the extent that problems will arise in the United States which have any relationship to employment, to training and education, to the adequacy of the work force, to the multiple problems which flow from chronic unemployment, the Bureau of Labor Statistics is the most likely source of constant and objective observation and interpretation.

6. There is a more limited but extremely vital area of intelligence essential to the protection of the national security which has involved the collaboration of the Intelligence

Community, the Defense Department and the Department of Commerce. It involves the protection of highly sensitive technology. A new set of questions are now added to the traditional ones. To what extent does the assembly and/or manufacture of sensitive high technological products outside the United States make them more accessible to the Soviet Union? There is the further question of the extent to which the increasing number of joint ventures between our domestic and overseas companies may increase U.S. dependency upon overseas sources in the event of an emergency. And this, of course, leads to the final question. To what extent will industrial mobilization in the United States become difficult, if not impossible, because essential manufacture has been moved offshore?

These by no means exhaust the intelligence-related problems which must be reexamined. There is an area of traditional intelligence which must focus upon one of the most intriguing, and potentially promising, of the international changes which lie ahead.

There is the possibility that the entire balance of power between the United States and the Soviet Union may be changed as the Information Age matures. Is it possible, if not probable, that a closed society such as the Soviet Union may not be able to adapt itself to those key aspects of structural change which flow from the flowering of the Information Age? In terms which may be overdramatic but are not unreal, it is entirely

possible that the microchip may prove more powerful than the nuclear weapon. The unhampered availability of information and judgment and the existence of total political control are oil and water. This, at least, is the premise which has guided much of our understanding of the Soviet society. A society which keeps its electrostatic printers under lock and key with the result that prohibited communication is passed along by hand in the form of Samizdat either misreads its requirements for political control or is fundamentally unequipped for the problems it faces which will be compounded as the Information Age matures. Even now, xeroxing involves a technology which is primitive compared to those personal computers which are already linked to extensive data bases and increasingly permit communication from console to console.

I raise a heretical question: To what extent does the Soviet Union purchase or steal the high technology output of the West not because its engineers are incapable of comparable invention? May not the motivation flow from the fact that political control suggests the wisdom of avoiding the intellectual openness which produces the invention of these products in the West? It is politically safer to rely instead on the acquisition of the final component or product. By-product benefits are sacrificed in the process. But much of that can be recaptured by "reverse engineering".

Closely related to this massive new difficulty which confronts the Soviet Union is the evidence that tensions have

been increasing in the relationship between the USSR and the more educated, more technologically oriented, the less corseted scientific communities in the Soviet's more advanced client states. Precisely because the impact of the Information Age may prove explosive in the power contest between us and our major adversary, it is urgent that the analysis directed to this inquiry be impeccably objective and agnostic. Mirror imaging and wish fulfillment would serve us poorly.

The questions are of such weight and will so affect policy that we must know as much as we can, as early as possible, and with maximum authority.

I close with another heretical question: It has been widely assumed that the reinvigoration of our military and strategic capability impelled the Soviet Union to return to the bargaining table. Is it not possible instead that the Soviet Union has been observing the onset of the Information Age and the structural changes which are inevitable as acutely as we have -- and very possibly for some time before our own complacency was shaken? Should there be merit in this speculation, the Soviet concern that it may not be able to manage and control the changes produced by the Information Age may well be the single most important implication of the structural changes we are examining. Should that be the Soviet motivation, it would not only significantly strengthen the hands of those who represent us. It could even alter the content of that which

is being negotiated. Simultaneously, however, we must intensify our concern that the Soviet Union will not "go gentle into that good night," choosing instead to "Rage, rage, against the dying of the light".*

*Dylan Thomas