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The Role of the Party in Soviet
Science and Technology Policy

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Summary

THE ROLE OF THE PARTY IN SOVIET SCIENCE AND TECHNOLOGY POLICY

The deepening involvement of Party organs in Science and Technology (S & T) matters underscores the inability of the regime to manage and execute its new strategy for science, technology, and economic growth, its failure to reorient effectively its institutions and structures toward technical progress.

In an attempt to overcome these failures, the Communist Party of the Soviet Union is reorienting science and technology policy. The reconceptualization of science policy, however, has not led to an abandonment of a basically centralized approach and holistic perspective toward science and technology, even in the face of the growing size and complexity of the Soviet R and D effort. On the contrary, a perceived need to accelerate innovation has led the leadership to press all the more strongly in the 1970s and 1980s for better techniques of comprehensive planning and systems management.

In general, this report finds that "science" and "production" are just as much separate worlds in the Party structure as they are in Soviet society generally. In addition, S & T policy functions tend to be as fragmented and compartmentalized in the party apparatus as they are in the government. These underlying conditions impose severe constraints on the Party to provide the kinds of integrative capabilities to ensure comprehensive and coherent S & T strategies that it is being called upon to perform. At the same time, the failure of the Party to restructure its own internal operations toward technical progress limits its ability to act as the modernizing agent of the leadership in the era of the so-called "contemporary scientific and technological revolution."

This report examines the role of the Communist Party in Soviet science and technology policy. Most studies of this subject focus on the political and ideological aspects of party control over science, on the intrusion of the party apparatus into the affairs of the USSR Academy of Sciences, and on the generally hostile adversarial relationship between political authorities and the scientific community. While not denying the importance and saliency of these dimensions of the party-science nexus, this report looks at other aspects of the relationship that, though neglected by Western analysts, have taken on new meaning in the contemporary context.

In this report, the Party's expanded role in and more complex relationship with S & T are examined against the background of the reconceptualization of science policy and development strategy by the Soviet leadership since the late 1960s. Although many of the basic problems in accelerating the research-to-production process are themselves not new, Soviet perceptions of them have broadened and changed along with the scope of official motivation to use science and technology to help solve or ameliorate social and economic problems of contemporary Soviet society. The continuing economic slowdown and stringencies of the 1980s add further impetus to efforts to put technology into strategy, to use science and technology more effectively as tools of economic policy and progress.

The reorientation of policy on the conceptual level has proceeded along two main lines: expanding the boundaries of science policy and of integrating science policy with economic policy, on the one hand; and switching to an intensive growth strategy for science and technology with emphasis on increasing the efficiency and effectiveness of R & D, on the other. As regards the first issue, there is movement towards a broader concept of science policy and the closer coupling of R & D with the totality of domestic and foreign policy. In line with this more strategic approach is an emphasis on external rather than internal criteria in S & T policy. The object of science planning has gradually shifted from "scientific research" and "new technology" to "scientific and technical progress" more broadly.

The fact that scientific research and development in the USSR is highly concentrated in a few large urban centers figures prominently in why and where Party organs intervene. Over half of the nation's research potential (scientific manpower and allocations to R & D) is located in just 11 cities. If we add to this number another 11 cities, then approximately 80 percent of the resources are concentrated in this group of 22 large urban centers. Indeed, it is in these 22 cities that the Party organs have become most active in S & T matters in recent years. These cities represent only 13 percent of the capital cities of union and autonomous republics or territorial and provincial centers--that is, 13 percent of intermediate Party organs as well.

These 22 major cities are furthermore large research and production complexes with specialization in specific areas. The technological innovations developed there generate S & T progress in adjacent economic zones and on a national scale as well. Many of these centers are where some of the USSR's most important national interbranch S & T problems are being solved. The importance of the technology produced far transcends their regional boundaries. These 22 major cities are special nurseries for innovation. Indeed, the significance of the S & T being developed and/or used in these local areas generates the interest and involvement in S & T matters not only of local Party leaders, but of CPSU officials at the center as well. It is this factor, moreover, that makes possible the support to and back-up of local leaders from central Party organs.

To put the issue somewhat differently, the expansion of Party involvement is prompted both by design and by default. It is prompted in part by a conscious desire by the Party leadership to maintain the leading role in the Party in society and to increase party control over that sphere of action which is developing the fastest, is the most visible, in which the country's prestige is deeply engaged, and which has the largest potentiality for influencing the future development of the USSR and its place in the international order but which also has fallen largely outside the Party's control. At the same time, however, this growing intrusion of Party organs is prompted in part by default as well-- by the failure of the Brezhnev regime to implement meaningful reforms to improve the system's performance and capacity in innovation. Expanding the use of the Party to perform linkage and integration functions reflects the failure to erect effective coupling and coordination mechanisms within the system to facilitate and speed the innovation process. Here the Party is not so much usurping a role as filling a functional and institutional void that continues to persist. Similarly, the increasing resort to traditional mobilization techniques and political pressure tactics, such as socialist competition, in S & T programs reflects the failure to build an adequate incentive structure for innovation.

Linkage and integration have become the dominant key concepts underlying the reconceptualization of science policy design and management. They point clearly to the major interface difficulties that underscore such a systems approach in general and the deficiencies of the Soviet R&D system in particular. Moreover, linkage and integration are the principal tasks that Party organs are being called upon to perform in this policy arena. As the guardians and enforcers of the values and preferences of society--as specified by the leadership--Party organs are being used to promote and implement the new stress on technical progress and innovation. As the principal integrators of organizational activities that cut across departmental and functional lines, Party organs are being enlisted to secure better coupling and coordination throughout the research to production cycle and to ensure that general objectives and priorities prevail over the parochial aims and special interests of the various institutional participants in innovation. In short, the Party and its integrative capabilities are being increasingly called upon to apply more effectively a systems approach to contemporary problems in S&T.

Why is the Party being assigned this expanded role in S&T policy? Basically, the Party is being called upon to help close the gap between policy design and implementation. Although the Brezhnev leadership has made some conceptual advances in reorienting policy toward technical progress, its efforts at restructuring the government to support the new policy orientation have run into problems of implementation. The leadership has found it extremely hard to recast the structure and attitudes of both a scientific and bureaucratic establishment that have taken decades to shape. More and more, the Party's deepening involvement in S&T development is directed at overcoming departmental problems and barriers and at prodding bureaucrats, scientists, and economic managers in the pursuit of technical progress.

The report looks at how the Party itself has gone about restructuring its own internal structure to accord with the new orientation toward technical progress. In general, there has been little restructuring of Party structure, especially at the top of the hierarchy. Rather, it is at the intermediate levels of the party administrative ladder--below the republic level down to the primary party organization--that increased activity is most discernible. Even here it is primarily the development of a nonstaff party apparatus--a special set of councils and commissions--oriented specifically to spurring technical progress and innovation that has evolved and provides the main structure through which the regular apparatus exercises influence on and exerts pressure on the scientific establishment and managerial bureaucracy to join forces in the cause of innovation.

In examining the increased involvement of Party agencies in S&T policy, the report looks at the variability of response among regional Party elites to the new technology imperatives and reformist pressures. It argues that we must look beyond the personality and attitude of local Party leaders in explaining why some Party organs become involved while others do not. Differences in economic conditions, in R&D resources, in local interests and priorities, in the relative importance of the region in national plans, and in capabilities to engage in innovation together produce a range of opinion and action among regional Party elites in this policy sphere.

Closely related to the reorientation to S & T progress is the growing emphasis on innovation, on the application of new technology rather than on its creation. Accordingly, science policy is beginning to move from largely a policy for research to a policy for research utilization. Just as for broader economic policy there is growing emphasis on the need for greater productivity and rational resource allocation in R & D. Wrestling with ways to increase the effectiveness of R & D, Soviet science analysts and policy-makers have become increasingly aware of the major structural problems impeding S & T performance in general and innovation in particular. Deficiencies in organizational structure, planning, management, and motivation are all seen to have a common root: the organizational dissociation of R & D participants and the severe coupling problems this creates in moving ideas from the lab into use. The need for greater integrative capabilities to manage innovation as a process is explicitly recognized, especially as regards large-scale, complex S & T problems of national priority that cut across ministerial, departmental and regional lines.

THE ROLE OF THE PARTY
IN SOVIET SCIENCE AND TECHNOLOGY POLICY

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THE ROLE OF THE PARTY
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Introduction

At a moment when science and technology are being assigned a high priority on the national agenda of the USSR, an assessment of the role of the Communist Party in this policy sphere appears both timely and important. Despite the many descriptions of the Party in the Soviet system, we still know very little about, much less understand, the nature of Party involvement and activity, down the administrative hierarchy, in science and technology policy. Although Party agencies are recognized as having broad decision-making and supervisory authority, little attention has been given to how and to what extent they exercise these responsibilities in practice.

For the most part, Western studies of Soviet science policy have focused on the issue of "party control" in the sense of political control and the impact of the political environment. Much attention has been given to official efforts to enforce ideological conformity and to curb intellectual and political dissidence among the scientific community. Emphasis has been put on the Party's intrusion into the affairs of the Academy of Sciences, and the interaction between the

political authorities and the Academy has been generally represented as an adversarial relationship. Certainly, the actions and attitude of the Brezhnev regime have done little to diminish the saliency of these dimensions of Soviet science policy. The visible tightening of Party control over Academy operations and suppression of protest and dissent among individual scientists since the mid-1960s serve as a constant reminder that politics still dominates and shapes the science policy environment in the USSR. Moreover, the relentless campaign against Academician Sakharov and his banishment to Gorky along with the cases of S. R. Shafarevich, Zhores Medvedev, V. G. Levich, A. M. Nekrich, and others have kept the political and ideological aspects of Party control at the center of Western analyses of Soviet science to the neglect of other dimensions that have taken on new meaning in the contemporary context.¹

Meanwhile, the Party connection with technological development and delivery remains largely unexplored. "In fact, the Party's role in technical progress and innovation is not very clear," writes Gregory Grossman.² The few scholars who have investigated this relationship have come to different and contradictory conclusions. In his monumental study of innovation in Soviet industry, Joseph Berliner found that Party activity was not "central" to his discussion, and that the subject may be examined "independently of the Party's role."³ Robert Campbell, on the other hand, found that oblast and higher Party authorities played a crucial role as mechanisms of technology transfer for certain key managerial innovations that had their origin in military and space programs but were later diffused to the civilian sec-

tor.⁴ In light of these conflicting interpretations, Grossman rightly concludes, "In truth, we do not know very much yet about the role of the local Party organs in promoting both technical and managerial innovations."⁵

This study takes as its central focus the latter dimension of the Party's role in science and technology policy. Our aim is to illuminate not the political and ideological aspects of Party control but rather what Grossman calls the managerial and even entrepreneurial functions of Party agencies with respect to promoting technological change. Accordingly, we will look at the nature of Party participation, at different levels, in efforts to improve planning, organization, management, and motivation throughout the research-to-production cycle. As a complementary focus, we will also explore the impact of recent changes and experiments in R&D planning and administration on Party organizational structure, operations, and membership prerogatives. This dual focus should shed light on how the Party apparatus both shapes and, in turn, is shaped by science and technology policies as well as on what administrative adaptations are being made to accelerate and control the innovation process. Hopefully, the analysis will also enhance our understanding of the extent to which the Party administrative hierarchy itself acts as a force for and/or impediment to technological modernization and institutional reform.

The managerial and entrepreneurial functions of Party agencies have been selected not simply because they have received less attention than political and ideological control responsibilities, or because the latter are no longer important. On the contrary, the Party apparatus under Brezhnev, we have noted, has exercised its traditional

control functions even more strongly than before. The important point behind the research design is that the Party's managerial and entrepreneurial activities are acquiring increasingly greater significance as the stress on technical progress mounts. They underscore a much expanded and more complex relationship between Party authorities and the science and technology establishment. Growing Party involvement and influence in this area are integrally related to the new directions taken since the late 1960s by the Brezhnev leadership not only in S&T policy but in economic reform strategy and the evolving tactics of implementation as well. At the same time, it is clear that the extent to which Party agencies have become involved and the effectiveness of their actions in promoting technical progress have varied substantially, both regionally and vertically. Thus, another major thrust of this study will be to examine some of the factors contributing to the variability of response to the requirements of advancing technology and complexity.

The Scientific and Technological Revolution,
Development Strategy, and the Role of the Party

The keen, almost consuming interest in accelerating innovation and change reflects the extent to which a perceived "technological imperative" has come to dominate and divide the Kremlin leadership in the last decade. Although many of the basic problems themselves are not new, Soviet perceptions of them have broadened and changed along with the scope of official motivation to use science and technology to help solve or ameliorate social and economic problems of contemporary Soviet society. The continuing economic slowdown and

stringencies of the 1980s add further impetus and importance to efforts to put technology into strategy, to use science and technology more effectively as tools of economic policy and progress.

Two important cognitive discoveries have prompted this official concern. First is the rather belated awakening of the ruling elite to the full significance of the development and role of science and technology in the world, roughly since mid-century. These changes have been dubbed the "contemporary scientific and technological revolution (STR)," largely a euphemism for the computer age. Adjustments in perceptions and policies have not been rapid or easy, however. Politicians have lagged rather than led in the awakening to this phenomenon. Not surprisingly, it was among the Soviet scientific community that concern mounted over Russia's backwardness and the growing technology gap with the West. As a letter of appeal from dissident but concerned scientists to Party and government leaders in March 1970 noted frankly: "We are simply living in a different era. The second industrial revolution came along and now, at the onset of the seventies, we see that far from having overtaken America, we are dropping further and further behind."⁶ Generally speaking, the notion of the STR, which first emerged in the mid-1950s, had been primarily a subject for academic debate in the 1960s. Not until the 1971 CPSU Congress did the scientific and technological revolution begin to serve as a fundamental organizing concept for Soviet domestic development and foreign relations.⁷

The changing conditions and new demands associated with this new stage of industrial revolution are seen as placing unprecedented im-

portance on scientific and technical progress. Such progress becomes not only the key force driving modern society forward but also a major arena of competition between the world's two opposing social systems. Increasingly, therefore, the future of the Soviet system is seen to be inextricably linked with the STR, with the capacity of the regime to facilitate and master the developmental processes associated with this phenomenon. A "historic" task facing the USSR, Brezhnev told the Twenty-fourth Party Congress, is "to combine organically the achievements of the STR with the advantages of the socialist economic system, to unfold more broadly our own, intrinsically socialist forms of fusing science with production."⁸ Three years later in Alma Ata, he reiterated, "Today we have no issue more important than realization of the STR. The solution of many problems in the development of our society depends on and flows from it."⁹ On the occasion of the 250th Anniversary of the USSR Academy of Sciences in the fall of 1975, the General Secretary once again emphasized that he regarded the success of science and the success of socialism as inseparable: "Only by relying on the latest achievements of science and technology is it possible to build socialism and communism successfully."¹⁰

Second, there has also been growing realization that the Soviet economy is approaching the limits of "extensive" growth and entering a new era that calls for more "intensive" methods of development. Declining supplies of manpower, energy, and material resources require a basic shift in development strategy and greater emphasis on qualitative improvements rather than quantitative increases of inputs as the main source of future growth. Already at the end of the 1960s, Brezhnev declared firmly that intensification "becomes not only the main way but

the only way of developing our economy."¹¹ Moreover, in this approach, he told the 1971 Party congress, "Progress in science and technology is now the main lever for building the material-technical base of Communism." "From the point of view both of current tasks and of long-term prospects the acceleration of scientific and technical progress is given priority." Premier Kosygin similarly insisted at the 1976 congress that without faster translation of S&T into production the "economy can no longer advance successfully along the path of intensification and quality improvement."¹² Once again confirming that this remains the fundamental line in Kremlin strategy, the Chairman of the USSR Gosplan told a general meeting of the Academy of Sciences in December 1979, "The only correct and reliable course consists in boldly transferring the whole economy to the rails of intensive development." To back up his statement with the authority of the General Secretary, he quoted Brezhnev's own words to a plenum of the Central Committee the month before: "There is no alternative to this course."¹³

International and domestic pressures have combined, therefore, to make the acceleration of scientific and technical progress a major issue in the 1970s and 1980s. Just as he had defined this to be the "key task" of economic policy in 1971, Brezhnev also listed it first among the "key problems" of the Tenth Five Year Plan (1976-1980). Indeed, he affirmed, "In our entire economic development perhaps there are no tasks more urgent and more important."¹⁴

More and more, two basic factors of "intensification," two main levers for speeding economic development, have moved to the forefront of the Soviet Union's modernizing strategy: modern technology and modern management. In 1970, Brezhnev had already observed that "the solution

to many of our economic problems should now be sought at the juncture between progress in science and technology and progress in management." At that time he also made the statement that has since become a slogan of the day: "The science of victory [in building socialism] is, in essence, the science of management."¹⁵ Dzherman Gvishiani, Deputy Chairman of the State Committee for Science and Technology, also noted early that "fusion of the latest achievements in science and technology with the most up-to-date achievements in organization and management is an imperative of the contemporary STR."¹⁶ The two linchpins of this strategy of modernization have become "the management of science" and "the science of management."

Increasingly, moreover, emphasis has been put on the notion that accelerating technical progress and improving planning and management are interrelated and interdependent processes. Underlying this theme is enhanced awareness of a direct correlation between technology and structure and the realization that technological innovation rests on and requires administrative adaptation as well.¹⁷ As P. M. Masherov, the Belorussian First Party Secretary and candidate member of the Politburo, told the 1971 Party congress, "It is impossible to 'squeeze' the revolution in science and technology into the framework of old methods and organizational forms of work."¹⁸ Indeed, to attempt to put the research-to-production cycle into traditional forms is, according to some specialists, "like trying to use a steamboiler to harness atomic energy."¹⁹ "Scientific and technical progress--the basic change in the correlation of forces of economic growth--makes new demands on the economic mechanism," stressed a prominent professor at the CPSU's Academy

of Social Sciences at the end of the 1970s. "Methods and forms of management that produced good results in the relatively recent past," he added, "can today prove to be a hindrance to socioeconomic progress."²⁰

In spite of this undiminished stress on the importance of technological innovation and administrative improvement, practical advances have been slower than anticipated on both fronts. At the Twenty-Fifth Party Congress, Brezhnev complained that the introduction of R&D results into production and use was still a major bottleneck "despite the fact that this question was raised repeatedly and insistently" at the highest levels.²¹ Even then there was little change. The planned targets for development and application of new technology for the first four years of the Tenth Plan were fulfilled by only 80 to 85 percent. Meanwhile, the rate of renewal of equipment and machines actually slowed during this interval. The share of new products that were assimilated for the first time in the USSR among the total volume of goods produced also declined steadily over the course of the decade: from 4.3 percent in 1970 to 3 percent in 1977 and to 2.5 percent in 1978. Having cited these figures, the Chairman of Gosplan told the Academy of Sciences at the end of 1979, "It is absolutely clear that without a sharp improvement in the state of affairs in the area of scientific and technical progress it will be impossible for us to solve the major tasks set by the Party and government."²²

Similarly, the improvement of planning and restructuring of management have lagged behind the perceived demands of the times, despite repeated and forceful hammering on these themes by Brezhnev since the late 1960s. Obviously with Khrushchev in mind, he told the December 1973

meeting of the Central Committee. "In our time we justly condemned the unwarranted tendency for organizational restructuring which took place in the past." "But at the same time," he insisted, "it is impossible to allow the ossification of organizational structures."²³ At the 25th Congress, the General Secretary again emphasized, "The Central Committee is against hasty, ill-conceived reorganization of the managerial structure and of established methods of administration. It is necessary, as the saying goes, to measure the cloth not seven times, but eight or even ten times before cutting. But once we have done the measuring, once we have understood that the existing economic mechanism has become too tight for the developing economy, we must fundamentally improve it."²⁴ The thrust of his remarks gave the strong impression that, at least in his mind, the necessary measuring had already been done and it was time to get on with the cutting. Nonetheless, more than three years later while commenting on the July 1979 party-government decrees on improving planning and management, Masherov again emphasized, "We cannot limit ourselves, as some are already trying to do, to half measures, to a superficial or formal approach, accepting nothing more than minor modifications of established structures and practices."²⁵

It is in the context of the perceived need to close the gap between policy design and implementation that the Party's relationship with the STR begins to be defined. The Party apparatus has often served, in addition to its familiar role as an instrument of social control, as a driving force for innovation. Repeatedly from time to time, the Party has been enlisted to combat bureaucratic inertia in

the formal administrative machinery in order to facilitate the implementation of policy changes and innovative programs enacted by the ruling elite.²⁶ Already by the late 1960s, Rigby and Miller observe, it was clear that the restored ministerial structure was again posing sufficient resistance to technological innovation and economic reform to warrant "an ample role" for Party involvement throughout the science-production nexus.²⁷ More and more, in fact, the Party hierarchy has been called upon to help overcome the human and institutional barriers to technological and administrative change. Just how it has gone about this task will be examined in the following pages.

Early on, Brezhnev struck the theme that "the success of the STR cannot be ensured by the efforts of scientists alone." "At each enterprise," he insisted, "the heart of the director and of every worker, of the Party secretary and of every Communist, must bleed for scientific and technical progress."²⁸ Both the introduction of new technology and the improvement of planning and management have been made not only central economic tasks but important political-party tasks as well.²⁹ "These are all tasks of profound concern to the Party," the General Secretary told the 1976 CPSU Congress.²⁹ In addition to the scientific-engineering community and the managerial elite, the Party itself--both rank and file members and the executive corps--has come under mounting pressure to adjust to the new requirements posed by the STR. Such institutional adaptation is necessary if the Party is to serve as an effective instrument of innovation and supervision in an increasingly technological and complex world.

Indeed, the scientific and technological revolution poses a major challenge to the Party and to its traditional directing role. The chal-

lenge is all the more critical because this "motive force of the current historical epoch" is occurring in science--the very sphere of activity which is developing the fastest, is the most visible, in which the country's prestige is most deeply engaged, and which has the largest potentiality for influencing the future development of the USSR and its place in the international arena but which also has fallen largely outside the Party's control.³⁰ This factor, more than any other, has prompted the new directions in Soviet science policy since the late 1960s and especially the concerted efforts to extend party control over scientific affairs.

In general, science and production have been--and still are--relatively separate worlds in the Soviet Union. Moreover, it is the production sector that has always been perceived to be the main sphere of action in building socialism and where the Party has concentrated its attention, energies, and forces. The industrial policies pursued by Khrushchev led to active intervention and often excessive meddling by Party officials in economic decision-making and administration, even to a blurring of Party and government functions and institutions. This was not the case, however, for the R&D sector, which remained throughout Khrushchev's period of rule relatively free and immune from direct and heavy Party sway. Basically, the Party exercised its authority and influence indirectly, working through and with the regular administrative channels of the Academy of Sciences, the ministries, and state committees. Unlike their counterparts in production units, primary party organizations in most scientific research institutes, educational establishments, design bureaus and technological offices did not have the right to supervise administrative activity in their collectives.

For the most part, party cells and officials in R&D organizations were relatively passive, did not meddle in the day-to-day business affairs, and restricted their work largely to questions of ideological indoctrination and intraparty life. Local Party organs were rather timid in interfering in the professional activities of scientific and engineering personnel.³¹

Basically, Party functionaries were simply too incompetent to deal with complex and important scientific matters. Official recognition of this fact motivated the policy of nonintervention. To permit and promote the kind of party interference in the science sector that took place in the production sphere would, indeed, have resulted in "subjectivist bungling" of the worst sort. Despite his support of Lysenko and of his pseudo-scientific quackery in biology and agriculture, not even Khrushchev contemplated such a "harebrained scheme."

Since the early 1970s, however, steps have been taken to change this situation and to enhance the capacity of Party authorities to exercise supervision over and to exert pressure on the actions or, equally important, the inactions of R&D personnel. For the first time, the Twenty-Fourth Congress extended the formal right of control over administrative activity to all R&D establishments. The significance of this measure is clearly seen by the fact that it involved more than 160,000 or 45 percent of all Party organizations and more than four million or one-third of all its members.³² Although Party involvement and intervention have grown appreciably in the interval, the Brezhnev regime has not unleashed Party functionaries with a free rein in the research and development sector. Expanded party control, it is emphasized, must

not result in petty tutelage and the usurpation of administrative functions.³³ These underlying conditions and past experience impose important constraints on the capabilities of Party organs to develop and discharge effectively the kinds of managerial and entrepreneurial functions that they are being increasingly called upon to perform in science and technology.

Reorienting Science Policy and Structure
Toward Technical Progress

The belated discovery of the STR and growing realization of the need to switch to a more intensive strategy of economic growth have prompted a reorientation of science policy. Some of the fundamental assumptions, managerial attitudes, and organizational arrangements which underlay S&T activity in the past have been reexamined and are giving way to new approaches and directions in science policy design and management. Although there is still considerable debate and disagreement over many aspects of policy reform, it is possible to discern the broad contours of emerging trends and major thrusts. We can, then, look at the organizational restructuring of Party and government to see what kinds of modifications are--or are not--being made to accommodate changed policy goals and institutional functions.

In general, reorientation has proceeded along two main lines: expanding the boundaries of science policy and of integrating science policy with economic policy, on the one hand; and switching to an intensive growth strategy for science and technology with emphasis on increasing the efficiency and effectiveness of R&D, on the other.

As regards the first issue, there is movement towards a broader concept of science policy and the closer coupling of R&D with the totality of domestic and foreign policy. Traditionally, scientific re-

search and development have been conceived apart from the wider political and economic context rather than as an organic part of it. Indeed, science has generally been viewed more as an appendage of social and cultural policy than as an aspect of economic policy. Increasingly, however, attention is being given to its status as a direct force of production and key source of economic growth in the era of the STR. The focus is on relating S&T to a much broader range of national aims and activities, on the role of R&D in solving contemporary economic and social problems.

In line with this more strategic approach is an emphasis on external rather than internal criteria in science policy. Already by the end of the 1960s Gvishiani had sounded the new line. He noted that science policy was no longer simply a question of the rational planning of R&D expenditures, of the training of scientific manpower, of the allocation of resources, or of the supply of scientific instruments. "The issue is broader and deeper," the deputy chairman of the State Committee for Science and Technology (SCST) affirmed. "It is about the future, about the long-term development of socialist countries, about the very fate of the world and of socialism." "For now only that system can win," he continued, "which is able to assure itself a vanguard position in scientific and technical progress."⁵⁴

Indeed, the object of science policy planning has gradually shifted from "scientific research" and "new technology" to "scientific and technical progress" more broadly. Brezhnev himself observed in 1971 that the demands of the times required a change of focus: "In an age when the role of science as a direct force of production keeps growing, separate scientific achievements, no matter how brilliant, are no

longer the central issue. What is central," the General Secretary asserted, "is a high scientific and technological level of production as a whole."³⁵ Also at that time Brezhnev stressed the need to make the economic plan proper a powerful lever of S&T progress; and he called explicitly for the formulation of a comprehensive program for the development of science and technology that could then be used as the basis upon which to build a 15 year general economic development plan. Such a program, he told the Party Congress five years later, "provides points of reference and orientation without knowledge of which it is impossible to manage the economy successfully."³⁶

Suffice it to note that, though the promised 15-year macroeconomic plan (1976-1990) has not materialized, a long-range S&T plan has evolved like a slow-motion happening over the course of the past decade. Entitled "Comprehensive 20-Year Program for Scientific-Technical Progress and Its Social and Economic Consequences," this document has now begun to be used as a general frame of reference for the Eleventh Five Year Plan (1981-1985), for the "Basic Directions of Social and Economic Development" to 1990, and for modeling the development of the USSR to the Year 2000. In August 1972 the Central Committee and the Council of Ministers instructed the Academy of Sciences and the SCST to begin work on such a 15-year plan. By the fall of 1975 a rough and partial draft was completed. The Twenty-Fifth Party Congress in 1976 ordered that work on the Comprehensive Program be continued and the forecasts be better grounded. In February 1979 the Academy, the SCST, and the State Committee for Construction were directed to extend the program

to the year 2000. Also at that time Gosplan began to involve itself heavily in the project. By the end of 1979 the Chairman of the State Planning Committee reported that there was substantial agreement between most departments of Gosplan and the various expert panels of the Academy and the SCST on the main directions of the Comprehensive Program and that material from the program was being incorporated into the regular economic planning process.³⁷ The Comprehensive Program for Scientific-Technical Progress thus provides a good example of the regime's mounting efforts to integrate science policy and economic policy, at least in the area of planning.

Closely related to the reorientation to S&T progress is the growing emphasis on innovation, on the application of new technology rather than on its creation. Accordingly, science policy is beginning to move from largely a policy for research to a policy for research utilization. Brezhnev early in the 1970s singled out the application of R&D results as the most important but also the most deficient aspect of Soviet science and technology policy. "If we examine all the links of the intricate chain that binds science to production, we shall easily see that the weakest links are those relating to the practical realization of scientific achievements, to their adoption in mass production." It was necessary, the General Secretary stressed, "to create conditions compelling enterprises to manufacture the latest types of products, literally to chase after scientific and technical novelties and not to shy away from them, figuratively speaking, as the devil shies away from holy water."³⁸ Similarly, five years later he told the Twenty-Fifth Congress, "Today the practical application of new scientific ideas is no less important a task than their development."³⁹ Indeed, a major

challenge consists in formulating a science policy and building the appropriate institutional structures to promote the innovation process. Although this turn in policy continues to run into formidable problems of implementation, the accent on technological innovation and diffusion remains clear, persistent, and growing.

The second major line of policy reorientation, initiated in the 1970s, has been in the direction of pursuing a more intensive path of development for science and technology, or, to use Gennady Dobrov's words, a "shift in emphasis in national science policy from a quantitative to a qualitative approach."⁴⁰ Just as for broader economic policy, therefore, the need for greater productivity and the question of rational resource allocation for science policy have become dominant. At the Twenty-Fourth Party Congress Premier Kosygin signaled explicitly the need for this general change of course:

Realization of the possibilities of the STR requires more and more expenditures. However, at each stage of its development the state has available only a fixed amount of resources that it can allocate for these purposes. Thus the need arises for choice and for the preferential development of the most important directions of S&T progress, for the formulation and implementation of a uniform national science policy.⁴¹

Changing conditions and new constraints have fed the quest for relevance, the drive to weed out unpromising and unimportant lines of research, and the stress on utilization of R&D results.

In seeking ways to increase effectiveness of R&D, Soviet science analysts and policy-makers have become increasingly aware of the major structural problems impeding S&T performance in general and innovation

in particular. Moreover, the deficiencies in organization, planning, management, and motivation are all seen to have a common root: the organizational dissociation of R&D participants and the severe coupling problems that this creates in moving ideas from the lab into use. The traditional Soviet approach to innovation has been based upon the extreme functional specialization of institutional performers. This has left the process structurally fragmented and shapeless. Structural barriers have been created all along the innovation chain. In essence, innovation has been unorganized and unmanaged as a process. Wrestling with these problems, science policy experts have come increasingly to realize the importance of linkage and of the need to structure more explicitly and effectively the vital interfaces in the transfer process.⁴² As Gvishiani notes: "The problem of ensuring continuity of the process at every stage of R&D, including the introduction of results into production is now being brought to the fore as the most complex organizational task. It is absolutely obvious that this process requires integrated management."⁴³

Enhanced integrative capabilities are perceived to be particularly needed for large-scale, complex S&T problems of national priority that cut across ministerial, departmental, and regional lines. The importance and frequency of this class of decision problem are rising with the growing size and complexity of the Soviet economy and the demands of modern production and technology. Yet, the deficiencies of the existing administrative system in dealing with these kinds of problems are becoming steadily apparent and intolerable. G. Popov, a leading specialist on management of science and technology, writes: "Today virtually all questions of any significance--and above all the key problems of S&T progress--have become interbranch in nature. This is why

improvement of the mechanism of interbranch coordination is one of the core problems of management."⁴⁴

Significantly, the search for solutions also emphasizes a common theme: the need to apply a systems approach to contemporary S&T problem-solving. Indeed, modern systems technology and terminology have become the fashion of the times in Soviet discussions of science policy. More sophisticated and higher-capacity management and control techniques are being developed along the lines of modern Western techniques, such as, program planning, systems budgeting, matrix organization, and project management. Taken together, these conceptual changes and administrative innovations in the area of science and technology indicate the efforts being made to bring space-age management perspective and method to the Kremlin and to the civilian R&D sector. Through the use of these integrative tools Soviet leaders hope to improve managerial performance and effectiveness as well as to ensure Party control.⁴⁵

It is important to stress that Soviet authorities in reorienting science policy toward technical progress have not abandoned their basically centralized approach and holistic perspective toward science and technology, even in face of the growing size and complexity of their R&D effort. On the contrary, a perceived need to accelerate technological innovation has led them to press all the more strongly in the 1970s and 1980s for better techniques of comprehensive planning and administration. The new systems movement and management mentality are very much in keeping with the conventional centralized approach to science policy. At the same time, however, the new systems rhetoric continues to suggest an image of unity, coherence, and wholeness that are still lacking in reality.

"Linkage" and "integration" have become, therefore, the key concepts underlying the reconceptualization of science policy design and management. They point clearly to the major interface difficulties that underscore such a systems approach in general and the deficiencies of the Soviet R&D system in particular. Moreover, linkage and integration are the principal tasks that Party organs are being called upon to perform in this policy arena. As we shall see, these tasks lie at the heart of their expanded managerial and entrepreneurial functions in the era of the STR. As the guardians and enforcers of the values and preferences of society--as specified by the leadership--Party organs are being used to promote and implement the new stress on technical progress and innovation. As the principal integrators of organizational activities that cut across departmental and functional lines, Party organs are being enlisted to secure better coupling and coordination throughout the research to production cycle and to ensure that general objectives and priorities prevail over the parochial aims and special interests of the various institutional participants in innovation. In short, the Party and its integrative capabilities are being increasingly called upon to help apply more effectively a systems approach to contemporary problems in science and technology.

Why is the Party being assigned this expanded role in S&T policy? Are its own integrative capabilities up to the task? To a large extent, the answer to the first question relates to the overall structure of the Soviet system of governing research, development, and innovation and in particular to the lack of effective integrating mechanisms under existing arrangements. Similarly, the second depends in large mea-

sure on how the Party restructures its own organization and activity to facilitate deeper institutional involvement and an expanded role in science and technology.

Though highly centralized, the Soviet S&T establishment is far from monolithic.⁴⁶ On the contrary, it is heavily compartmentalized, horizontally and vertically, among numerous functional agencies and relatively autonomous institutional subsystems. Power is dispersed and authority is divided among a myriad of organizational actors. Adhering to the principle that "science cannot be administered exclusively from a single center," Soviet authorities emphasize the joint realization of planning and management functions.⁴⁷ That is, the basic modus operandi in Soviet R&D revolves around joint decision-making, power sharing, and cooperative actions in a multi-organizational context.

Given this context, a heavy burden falls particularly on the network of functional interbranch agencies that are responsible for coordinating the vast and diverse R&D effort. On paper, these organizations possess formidable powers to enforce central priorities and to facilitate uniform S&T policies. In practice, however, they frequently lack the authority and means necessary to perform their integrating functions. Instead of regulating developments in their tangled branch constituencies, they are themselves at times being regulated and ignored. The ministries do not always accept the recommendations of these central agencies; instead they pursue their own ways and wishes.

To be sure, the actual workings of this machinery of coordination are much more complex than implied by the formal organization chart. The key to understanding Soviet policies lies not so much in the struc-

ture of institutions as in the fundamentally bureaucratic context in which they operate. The authority and activity of state committees are frequently circumscribed. Caught in a constant cross fire of pressures from competing and powerful organizations, each promoting its own interests and R&D goals, the committees find themselves challenged and constrained at every turn. Given the nature of their overlapping and shared responsibilities for R&D planning and management, the state committees are frequently forced to seek the approval of and some kind of accommodation with various branch ministries, government departments, and other state committees, not to mention Party agencies. They are integral parts of a giant maze of bureaucratic subsystems and circles of administrative confusion, rather than standing apart from it. As a result the state committees are forced to perform a continuous and difficult balancing act in which national goals and priorities are reconciled with the special interests of the numerous organizations that conduct the Soviet R&D effort. This process inevitably involves them in heavy political conflict, bargaining, and compromise. Although we still know little about the actual mechanics of power and processes of negotiation within the Soviet system, the reality of bureaucratic politics and its imprint on science policy are unmistakable. The interplay of multiple agencies with diverse perspectives, different wills, and competing interests constrains the actions and limits the capabilities of central authorities to formulate and implement comprehensive and coherent policies in science and technology.

To be sure, there is considerable dissatisfaction with the existing system among members of both the Soviet political and scientific elites. Numerous articles criticizing the basic state of affairs in S&T policy-

making and administration have appeared since the early 1970s along with repeated calls for reform. Several observers have argued for strengthening the powers and prerogatives of the State Committee for Science and Technology, the agency that bears primary responsibility for ensuring the formulation and implementation of a unified S&T policy and, in particular, for overseeing the conduct of interbranch S&T programs of national priority. Other analysts have pressed for an expansion of the coordinating role of the Academy of Sciences over not only fundamental research but also applied R&D and the introduction of major new technology. Only the Academy, they claim, can surmount the branch parochialism and technological conservatism of the ministries and of Gosplan. Still others have supported an extension of Gosplan's planning responsibilities in S&T matters.⁴⁸ However, no general consensus has been reached yet over what should be changed and how. It is this combination of dissatisfaction with existing arrangements and of disagreement over the direction of reform, it seems, that has led in part to the Party's deepening involvement in S&T matters.

Significantly, therefore, institutional continuity and bureaucratic stability have been distinct hallmarks of the Soviet S&T establishment since Khrushchev. Although considerable experimentation and some change have taken place in the organization of R&D at the performing level in this interval, there has been little change at the highest levels of the system. There is no evidence that the distribution of power among the central agencies administering R&D--particularly the "Big Three" (the SCST, the Academy of Sciences, and Gosplan)--has altered significantly during the past 15 years.

Developments at the USSR Supreme Soviet, in fact, provide a good indication of just how slow the Soviet leadership has been at restructuring the government (and its own perceptions) to the new demands for a more technology-oriented science policy. In 1966 several new standing commissions were created under both chambers of the Supreme Soviet to provide greater scope for genuine discussion of, and influence on, the details of new legislation concerning public policy. Among these were a Standing Commission for Education, Science, and Culture--the name itself reflecting the extent to which science was still perceived to be primarily a "cultural" category. Only two of the 30 members on each commission in both chambers were scientists. Only in April of 1979 was science finally separated out from Education and Culture and was a new standing commission formed for Science and Technology. Moreover, in both chambers of the Supreme Soviet prominent Academicians with a strong interest in technology application--G. I. Marchuk and I. A. Glebov--were appointed to head the new commissions.⁴⁹ Separate standing commissions for science and technology, however, have not yet been created in the union republic Supreme Soviets.⁵⁰

At the same time, other very recent developments have taken place that may, in fact, portend new directions in policy at the top, if not a redistribution of power and responsibility, among the central agencies concerned with R&D planning and management. After 15 years as Chairman of the SCST Vladimir Kirillin was relieved on January 22, 1980 of his post and replaced by Guriy Marchuk, head of the Academy's Siberian Division and strong advocate of close ties between science and industry. Judging from recent public statements by high planning officials and

science administrators, Gosplan is beginning to assume a more positive and active stance with respect to the introduction and diffusion of new technology. This relates in particular to major innovations produced within the framework of priority S&T programs that can significantly improve labor productivity, save fuel and materials, and help solve other critical economic and social problems.⁵¹ Interestingly, Ya. Ryabov, the former party secretary in charge of the defense industry and a first deputy chairman of Gosplan since February 1979, seems to be a prime mover of the new orientation at the State Planning Committee.⁵²

In addition, just below the national level, mounting efforts to strengthen integrating structures and functions at the highest echelons of government (and party) are also discernible in a number of republics. Because no state committees for science and technology exist at this level except in Georgia, problems of interagency coordination are especially difficult. Rising dissatisfaction with the present state of affairs has prompted some republic Party secretaries and Politburo members to speak out frankly on the issue and to accent forcefully the need for structural change. In Belorussia, for example, the post of Deputy Chairman of the republic Council of Ministers in charge of Science and Technology has been recently instituted. Commenting on this action, Masherov told a meeting of the Belorussian Party Organization in September 1979, "We were trying to make the work of the various agencies that manage science and S&T progress more systematic and purposeful, and to achieve the necessary centralization." He admitted, however, that this had not yet been accomplished and added, "Various explanations are given for this. But it is perfectly clear that something must be done. If some

people lack authority to solve problems, they should have it." He further suggested that perhaps a Commission on S&T Progress should be created under the Presidium of the republic Council of Ministers."⁵³

Indeed, such a Commission on S&T Progress has been set up in the Ukraine and is led also by a Deputy Chairman of the republic Council of Ministers for Science and Technology. The latter position, created in early 1977, was filled by I. P. Kochevykh, the former director of the L'vov Production Association who gained national visibility for pioneering an innovative system of quality control. However, these organizational changes have not yet improved appreciably the handling of interdepartmental coordination problems, and in March 1980 Kochevykh was replaced as Deputy Chairman for S&T by S. I. Gurenko, the former Party secretary for industry of the Donetsk Obkom.⁵⁴ V. V. Shcherbitskiy, the Ukrainian First Party Secretary and Politburo member, harshly criticized the present state of affairs in the management of S&T related matters and insisted that these issues come under the direct and personal supervision of the highest Party and government leaders:

The interests of the situation require significantly increasing the responsibility of persons in the Council of Ministers and the Gosplan who are in charge of scientific and technical progress as well as of ministerial and departmental leaders.... The Ukrainian Communist Party Central Committee considers it expedient to place the application of ideas involving the most important problems of technical progress and particularly the implementation of republic level comprehensive S&T programs directly under the personal supervision of Central Committee secretaries, Council of Ministers deputy chairmen and obkom secretaries.⁵⁵

Indeed it was precisely this group of officials to whom he was speak-

ing, that is, the plenum of the republic Central Committee in October of 1979.

In other republics organizational restructuring has taken different lines. In Moldavia, for example, a republic Council for Coordination of Interdepartmental S&T Problems has recently been set up and is headed by the President of the republic Academy of Sciences.⁵⁶ In the Leningrad region, which has the status of a union republic, a similar coordinating council for R&D institutions of all departmental affiliations has been established under the auspices of the USSR Academy of Sciences. It is headed by I. A. Glebov, who also chairs the Standing Commission for Science and Technology in the Council of the Union of the USSR Supreme Soviet.⁵⁷

The full meaning of these institutional developments is not clear. They may signal the creation in the near future of state committees for science and technology in not only the Ukraine and Belorussia but other republics as well. The possibility of restoring a republic SCST was raised in September 1979 by the President of the Kazakh Academy of Sciences and brother of D. A. Kunaev, the Kazakh First Party Secretary and Politburo member.⁵⁸ They may even portend the transformation of the USSR State Committee for Science and Technology from an all-union to a union-republic agency along the lines of its predecessor body. In such a reorganization, individual committees, subordinate to the USSR SCST in Moscow as well as to the republic council of ministers, would be created in all the major republics.⁵⁹

In any case, these recent actions reflect heightened concern among the highest levels over the state of science and technology policy and

the need for organizational restructuring to accommodate the enhanced emphasis on spurring technical progress and innovation. The Party leaders in these areas of institutional change, namely G. V. Romanov (Leningrad), P. M. Masherov (Belorussia), and V. V. Shcherbitskiy (the Ukraine), are among the most outspoken members of the Politburo on the need for economic reform and technology advancement.

As regards how the Party itself has adapted to the new orientation to technical progress both in its internal operations and in its relations with the State, restructuring has lagged behind reconceptualization even more than in the case of the governmental machinery. The development of the Party's formal structure has been generally conservative since Khrushchev. Having restored the pre-1962 Party structure, the apparatus under Brezhnev has produced very little organizational innovation.⁶⁰ Although some experimentation with new forms for improving the activities and coordinating the work of Party organizations at the lowest levels has taken place since the early 1970s, there has been strong reluctance and resistance to generalizing innovation and formalizing change.⁶¹ As for the Party's central executive structure there has been no significant alteration in the Central Committee departmental system or in the Secretariat. No evidence is available to suggest that any new formal subdivision has been created with specific responsibility for promoting S&T progress and innovation. To quote Jerry Hough, "The Party apparatus has remained quite stable in its fundamental organization and even in most of its details."⁶²

The existing structure of the Party apparatus seems, moreover, to be particularly ill-suited for dealing with contemporary science policy issues. Party organization reflects--indeed institutionalizes--the traditional view of science as an appendage of social and cultural policy rather than its recently recognized status as a direct force of production. Thus scientific matters come within the jurisdiction of the Department for Science and Educational Institutions. Organizational structure also reflects the Party's traditional concern with political aspects and ideological control of science. The Department for Science and Educational Institutions, for example, comes under the supervision of M. V. Zimianin, the party secretary responsible for culture, education, propaganda, and science. Within the Secretariat M. A. Suslov, the Party's top ideological expert and watchdog, exercises general surveillance over culture, education, and science. Below the oblast level, local party committees (except in major cities) do not generally include a special department for science and educational institutions. Here, scientific matters fall directly within the domain of the party secretary for ideological affairs. No Department for Science and Technology has been created in the CPSU Secretariat along the lines of the recent changes at the USSR Supreme Soviet.

Similarly, the backgrounds and professional expertise of the Party's science administrators leave them ill-equipped to handle the main growth areas in Soviet science policy today--namely applied research, development, and the introduction of new technology. For the most part, they are still primarily social scientists--not technologists--which again reflects the traditional and still dominant concern with Party control

and ideological conformity in science. For example, S. P. Trapeznikov, head of the Department for Science and Educational Institutions since 1965, is an ideologist of known hardline views and whom Sakharov described as "one of the most influential representatives of neo-Stalinism." Before assuming his post, he had served for eight years as the Director of the Higher Party School in Moldavia and for five years as Deputy Director of the Higher Party School under the CPSU Central Committee. Party Secretary Zimianin was formerly chief editor of Pravda. A former head of the Department of Philosophy and Sociology at the CPSU's Academy of Social Sciences and currently chief editor of Pravda, V. G. Afanasyev, has chaired the Standing Commission for Education, Science and Culture at the RSFSR Supreme Soviet since 1975. Similarly, P. N. Fedoseev, a Vice President of the Academy of Sciences and political economist, is formerly a Director of the Institute of Marxism-Leninism. In 1970 he replaced S. P. Trapeznikov as Chairman of the Standing Commission for Education, Science, and Culture in the Council of Nationalities at the Supreme Soviet. After the establishment of a separate Standing Commission for Science and Technology in April 1979 Fedoseev continued to preside over the revamped Commission for Education and Culture. Similarly, A. E. Voss, the Latvian First Party Secretary, continues to chair the same Commission in the Council of the Union, a post he has also held since 1970. This highly political and ideological profile of the Party's chief administrators of science persists and points to the continuing primacy that the Soviet political command attaches to party control in the sphere of science.

Other aspects of Party organization also bear on its overall capabilities in S&T policy. Organizationally, the Party hierarchy is

structured on a territorial basis, especially in its intermediate levels. It is this structural feature that gives the Party hierarchy the capacity to perform its important coordinating role in society and supposedly the generalist vision to enforce the official values and preferences of the leadership in overriding departmental and branch interests.⁶³ At the national and union republic levels, however, the Party apparatus is structured strongly along branch lines. The capacity of central party functionaries and even secretaries to direct and coordinate activities in their respective policy domains is much more constrained than at the intermediate levels. In addition, as Rigby notes, "The dominance of the Party machine over the government machine, which is universally found at all levels from the republics down, does not necessarily apply at the center."⁶⁴

To be sure, we still know almost nothing about the internal distribution of power and responsibilities in the area of research and development within the central Party organs.⁶⁵ It seems most likely, however, that other departments besides Science and Educational Institutions are involved and influence Central Committee decisions on R&D. This would include, for example, the departments for Defense Industry, Chemical Industry, Heavy Industry, and Machine-building Industry. As for technology-related matters in particular, the Science and Educational Institutions Department does not appear to be heavily involved. On the contrary, these questions appear to be channeled through the various branch departments. As we shall see later, the Departments for Planning and Financial Organs, Organizational-Party Work, and even Propaganda and Agitation become involved in the introduction and diffusion of managerial innovations. The dominant picture that emerges, therefore, is

that the handling of science and technology problems is as fragmented in the Party apparatus as it is in the governmental structure. Just as in the government there are strong departmental barriers that must be overcome for the effective solution of problems. Indeed it may be argued that for a major technological (or managerial) innovation to be successfully introduced (and even more diffused) the joint efforts of several departments are needed. In fact, if only one department--above all the Science and Educational Institutions Department--is involved, the effort will probably fail. In addition, it is also apparent that "science" and "production" are separate worlds in the Party apparatus almost as much as they are in Soviet society generally. These two factors together constrain the capabilities of the central party machine and the hierarchy more broadly to produce comprehensive and coherent S&T policies.

From the perspective of development of formal structure of the Party apparatus (especially at its very highest levels), then, the image is almost one of the Party standing still or standing to the side and being bypassed by the scientific and technological revolution. Such an image is very misleading, however. The absence of formal structural change does not mean the lack of official concern. Issues surrounding the STR and its implications for the future of the Party, the economy, and the political system are constantly at the core of Kremlin politics today. There is considerable debate and disagreement within the ruling elite over how to modernize and how to master the STR. In March 1972 and again in July 1973, for example, Brezhnev mentioned that the Central Committee intended to examine

soon, at one of its plenary meetings, the problems of accelerating S&T progress.⁶⁶ Although no such formal plenum has yet occurred, these problems continue to agitate and divide the Party leadership. On August 4, 1980, for example, Andrei Kirilenko, the party secretary with overall responsibility for management of the economy and a Politburo member, opened a special conference at the CPSU Central Committee on "Accelerating S&T Progress in the Economy."⁶⁷ Reference has already been made to Shcherbitskiy's comments at the October 1979 Ukrainian Central Committee meeting and his instructions that republic priority interbranch S&T programs be placed under the personal supervision of Central Committee secretaries, Council of Ministers deputy chairmen, and obkom secretaries--in that order. Similarly, the month before, Masherov expressed strong concern over the need for Party involvement and action at the highest levels in promoting the development of science and technology:

Our Party views the development of science and the rapid translation of scientific ideas into practice as a crucial sphere of activity for all party organizations and committees. We talk a lot about working in a scientific way and about scientific management. If we want this to be the case in fact, not just in words, we must all, beginning with the Belorussian Central Committee, carry on the management of science, at the very least, at the highest possible level and create optimum conditions for the development of science.⁶⁸

Equally important, a focus on formal structure misses entirely the development since Khrushchev of more informal organizational mechanisms within the Party hierarchy that are oriented to spurring

STOCKHOLDERS EQUITY

Capital Stock, No Par Value, 32,000 shares issued and outstanding		\$30,020.00
Retained Earnings (Deficit)		
FY '79 Loss carried forward	\$(7,075.10)	
Current year loss brought forward (first quarter)	(184.35)	
Net loss this quarter	<u>(14,943.77)</u>	<u>(22,203.22)</u>
TOTAL STOCKHOLDERS EQUITY		<u>\$ 7,816.78</u>
TOTAL LIABILITIES AND STOCKHOLDERS EQUITY		<u><u>\$29,511.95</u></u>

SOUNDWAVE, INC.

Statement of Financial Condition

June 30, 1980

ASSETS

Cash in Bank - Riggs Operating Account		\$ 1,325.49
Passbook Savings Account - Guardian Federal		100.00
Petty Cash		50.00
Accounts Receivable		
Trade	\$ 2,878.08	
Musician Services Due	750.00	
Other	<u>441.72</u>	4,069.80
Deposits		653.18
Tape and Recording Supplies Inventory		1,737.18
Music Library		227.89
Studio and Office Equipment and Furnishings at lower of cost or market	\$22,559.06	
Less: Accumulated Depreciation	<u>(2,400.09)</u>	20,158.97
Prepaid Insurance		442.64
Organization Expense	\$ 845.50	
Less: Accumulated Amortization	<u>(98.70)</u>	746.80
TOTAL ASSETS		<u><u>\$29,511.95</u></u>

LIABILITIES AND STOCKHOLDERS EQUITY

LIABILITIES

Accounts Payable and Accrued Trade Payables		\$ 7,523.87
Accrued Payroll Expense		1,833.34
Sales Tax Payable		45.31
Payroll Taxes Payable		1,704.10
Note Payable		10,000.00
Accrued Interest Payable		<u>583.55</u>
TOTAL LIABILITIES		<u><u>\$21,695.17</u></u>

SOUNDWAVE, INC.
STATEMENT OF OPERATIONS
FOR THE SECOND QUARTER ENDED JUNE 30, 1980 AND
FOR THE YEAR TO DATE

	SECOND QUARTER			FIRST QUARTER		
	Amount	%s	Amount	Amount	%s	Amount
<u>Income from Sales (Attachment)</u>			\$23,992.22			\$48,155.41
<u>Direct & Variable Production</u>						
Expenses:						
Tape and Recording Supplies	\$ 1,649.57	4.4%		\$ 2,625.84	5.5%	
Musican Fees; Producer Fees	1,050.00	2.8		5,900.00	12.3	
Talent & Agency Fees	200.00	.5		-0-	---	
Outside Production Services:						
Tape Duplication	2,658.30	7.1		9,647.00	20.1	
Printing	-0-	---		562.50	1.2	
Record Manufacturing	1,027.79	2.8		-0-	---	
Remote Recording	-0-	---		-0-	---	
Other Services/Supplies	-0-	---		976.88	2.0	
Music Licensing	450.00	1.2		205.00	.4	
Equipment Rental	-0-	---		573.00	1.2	
Postage/Shipping/Misc.	50.29	.1		86.92	.2	
<u>Total:</u>	<u>7,085.95</u>	<u>18.9</u>	<u>7,085.95</u>	<u>20,577.14</u>	<u>42.9</u>	<u>20,577.14</u>
<u>Gross Margin on Sales:</u>			16,906.27			27,578.27
<u>Administrative, Selling and</u>						
General Expenses:						
Salaries (Technical & Admin.)	14,125.04	37.6		14,631.27	30.5	
Part-Time Help	1,581.00	4.2		-0-	---	
Payroll Taxes	1,353.32	3.6		595.50	1.2	
Other Corporate Taxes	25.00	.1		-0-	---	
Rent	7,267.68	19.4		7,186.29	15.0	
Piano Rental	450.00	1.2		450.00	.9	
Technical Maintenance	690.96	1.8		569.03	1.2	
Office Supplies & Expenses	1,111.46	3.0		1,641.72	3.4	
Printing & Photocopying	73.48	.2		144.30	.3	
Advertising/Promotion/Travel	1,221.21	3.3		909.97	1.9	
Insurance (Corp/Wkmm Comp/Group)	1,536.01	4.1		276.20	.6	
Postage/Shipping/Delivery	92.62	.2		141.63	.3	
Local Travel	214.90	.6		56.30	.1	
Telephone	649.74	1.7		723.00	1.5	
Subscriptions/Publicat/Dues	33.00	.1		102.25	.2	
<u>Total:</u>	<u>30,425.42</u>	<u>81.1</u>	<u>30,425.42</u>	<u>27,427.46</u>	<u>57.1</u>	<u>27,427.46</u>
<u>Total Operating Expenses:</u>	<u>\$37,511.37</u>	<u>100.0%</u>		<u>\$48,004.60</u>	<u>100.0%</u>	
<u>Net Profit/Loss Before</u>						
Other Items:			(13,519.15)			150.81
Interest on Note	451.26			400.00		
Depreciation on Equipment	1,086.60			1,025.97		
Amortization of Organiz. Exp.	42.30		(1,580.16)	42.30		(1,468.27)
Gain on Sale/Exchange of Equipment	-0-			776.40		
Miscellaneous Income	155.54		155.54	356.71		1,133.11
<u>Net Income/Loss</u>			<u>\$(14,943.77)</u>			<u>\$ (184.35)</u>
<u>Net Income/Loss Per Share</u> (32,000 shares issued and outstanding)			<u>\$ (.46)</u>			<u>\$ (.01)</u>

DISTRIBUTION OF INCOME FROM SALES: YEAR-TO-DATE: SIX MONTHS ENDED JUNE 30, 1980

STATION A	STATION B	STATION C	DUES (EST OR PROB)	DUES (EST OR PROB)	MEDICAL DUES	RELIGIOUS DUES	STUDENT DUES	STUDENT DUES	STUDENT DUES	TOTAL	EST. DUES	STATION	CLIENT CATEGORIES
TIME	TIME	TIME											
415	15	22	25	25	10	10	10	10	10	60	6,016	23	Musicians
48	22	25	25	25	10	10	10	10	10	125	125	12	Record Companies
755	227	157	252	252	10	10	10	10	157	157	18,548	247	Professional Industry and Audio-Visual Companies
122	23	25	11,01	54	10	10	10	10	11,01	11,01	14,903	227	Trade Associations
252	22	25	25	25	10	10	10	10	10	45	6,302	57	Advertising Agencies
257	21	29	152	11	10	10	10	10	10	270	18,677	250	Government Agencies and Institutions
278	21	22	25	25	10	10	10	10	10	22	6,419	10	Theater and Art Groups
278	21	22	25	25	10	10	10	10	10	10	360	15	Churches, Schools and Educational Institutions
278	21	22	25	25	10	10	10	10	10	10	798	11	General Public
27,631	4,252	5,864	15,386	2,824	8,884	2,003	1,312	665	157	1,981	72,148	100	TOTAL

* 278 No 15 white Dues
 IN 1980-1981
 SEE BOARD SINCE 4/21/80.

Y-T-D: Done

DISTRIBUTION OF

June 1980

STUDIO A TIME	STUDIO B TIME	MASTER TAPE	DUBS (CUT or HOUSE)	JOBS (IN HOUSE)	MUSICIAN SWS, # TALENT	RECORD TROD.	SFX & MUSIC LIBRARY	LEAVE TOTAL (MATERIALS)	RENTURE RECORDS	MISC.	TOTAL CHARGES	PERCENT	CLIENT CATEGORIES
65000	-0-	16800	-0-	14525	-0+	-0-	-0-	-0-	-0-	-0-	96325	10.8	Musicians
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.0	Record Companies
419575	-0-	59050	-0-	7475	140000	-0-	-0-	118445	-0-	9153	715502	80.4	Professional Industry and Audio Visual Companies
41150	-0-	16100	-0-	15340	-0+	-0-	-0-	-0-	-0-	915	93505	0.3	Trade Associations
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.0	Government Agencies and Institutions
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.0	Theatres and Art Groups
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.0	Churches, Schools and Educational Institutions
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.3	General Public
515725	-0+	91950	-0+	42500	14	-0-	-0-	1018545	-0-	181	87043	10.1	Total Charges
2719	-0+	1013	-0-	415	1517	-0-	-0-	111	11	0.0	10.1	10.1	Talent

* Studio B down
 other months for
 renovations & await
 for board.

JUNE

DISTRIBUTION OF

May 1980

STUDIO A TIME	STUDIO B TIME	MASTER TAPE	DUBS (CUT @ HOUSE)	DUBS (IN HOUSE)	MUSICAL SVCS.	RECORD TROOP	SPX LIBRARY	RECORD TROOP	RECORD TROOP	MUSIC	TOTAL CATEGORIES	PERCENT	CLIENT CATEGORIES
		76									4130	2.1	Musicians
													Record Companies
11:45		11:50	25:00	10:00				17:00		150	2730	27.3	Professional Industry and Audio Visual Companies
11:45		11:50	30:00	14:00							4300	2.7	Trade Associations
11:45		11:50	14:00	17:00						250	1100	23.1	Advertising Agencies
													Government Agencies and Institutions
11:45		11:50		14:00						70	1600	2.5	Theatres and Art Groups
													Churches, Schools and Educational Institutions
11:45				17:00							1100	2.3	General Public
11:45			7	11:00				17:00		100	6000	1.1	Total Music
11:45		72	11:00	23	100	23	17	211	27	1	1	100	Percent

11/11

DISTRIBUTION OF

APRIL 1980

STUDIO A TIME	STUDIO B TIME	NUMBER TAPES	DUBS (OUT OF HOUSE)	DUBS (IN HOUSE)	MUSICIAN SPE.	RECORD TAPES	SPE MUSIC TAPES	ENTIRE SESSION (HOURS)	RENTAL TAPES	MISC.	TOTAL CATEGORY	PERCENT	CLIENT CATEGORIES
-0-	-0-	-0-	-0-	700	-0-	-0-	-0-	-0-	-0-	-0-	750	2.1	Musicians
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Record Companies
1174 25	526 25	554 25	225 00	23500	-0-	-0-	23500	600	-0-	75	2833 05	24.2	Professional Industry and Audio Visual Companies
716 00	237 00	111 75	112 00	1100	-0-	-0-	21000	100	-0-	-0-	1962 75	23.7	Trade Associations
700 25	-0-	241 25	-0-	4700	-0-	-0-	-0-	-0-	-0-	400	1192 75	14.0	Advertising Agencies
-0-	-0-	-0-	3 00	-0-	-0-	-0-	-0-	-0-	-0-	-0-	36000	4.2	Government Agencies and Institutions
-0-	40 00	215	-0-	7300	-0-	2,000 87	-0-	-0-	-0-	700	2134 97	25.0	Theatres and Art Groups
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Churches, Schools and Educational Institutions
-0-	-0-	-0-	-0-	1550	-0-	-0-	-0-	-0-	-0-	-0-	1650	1.8	General Public
3,025 50	863 25	765 50	599 00	425 40	-0-	2,002 87	775 00 ⁽¹⁾	60 00	-0-	21 00	8537 52	100%	TOTAL
104	101	70	10	50	-0-	225	11	11	-0-	22	10 00		TOTAL
*													
*STUDIO B SHUT DOWN FOR RENOVATIONS AS OF 4/21/80													

April

DISTRIBUTION OF **INCOME FROM SALES: YEAR-TO-DATE:** QUARTER ENDED 3/31/80.

STUDIO A TIME	STUDIO B TIME	PROG. TIME	DUBS (OUT OF HOUSE)	DUBS (IN HOUSE)	MUSICIAN SALS.	RECORDS FROM	STAFF FUND. MONITOR	STAFF FUND. REVENUE	REMBE. REVENUE	MISC.	TOTAL CATEGORIES	PERCENT	CLIENT CATEGORIES
8,500	17	23	20	22				11.11		60	4,581	9.5	Musicians
43		26									125	0.3	Record Companies
1,287	1,761	111	147	400			295	11.15		151	4,904	10.0	Professional Industry and Audio Visual Companies
11	416	53	1,787	4						1,142	13,480	27.9	Trade Associations
2,795	300	341		120			8			7	2,807	5.8	Advertising Agencies
2,054	2,23	121	52	14	700			11.15		510	18,317	38.0	Government Agencies and Institutions
2,150	46	573		175			100	11.25		6	4,121	8.6	Theatres and Art Groups
				201							360	0.7	Churches, Schools and Educational Institutions
11	6	11	13	41			7			42	560	1.2	General Public
16,916	3,388	3,707	13,087	1,433	7,484	-0-	412	615 195	-0-	1,898	48,155	100.0	
512	21	21	281	40	26	20	11	11		21	1100		Quarter

Y-T-D: MARCH

technical progress. Indeed, it is on this level that the Party's growing involvement in science and technology is most evident. Under many party committees, councils or commissions for S&T progress, non-staff departments or sectors of science, have been established in recent years; and, more and more, these structural forms are the primary action mechanisms through which the Party hierarchy exerts pressure and influence on policy direction and implementation. Through this nonstaff party apparatus Party authorities link and integrate scientists, engineers, and production managers in the cause of technological innovation and diffusion.

Such organizational practices are not a new phenomenon in Party activity. Khrushchev in particular promoted the rapid development of various forms of public participation and the growth of a volunteer apparatus as a nonstaff adjunct of the regular Party machinery. However, the former First Secretary also used "public principles" for his own political ends and struggle against the bureaucratic establishment. To a large extent, these organizational forms developed as instruments of public pressure and social control in and against both the state and party apparatuses. Carried to an extreme at times, they led to a motley of nonstaff departments and organs that virtually paralleled the regular structure of the party committees. Volunteers were often amateur enthusiasts whose intrusions in the work of the bureaucracy generally did little to improve its operations. Not surprisingly, like most of Khrushchev's innovations in Party organizational affairs, the nonstaff apparatus was extensively reorganized after his fall.⁶⁹

Significantly, the Brezhnev Party leadership in the late 1960s and early 1970s began to develop and reorient a part of the nonstaff

apparatus toward the problems of accelerating S&T progress. The expanded use of experts was made to meet the challenges of increased complexity and advancing technology. Various commissions and councils were formed under the auspices of Party committees and were generally led by a party secretary or staff official. These new structural forms brought together research scientists, design engineers, technologists, construction experts, planners, and industrial administrators who could advise and assist Party authorities in resolving complex problems in science and technology. In general, the Party apparatus (especially at its intermediate levels) has lacked the personnel and resources to engage significantly in technical decision-making.⁷⁰ The formation and use of "public" councils and commissions have provided Party organs with a reservoir of outside specialists who can be tapped to supplement full-time Party functionaries.

In light of the expansion of Party initiative and influence in S&T related matters the growth of a nonstaff "expert" apparatus has other important political dimensions. The possibilities for petty tutelage and direct intervention by Party organs have been extended well beyond anything imagined by Khrushchev. At the same time, his successors have appreciated more than Khrushchev the need for expertise in solving management problems in both science and the economy. Fully aware of the lessons and limitations of his policies, they have been most anxious to avoid a repetition of past mistakes and of a situation in which Party intervention leads to excessive meddling and bungling. Economic planners and government administrators undoubtedly cite the Khrushchevian legacy as a powerful argument against undue

Party interference. But the Party apparatchiki themselves are also aware of the possible criticism and consequences to which they expose themselves should they intervene without restraint and without substantial "scientific" justification for their actions. In contrast to Khrushchev, therefore, there is greater realization among the ruling elite of the need to base Party initiative and intervention on sound analysis and expert knowledge. For many apparatchiki this is probably as much to protect themselves against renewed charges of subjectivism and adventurism as it is to prevent the rise of harebrained schemes and recurrence of previous errors. Thus, by relying upon these councils and commissions of experts, Party officials can raise the quality and effectiveness of their decisions. These new structural forms provide Party committees therefore with a means by which they can combine scientific authority with political power, and bring them to bear on the solution of pressing problems.

Significantly, it is at the intermediate levels of the Party hierarchy that the growth and use of nonstaff structures for promoting S&T progress have been most apparent. There is no evidence to suggest that a Commission or Council for S&T Progress has been created under the CPSU Central Committee or under any republic Party Central Committee. At the same time, we do know that this kind of structural form is used at the highest Party levels for purposes of complex problem-solving. Eduard Shevardnadze, the Georgian Party First Secretary, told a republic Central Committee meeting in December 1979:

The practice of the last few years has totally confirmed the expedient of creating working organs of the Party Central Committee and local Party committees, such as, standing or temporary commissions. These commissions,

which are led as a rule by members of the Central Committee Bureau, members of the Central Committee, and members of local Party committees, make it possible to focus the efforts of various departments and organizations as well as a range of leaders on achieving end results in a particular sphere.⁷¹

He revealed that a commission had been set up a few months before to deal with problems of mechanizing manual labor. Another commission, led by a secretary of the Central Committee, had been created earlier to oversee the solution to problems of modernizing existing enterprises with minimal capital investment. Obviously, both these examples touch directly S&T issues.⁷² At the same time, Shevardnadze observed that the effectiveness of these commissions was not always high and that improvements were needed. In particular, he stressed, it was necessary "to strengthen their coordinating role--for that is what it is, a coordinating role--in the functioning of all services designed to impose strict order everywhere and in everything."⁷³ A more explicit description of the linkage and integration functions of this structural form could not be found. It is largely through such commissions and councils, moreover, that several regional party committees have performed as powerful interdepartmental and intraregional forces for integration. In just what ways they exercise these functions will be examined shortly.

The image of the Party hierarchy that emerges from this analysis is seemingly quite dichotomous. At the intermediate levels, on the one hand, pockets of innovation stand out where Party organs have become deeply involved and highly active in promoting S&T progress. They are led by energetic and hard-driving First Party Secretaries who dis-

play a willingness to take risks and a capacity to innovate. Examples would include G. V. Romanov (Leningrad Obkom), P. S. Fedirko (Krasnoyarsk Kraykom), A. P. Filatov (Novosibirsk Obkom), I. A. Bondarenko (Rostov Obkom), G. P. Bogomyakov (Tyumen Obkom), B. V. Kachura (Donetsk Obkom), V. F. Dobrik (L'vov Obkom), A. P. Botvin (Kiev Gorkom), and B. YaL'tsin (Sverdlovsk Obkom). Two of the most energetic and innovative regional party secretaries in the 1970s who rose meteorically to become CPSU party secretaries for the defense industry and for heavy industry, respectively, were Ya. Ryabov (Sverdlovsk Obkom) and V. V. Dol'gikh (Krasnoyarsk Kraykom). These officials appear to belong to that younger generation of Party leaders that George Breslauer characterizes as having greater self-confidence, a more activist win-orientation, a greater impatience to get on with improving the functioning of the economy, and a fuller appreciation and greater tolerance of complexity than the present ruling group.⁷⁴ Perhaps it was this group of party executives and the organizations they lead that the editors of Pravda recently had in mind when they wrote that practically all advances in technical progress were due to the actions of party committees:

Everything new, everything beneficial that has appeared in recent years in the sphere of linking science with production arose from, and blossomed with, the very direct and active participation of party committees.⁷⁵

Though an exaggeration of the role of Party committees in the development of science and technology, the statement does point to an undeniable expansion of involvement and influence of Party organs in the process of innovation, especially in certain regional areas.

This dynamism discernible in certain segments at the middle and lower levels contrasts sharply, on the other hand, with apparently strong inertia and inaction at the top of the Party pyramid. At the apex little evidence exists of organizational adaptation and reorientation toward technical progress. Rather, it is the stability of structure and continuity of personnel that stand out as dominant features.

This image, we hold, is a misleading and inaccurate description of political reality, however. Such an image, though partially true, does not square with our understanding of how the Soviet system works or how local Party organs function. That general knowledge plus specific fragmentary evidence suggests a picture of more complex relationships, mutual interactions, and supporting roles between central and local Party officials. Though their direct involvement and influence are less visible, central Party executives are very much at the core of local developments. This is particularly true in S&T related matters.

Traditionally, regional Party authorities have focused their efforts on production and capital construction, in large part because they command the requisite resources and decision-making authority to deal with these issues. As a consequence, it is in these areas that they have been able to perform entrepreneurial functions and an effective integrating role. At the same time, they have generally not been interested in or effective at spurring technological innovation and economic modernization because of their own power limitations. The most important resources for raising quality and introducing new technology have been--as has been the case since 1965 with the restoration of the central ministries--outside the scope of their authority.

Significant innovations in technology and product design are certain to require the approval and the appropriation of funds by the ministries, and powerful research institutes may also be active participants in these decisions. Thus to succeed at technical innovation usually requires special conditions: the regional Party committees must be firmly and extensively supported by central Party organs.⁷⁶

These special circumstances appear to be the basic environmental conditions that underlie the Party connection with S&T policy under Brezhnev. As Grossman suggests, "In spurring technical progress and innovation the local Party organs perform a function that rates very high on the central authorities' scale of values, but which after all may not be as entrepreneurial as that of regional [economic] coordination in the sense that the initiative may be less their own."⁷⁷ In recent years and months, local Party authorities appear to be reacting in many instances to explicit suggestions, instructions, and/or pressure to accelerate innovation from the central Party apparatus and in particular from Brezhnev and Kirillenko. The General Secretary has consistently throughout the 1970s placed a high premium on S&T progress, has repeatedly praised various technological and managerial innovations, has personally bestowed awards on or written congratulatory letters to innovators, and has himself made suggestions to various Party organizations to undertake innovations or to emulate the example of others. Kirillenko, who has general responsibility for management of the economy and for provincial Party organs, has increasingly in articles, speeches, and visits accorded special attention to accelerating S&T progress. These two individuals, more than anyone, appear to be the

prime movers behind the intensification of activity by local Party organs in S&T policy, a subject to which we now turn.

The Integrating Role of Local Party Organs
in Regional S&T Development

Why do some Party organizations become deeply involved in S&T policy matters while others do not? Why is the number of the former seemingly so small and of the latter so large? What factors contribute to the variability of response among local Party elites to technological imperatives and reformist pressures? These are complex questions to which there are no easy or simple answers. They are important to address, however, because even partial explanations begin to shed light on the much broader questions of why the Party hierarchy and the CPSU as a whole have been so slow to turn on to the scientific and technological revolution and have been unable to turn rapidly the system around to meet the challenges the STR poses.

Wrestling with the above questions, we must look beyond the personality and attitude of local Party leaders. Although their own backgrounds, professional training, and leadership styles are important in determining their general posture toward science and technology, these factors alone are, to use the terminology of political science, "a necessary but insufficient condition" to explain the behavior and role of local Party organs in S&T development. There are other significant determinants as well. Differences in economic conditions, in R&D resources, in local interests and priorities, in the relative importance of the region in national plans, and in capabilities to engage in innovation together produce a range of opinion and action among regional

33. See, for example, V. Yagodkin, "Partiinaia zhizn' v nauchnykh kollektivakh," Kommunist, no. 11 (1972), 54-62; V. Degtiarev, "Partiinye organizatsii i nauchno-tekhnicheskii progress," ibid., 14 (1972), pp. 15-19; "Sovershenstvovat' partiinyi kontrol' deiatel'nosti administratsii," Partiinaia zhizn', 8 (1973), p. 6. For more recent views on this question, see S. Avramenko, "Kontrol' i proverka ispolneniia--vazhneishaia chast' organizatorskoi raboty," ibid., 15 (1979), 18-23.

34. Quoted in L. V. Golovanov, "Sistema upravleniia naukoii v SSSR i voprosy ee sovershenstvovaniia," in Nauchnoe upravlenie obshchestvom (Moscow: Mysl', 1969), III, p. 35.

35. XXIV S"ezd KPSS, I, p. 80.

36. XXV S"ezd KPSS, II, p. 72.

37. Baybakov, "O sovershenstvovanii planirovaniia i upravleniia ekonomikoi," pp. 19-20. He did acknowledge that there were major differences of view between Gosplan and the S&T establishment over the future directions of energy policy. For background information on the evolution of the Comprehensive Program, see V. A. Kotel'nikov, "Razrabotka kompleksnoi programmy nauchno-tekhnicheskogo progressa na 20 let," Vestnik Akademii Nauk SSSR, 5 (1980), pp. 37-43 and his "Problemy perspektivnogo planirovaniia nauchno-tekhnicheskogo progressa," Planovoe khoziaistvo, 7 (1979), pp. 44-49.

38. XXIV S"ezd KPSS, I, pp. 80-81.

39. XXV S"ezd KPSS, II, p. 72.

40. Gennady M. Dobrov, "Science Policy and Assessment in the Soviet Union," International Social Science Journal, XXV, 3 (1973), p. 308.

41. XXIV S"ezd KPSS, II, p. 19.

42. For a more detailed discussion of Soviet perceptions of innovation problems and solutions, see Paul Cocks, "Organizing for Technological Innovation in the 1970s."

43. D. M. Gvishiani, "The Scientific and Technological Revolution and Scientific Problems," Social Sciences (Moscow), I (7) (1972), p. 52.

44. G. Popov, "How Reliable Are the Interfaces?" Pravda, July 27, 1976.

45. See, Paul Cocks, Science Policy in the Soviet Union (forthcoming from the National Science Foundation in early 1981).

46. The following discussion draws from my forthcoming book cited above.

47. M. I. Piskotin, V. A. Rassudovskii, and M. P. Ring, eds., Organizatsionno-pravovye voprosy rukovodstva naukoj v SSSR (Moscow: Nauka, 1973), p. 141.

48. See, for example, G. A. Dorokhova, "Sovershenstvovanie sistemy organov upravleniia naukoj," Sovetskoe gosudarstvo i pravo, 6 (1972), 59-66; B. P. Rassokhin and M. P. Ring, "Pravo i vnedrenie dostizhenii nauki i tekhniki," ibid., 3 (1973); Piskotin et al, Organizatsionno-pravovye voprosy rukovodstva naukoj v SSSR, pp. 187-192, 205; M. P. Ring, "Problemae upravlenie v nauke: pravovye aspekty," Vestnik Akademii Nauk SSSR, 8 (1976): 27-34; Yu. M. Mikhnevich, Ekonomicheskie problemy upravleniia nauchno-tekhnicheskim progressom (Leningrad, 1974), pp. 132-137; V. P. Rassokhin, "Nuzhna chetvertaia sistema nauchnykh uchrezhdenii," EKO, 1 (1980), 51-64 and his "Pravo, organizatsiia nauki i vnedrenie ee dostizhenii v proizvodstvo," Vestnik Akademii Nauk SSSR, 11 (1979), 43-53.

49. In June 1980, V. A. Kotel'nikov, a Vice President of the USSR Academy of Sciences and Chairman of the Joint Scientific Council of the Academy and SCST responsible for drafting the 20-Year Comprehensive Program for Scientific-Technical Progress, formally replaced Marchuk as head of the Science and Technology Commission in the Council of Nationalities. Marchuk had replaced Kirillin as Chairman of the SCST in January 1980.

50. Actually, there is considerable diversity in union republic Supreme Soviets with respect to the standing commissions. In several republics (Armenia, Kirgizia, Latvia, the RSFSR, Lithuania, Moldavia, and Tadzhikistan) there is one Education, Science, and Culture Commission. In Azerbaidzhan and Belorussia there is both a Culture Commission and an Education Commission. A Culture Commission and an Education and Science Commission exists in Georgia and the Ukraine. Estonia has a combined Education and Culture Commission; Turkmenistan an Education and Science Commission and a Culture and Sports Commission; and Uzbekistan a Science and Culture Commission and an Education Commission.

51. On this point, see Baybakov's speech to the general meeting of the Academy of Sciences in December 1979, "O sovershenstvovanii planirovaniia i upravleniia ekonomikoi," pp. 13-16 and his article in Trud, March 1, 1980.

52. See Ryabov's article, "Nauchno-tekhnicheskii progress i effektivnost' proizvodstva," Planovoe khoziaistvo, 12 (1979), 3-10.

53. Sovetskaia Belorussia, September 13, 1979.

54. I. P. Pogrebniak, "Nauka i proizvodstvo i effektivnost' sodruzhestva," Ekonomicheskaiia gazeta, no. 20 (May 1977), p. 5; Radyanska Ukraina, March 29, 1980.

55. Pravda Ukrainy, October 21, 1979.

56. Sovetskaia Moldaviia, April 27, 1979.

57. Leningradskaia Pravda, September 29, 1979

58. A. Kunaev, "Overall Solutions Are Needed," Pravda, September 23, 1979. Speaking on this issue, he noted, "Obviously it is high time that an integrated coordinating body be established in the republic whose task would be a concern for the overall development and rational utilization of natural resources on a strictly scientific basis as well as a search for optimum solutions." As regards the restoration of a republic SCST, he added, "Other solutions are also possible. One thing is clear-- a lack of coordination among departments, even more than the occasional disregard of scientists' recommendations, is not beneficial."

59. The idea of creating state committees for science and technology in various republics has been urged and discussed before, apparently at the highest political levels, but no action has been taken to date. See Dorokhova, "Sovershenstvovanie sistemy organov upravleniia naukoi," p. 65.

60. William J. Conyngham, Industrial Management in the Soviet Union: The Role of the CPSU in Industrial Decision-making, 1917-1970 (Stanford, California: Hoover Institution Press, 1973), p. 256.

61. At the Twenty-Fifth Party Congress, I. G. Kebin, the Estonian Party's First Secretary, mentioned these organizational experiments and urged that a nationwide study of them be made so that positive experience could ultimately find expression in the Party rules. The 1976 Congress, in fact, was the only congress that did not make any changes in the Party rules. See Paul Cocks, "Science Policy and Soviet Development Strategy," pp. 48-49.

62. Jerry F. Hough and Merle Fainsod, How the Soviet Union is Gov-

erned (Cambridge, Massachusetts and London, England: Harvard University Press, 1979), p. 411.

63. For a stimulating discussion of these aspects of the Party's role from the perspective of an economist, see Grossman, "The Party as Manager and Entrepreneur."

64. T. H. Rigby, "The Soviet Communist Party and the Scientific and Technical Revolution," in Rigby and Miller, Political and Administrative Aspects of the Scientific and Technical Revolution in the USSR, p. 38-39.

65. This point was made also more than a decade ago by the authors of the monumental OECD study on Soviet science policy (E. Zaleski et al, Science Policy in the USSR (Paris: OECD, 1969), p. 49). Despite the proliferation of information and studies on Soviet science and technology in the interval, however, this particular aspect has not been illuminated and remains as unclear as before.

66. Brezhnev, Ob osnovnykh voprosakh, II, 216-217, 299.

67. Moscow Domestic Service, August 4, 1930.

68. Sovetskaiia Belorussiaia, September 13, 1979.

70. On these point, see Jerry F. Hough, The Soviet Prefects: The Local Party Organs in Industrial Decision-Making (Cambridge, Mass.: Harvard University Press, 1969), pp. 207-213.

69. See Paul Cocks, "The Rationalization of Party Control," in Chalmers Johnson, ed., Change in Communist Systems (Stanford, Calif.: Stanford University Press, 1970), pp. 165-190.

71. Zarya Vostoka, December 11, 1979.

72. An Interdepartmental Council for Raising the Qualifications of Cadres has also been formed recently under the Georgian Central Com-

mittee as "the main organizing and coordinating link" in the development and implementation of a comprehensive system for management retraining. It is led by a secretary of the Georgian Central Committee. See Zarya Vostoka, November 3, 1979.

73. Ibid., December 11, 1979.

74. George Breslauer, "Political Succession and the Soviet Policy Agenda," Problems of Communism, XXIX, 3 (May-June 1980), p. 46.

75. Pravda, September 15, 1979.

76. See on these points, Hough, The Soviet Prefects, pp. 207-209 and Conyngham, Industrial Management in the Soviet Union, pp. 237-238.

77. Grossman, "The Party as Manager and Entrepreneur," p. 22.

78. Yu. Kanygin and B. Botvin, "Razmeshchenie issledovatel'skogo potentsiala," Voprosy ekonomiki, 5 (1979), pp. 42-43.

79. Ibid., pp. 43-44.

80. Ibid., pp. 47-48.

81. Sovetskaia Belorussia, September 13, 1979.

82. Pravda, July 12, 1980.

83. Kanygin and Botvin, "Razmeshchenie issledovatel'skogo potentsiala," pp. 41-42.

84. V. Degtiarev, "Partiinye organizatsii i nauchno-tekhnicheskii progress," Kommunist, 14 (1972), p. 12.

85. Kanygin and Botvin, "Razmeshchenie issledovatel'skogo potentsiala," p. 45.

86. Ibid.

87. On regional scientific centers, see S. V. Vonsovskiy, "Nauchnyi tsentr i proizvoditel'nye sily regiona," in I. M. Pospelova, ed., Nauka--narodnomu khoziaistvu (Moscow: Sovetskaia Rossiia, 1979), pp. 41-55; G. I.

Marchuk, "Uchenye Sibiri--strane," ibid., pp. 18-40; Vestnik Akademii Nauk SSSR, 9 (1979), pp. 51-55; Rabochaia gazeta, February 2, 1980.

88. V. M. Shramenko, "Deiatel'nosti partiinykh organizatsii po uskoreniiu nauchno-tekhnicheskogo progressa i vnedreniiu ego dostizhenii v proizvodstvo," in G. K. Kriuchkov, ed., Peredovoi opyt--v praktiku partiinoy raboty (Kiev: Politizdat, 1977), pp. 305-313; Ya. P. Pogrebniak, "Nauka i proizvodstvo i effektivnost' sodruzhestva," Ekonomicheskaiia gazeta, no. 20 (May 1977), p. 5; D. B. Golovko, "Sviaz' nauki s proizvodstvom," ibid., no. 45 (November 1978), p. 12.

89. See A. P. Dumachev, Partiinye organizatsii i proizvodstvennye ob"edineniia (Moscow: Politizdat, 1977) and A. N. Arzamastsev, B. D. Lebin, V. A. Kutuzov, and E. V. Mazalov, Deiatel'nost' Leningradskoi partiinoy organizatsii po sovershenstvovaniiu gosudarstvennogo apparata (Leningrad: Lenizdat, 1976), pp. 168-268.

90. G. Romanov, "Stupeni ekonomicheskogo rosta," Kommunist, no. 1 (1974), p. 91 and also his "Kompleksno, s perspektivnoi," ibid., no. 5 (1975), pp. 17-23; A. P. Dumachev, "Polnee ispol'zovat' rezervy," Ekonomicheskaiia gazeta, no. 45 (November 1978), p. 11.

91. Leningradskaiia Pravda, September 29, 1979 and October 21, 1979.

92. "Sayano-Shushenskaiia GES," Ekonomicheskaiia gazeta, no. 39 (September 1978), p. 2; V. I. Chalov, "Nekotorye voprosy partiinogo rukovodstva sozdaniem i razvitiem territorial'no-proizvodstvennykh kompleksov," Voprosy istorii KPSS, 3 (1979), pp. 52-53; G. V. Romanov, "Sozidatel'naia sila sorevnovaniia," Ekonomicheskaiia gazeta, no. 19 (1979), pp. 5-6; Nauka i zhizn', no. 10 (1977), p. 34; V. Disson, "Nauchno-tekhnicheskie programmy v narodnokhoziaistvennykh planakh," Voprosy

ekonomiki, 11 (1979), p. 28.

93. Spravochnik partiinogo rabotnika (Moscow: Politizdat, 1976), XVI, pp. 357-358; Romanov, "Sozidatel'naia sila sorevnovaniia," pp. 5-6; "Sayano-Shushenskaia GES," p. 2.

94. P. Fedirko, "Krasnoyarskaia desiatiletka: itogi, problemy, perspektivy," Kommunist, 10 (1980), pp. 34-35, 45.

95. P. S. Fedirko, "Povyshat' uroven' partiinogo rukovodstva khoziaistvennym stroitel'stvom," Ekonomicheskaiia gazeta, no. 33 (August 1977), p. 5.

96. Kanygin and Botvin, "Razmeshchenie issledovatel'skogo potentsiala," p. 47.

97. P. S. Fedirko, "S positsii novykh metodov khoziaistvovaniia," Ekonomicheskaiia gazeta, no. 51 (December 1979), p. 5.

98. Fedirko, "Povyshat' uroven' partiinogo rukovodstva," and Chalov, "Nekotorye voprosy partiinogo rukovodstva sozdaniem i razvitiem territorial'no-proizvodstvennykh kompleksov," p. 53.

99. Fedirko, "Krasnoyarskaia desiatiletka," pp. 41-44.

100. V. Dobrik, "What Teamwork Does: The Experience of Interdepartmental Science-Production Complexes," Izvestiia, February 1, 1980. See also V. K. Brublevskii, V. V. Kosolapov, and V. N. Mazur, eds., KPSS i nauchno-tekhniceskaiia revoliutsiia: upravlenie edinyim narodno-khoziaistvennym kompleksom (Kiev: Politizdat, 1978), pp. 209-210. and A. Vasilets and A. Pokrovskii, "Region i otrasl': Effektivnost' nauki," Pravda, June 1, 1980.

101. V. I. Podshivalov, Gorodskaia partiinaia organizatsiia i povyshenie effektivnosti proizvodstva (Kharkov, 1978), pp. 39-40.

102. Ibid., pp. 27-37, 41-42.

103. I. I. Sakhniuk, "Na kompleksnoi osnove," Ekonomicheskaiia gazeta, no. 4 (1980), 5.

104. F. S. Goryachev, "Na Magistraliakh nauchnogo progressa," Ekonomicheskaiia gazeta, no. 13 (1978), p. 5; A. Filatov, "Partiinye organizatsii i nauchno-tekhnicheskii progress," Partiinaia zhizn', no. 21 (1978), 37-42; A. P. Filatov, "Na novyi uroven' khoziaistvo-vaniia," Ekonomika i organizatsiia promyshlennogo proizvodstva, 1 (1980), 3-17.

105. B. Kachura, "Partiinye komitety i upravlenie nauchno-tekhnicheskim progressom," Pod znamenem Leninizma, November, 1978, pp. 6-10; also his "V Soiuze s naukoii," Ekonomicheskaiia gazeta, no. 1 (1980), p. 5.

106. V. Zuev, "Koordiniiruet sovet obkoma partii," Ekonomicheskaiia gazeta, no. 16 (April 1977), p. 7 and K. P. Murenin, "Ratsional'no raskhodovat' toplivoi energiiu," ibid., no. 52 (1979), p. 5.

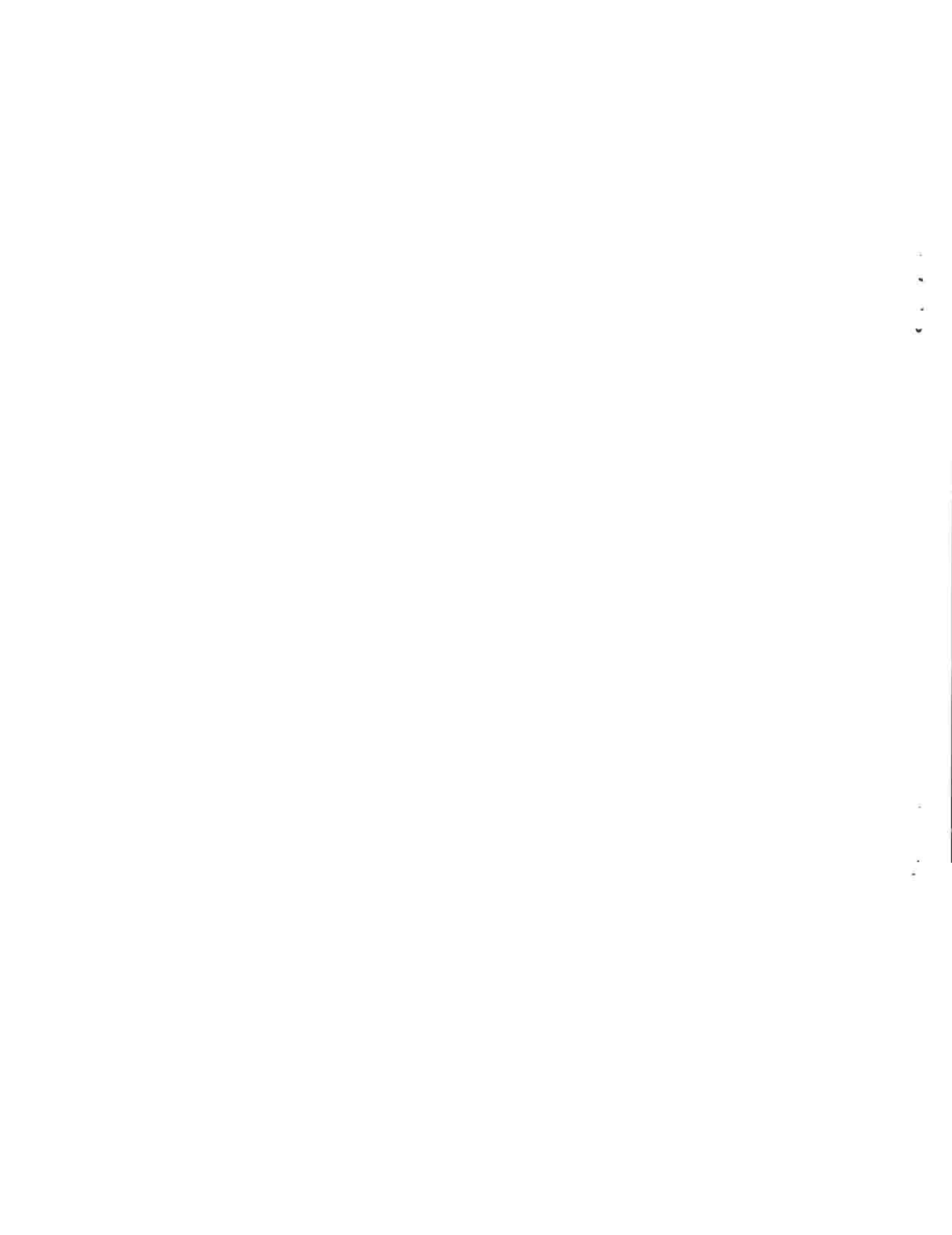
107. Hough, The Soviet Prefects, p. 210.

108. Cited in Merle Fainsod, "Bureaucracy and Modernization: The Russian and Soviet Case," in Joseph LaPalombara, ed., Bureaucracy and Political Development (Princeton: Princeton University Press, 1963), 252.

109. Leonard Schapiro, Rationalism and Nationalism in Russian Nineteenth-Century Political Thought (New Haven and London: Yale University Press, 1967), 168.

110. "Planirovanie i upravlenie nauchno-tekhnicheskim progressom v X piatiletke," Voprosy ekonomiki, 8 (1975), p. 122.

111. On these two guidance systems, see G. Kh. Popov, Effektivnoe upravlenie (Moscow: Ekonomika, 1976), pp. 128-136.



Party elites in this policy sphere.

Scientific research and development in the Soviet Union is very highly concentrated in a few large urban centers. A small group of the largest cities retain their dominant position, despite the pronounced trends over the past three decades toward regionalization of R&D and the accelerated growth of research potential in new regions and cities that previously were virtually devoid of scientific facilities (see Table 1). To be sure, the number of research organizations

Table 1. DEVELOPMENT OF URBAN SCIENTIFIC AND EDUCATIONAL CENTERS IN THE SOVIET UNION, 1914-1975

Year	Number of Urban University Centers	Number of Cities with large numbers of scientific workers				Number of Cities with large numbers of university students			
		More than 20,000 Scientific Workers	More than 10,000 Scientific Workers	More than 5,000 Scientific Workers	More than 1,000 Scientific Workers	More than 100,000 Students	More than 50,000 Students	More than 20,000 Students	More than 10,000 Students
1914	12	-	-	-	4	-	-	2	4
1950	33	2	4	6	32	2	2	14	32
1975	55	5	26	44	98	6	26	56	98

Source: Yu. Karygin and B. Borvin, "Razmeshchenie issledovatel'skogo potentsiala," Voprosy ekonomiki, 5 (1979), 40.

in such cities as Moscow, Leningrad, and Kiev and other "science capitals is growing at a slower pace than in the country as a whole. However, the growth rate of planned allocations for scientific research

and of scientific manpower in these major cities is practically the same as elsewhere.⁷⁸

More specifically, over half of the S&T resources (i.e., scientific manpower and planned allocations for scientific research) in the RSFSR are concentrated in three cities: Moscow, Leningrad, and Sverdlovsk. In the Ukraine the same situation exists with Kiev, Kharkov, and Donetsk. In all the other union republics more than half of their S&T resources are concentrated in the capital city. In 1975 over half of the nation's research potential was located in 11 cities: Moscow, Leningrad, Kiev, Kharkov, Novosibirsk, Sverdlovsk, Minsk, Tashkent, Alma Ata, Tbilisi, and Baku (see Table 2). If we add to this number another 11 cities (Donetsk, Gorki, Riga, Perm, Kazan, Dnepropetrovsk, Rostov, Chelyabinsk, Krasnoyarsk, Irkutsk, and Vladivostok), then approximately 80 percent of the USSR's resources for science and technology are concentrated in this group of 22 large urban centers.⁷⁹

This spatial location of S&T resources bears strongly upon Party involvement in the development of science and technology. For the vast bulk of Party organizations the acceleration of S&T progress is not a practical concern, but for a limited number of local Party organs this is a priority task and major worry. Indeed, it is largely in these 22 major cities that the growing engagement of Party organs is most evident. These cities represent only 13 percent of the capital cities of union and autonomous republics or territorial and oblast centers--that is, 13 percent of intermediate Party organs as well. Not only is the major part of the nation's scientific enterprise located in these cities but so too is the weight of the bureaucratic power

Table 2 . GEOGRAPHICAL DISTRIBUTION OF SCIENTIFIC RESEARCH
IN THE USSR

	1970			1975		
	Percent of the Number of Research Organizations	Percent of the Number of Research Projects	Percent of the Planned Allocations for Research	Percent of the Number of Research Organizations	Percent of the Number of Research Projects	Percent of the Planned Allocations for Research
Research in all Cities of the USSR	100	100	100	100	100	100
Including:						
Moscow, Leningrad, Kharkov, Novosibirsk, Sverdlovsk and union republic capitals	54.2	62.9	63.7	48.9	56.9	59.3
Other cities of the USSR	45.8	37.1	36.3	51.1	43.1	40.7
Moscow	25.7	27.2	24.7	14.7	23.9	24.7
Leningrad	6.7	9.2	8.1	5.8	8.0	8.7
Kiev	4.8	4.3	8.7	4.0	4.3	7.1
Kharkov	3.0	2.8	3.9	2.7	2.8	3.0
Novosibirsk	1.5	1.1	1.6	1.8	1.7	1.6
Sverdlovsk	1.5	3.1	2.0	1.7	2.6	1.9
Minsk	2.9	1.9	1.5	2.5	2.0	1.8
Tashkent	2.2	1.2	1.1	2.4	1.7	1.5
Alma Ata	2.3	1.6	2.9	1.7	1.4	1.6
Tbilisi	2.7	2.9	1.0	2.0	2.4	1.0
Baku	1.8	1.0	2.8	1.7	1.1	2.1
Total for these 11 cities	45.5	56.3	58.3	41.0	51.9	55.0
Total for all other cities in the USSR	54.5	43.7	41.7	59.0	48.1	45.0

Source: Yu. Kanygin and B. Borvin, "Razmeshchenie issledovatel'skogo potentsiala," *Voprosy ekonomiki*, 5 (1979), p. 43.

structure. Both the potential for achieving a faster rate of technological advance and the most formidable barriers blocking progress are found here.

Unlike the production base which evolved "vertically" within the framework of ministries and other agencies, the regional potential of R&D developed with some delay and lacks organizational cohesion. As a consequence, realization of this potential--the rational utilization of regional S&T resources--is impeded by interdepartmental barriers that are rooted in the organizational separation of R&D performers in various functional subsystems. In the Ukraine, for example, R&D organizations are subordinate to almost 80 ministries and departments while in Siberia the corresponding number is more than 50. In Kiev alone the scientific research and development network is fragmented among 57 ministries and different agencies while in Novosibirsk the R&D effort falls under 38 ministries and departments.⁸⁰ There are no special agencies that oversee and coordinate R&D on the krai and oblast levels. Masherov pointed this fact out to the September 1979 plenum of the Belorussian Central Committee and noted, "But each year there are more and more regional issues related to the optimum use of scientific and production potential in the local areas and to the coordination of the activities of scientific research institutes, project planning and design organizations, higher educational institutions, and production establishments." He then added, "In the future it is not impossible that distinct bodies to manage science will be organized under oblast Soviet executive committees."⁸¹

Increasingly, in fact, greater attention is being given to the theme of regional planning and management of R&D. Prof. K. I. Taksir,

Vice Chairman of the USSR Academy of Sciences' Scientific Council on the Economic Problems of Scientific and Technical Progress, wrote in Pravda in July 1980: "A more clear-cut, comprehensive regional system must be set up for managing S&T progress. The agencies that currently supervise this work at the local level function primarily on a volunteer basis, and for the most part their functions have not been officially spelled out."⁸² Significantly, he listed first among these volunteer agencies local Party committees' advisory councils and commissions on S&T progress. Again at issue is primarily the integrating role of Party organs in breaking departmental barriers and in securing more coordinated science and technology strategies within a given region or area.

Another feature of regionalization of R&D is the linkage between science and production. Indeed, the most important factor in the zoning of R&D has been played by various manufacturing branches of industry that are distinguished by more science-intensive technology, by relatively rapid obsolescence of equipment, and by frequent renewal of products. There is also a trend toward the increased regionalization of technology that is associated with the development of the extractive industry and primary processing branches, which makes them "privy" to the formation of regional centers for the development of technologies that are specific for various regions.⁸³ All of the major 22 cities that conduct the bulk of the nation's R&D effort are, in fact, large research and production complexes with specialization in specific areas. Thus, S&T information and technological innovations in these large centers "generate" S&T progress in adjacent economic zones and on a national scale as well. The Donetsk region, for example, in 1971

accounted for 16 percent of the coal extracted in the USSR, produced about 20 percent of the steel and more than 20 percent of the nation's metallurgical equipment. Innovations in technology and changes to improve the efficiency of existing plant and machinery that are made and used in Donetsk have an importance that far transcends the region.⁸⁴ Similarly, the Leningrad region produces more than half of the nation's electric power equipment, and some of the USSR's top priority R&D programs deal with the development and installation of superpowerful turbines and generators. In short, many of these 22 cities are the centers for solving major interbranch S&T problems of national priority. As two Soviet science policy analysts note, "The all-union functions of the research potential of large regions occupy first place. Therefore, the role of science centers, e.g., in the Ukraine, Siberia, the Urals, and the Far East, does not merely boil down to their regional significance."⁸⁵

To phrase the issue somewhat differently, these few cities and regional centers are the USSR's special nurseries for innovation. They have the responsibility to be the principal pacemakers of S&T progress. As Kanygin and Botvin emphasize, "The appearance of innovative branches was concurrent with the emergence of innovative regions and cities that functionally supplement the structurally vertical channels and that determine the intensification of production."⁸⁶ The importance of the science and technology being developed and/or used in these local areas generates the interest and involvement in S&T matters not only of local Party leaders but of CPSU officials at the center as well. It is this factor that makes possible the support to and back-up of local leaders from central Party organs.

In addition, these local Party organizations generally have available the S&T resources to engage in significant scientific research, development, and innovation. Important roles in this regard are played by various regional scientific centers, such as the Siberian Department of the USSR Academy of Sciences, both the Western and the Donetsk scientific centers of the Ukrainian Academy, the Urals Scientific Center of the USSR Academy, and the USSR Academy's new Interdepartmental Coordinating Council in Leningrad which is designed to serve the Northwest Region. These regional scientific centers have a pronounced applied research and development orientation, a strong territorial focus, and close ties with industrial research and production organizations as well as higher educational institutions. Equally important, they tend to maintain cooperative relationships with their respective local Party organs.⁸⁷ Indeed this close interaction may be a source of friction with their Academy superiors, who may resent the intrusion into and influence over scientific work by regional Party authorities.

Several examples from the experience of Party organizations begin to illustrate how in practice local Party authorities perform important linkage and integration functions and the role of advisory councils and commissions in this work. The Council on S&T Progress operating under the Kiev City Party Committee, for example, brings together more than 500 scientists and production specialists, including nearly 200 doctors and candidates of science. The Council organizes its work into 15 interbranch and 7 branch commissions in various areas of technology. The commissions aim at accelerating innovation and the

technological level of production of all enterprises within the boundaries of the city regardless of departmental affiliation. Among the areas singled out by the Council are the utilization of synthetic superhard materials and instruments and the development of modern methods of smelting and casting of steel. The Council does much to propagandize advanced experience, holds seminars to demonstrate new innovations, and promotes the growth of cooperative agreements between scientific organizations and production collectives. If there were about 500 such agreements in Kiev in 1975, then by 1978 the number had climbed to over 1400.⁸⁸

In Leningrad there is no Council to Promote S&T Progress attached to the regional party committee. Rather, a special Section on Technical Progress exists under the obkom's Council for Economic and Social Development. The Section directs the work of technical offices (tekhnicheskie kabinety) set up under the raikoms. The specific task of the Section on Technical Progress is to propagandize and help disseminate new technology and production techniques. The Leningrad Obkom under First Party Secretary Romanov has taken several new departures in organization, management, and technology. The obkom spearheaded the efforts to create production and science-production associations in the 1960s, and Leningrad today has 35 of the 120 or so science -production associations in the country.⁸⁹ The obkom was also a pioneer in regional social and economic planning. Indeed, Brezhnev himself suggested in December 1971 that the obkom undertake on an experimental basis the formulation of a comprehensive development plan for Leningrad City and Province.⁹⁰ The obkom's Council for Economic and Social Development also works

closely with the new Leningrad R&D Coordinating Council. A major responsibility of the Coordinating Council is to develop a program on fuel and energy technology. A special shtab or headquarters has been established under the Economic and Social Development Council to oversee all efforts in the energy field. Still another expression of the strong interest of the obkom in science and technology questions was the proposal by the Economic and Social Development Council in October 1979 to set up a special center to coordinate scientific R&D in the area of powder metallurgy. The development of this new technology, the obkom discovered, was particularly impeded by departmental barriers among the ministries for ferrous and nonferrous metallurgy, heavy machine building and the machine tool industry, and the electrical engineering industry.⁹¹

The Leningrad regional Party organization also took the lead in creating within the framework of "socialist competition" new forms of interdepartmental and interregional cooperation in solving major national economic and S&T problems. These efforts began in December 1974 when 28 Leningrad R&D organizations pledged to develop and deliver in the shortest possible time and at least cost equipment and machinery for the Sayano-Shushenskaia Hydroelectric Power Station, including the first 640,000 kilowatt turbine. This initiative was supported by 43 production collectives in Krasnoyarsk. By decrees of the Leningrad Obkom and the Krasnoyarsk Kraykom special coordinating councils were set up in both cities to oversee this cooperative effort. Party groups in the participating Leningrad R&D organizations reported daily to their district party committees, who in turn were in close contact with the obkom. Soon an additional 140 enterprises and organizations from dif-

ferent republics and oblasts joined in the collaboration. A comprehensive coordination plan along with a detailed network scheduling chart was developed by the Krasnoyarsk Kraykom for this particular "volunteer" effort, and ultimately the project was formally incorporated into the Tenth Five-Year Plan by Gosplan as one of the nation's 200 priority S&T programs.⁹²

The initiative by the Leningraders was also formally approved in 1975 by the CPSU Central Committee, which recommended that such an approach establishing a common integrating goals structure be used more broadly in solving national complex problems. Brezhnev himself praised the initiative in a personal congratulatory message to the Leningraders and in his address to the Bureau of the Krasnoyarsk Kraykom on April 1, 1978 during his two month trip to Siberia and the Far East. Suffice it to say that by 1979 this form of socialist competition was being used by more than 200 Leningrad plants, production associations, and R&D organizations involved in such major interbranch programs as construction of the BAM (Baykal Amur Mainline Railroad), development of the Ust-Ilimsk and the Sayansk territorial production complexes, and agricultural development of the RSFSR's Non-Black Earth Zone.⁹³

The Krasnoyarsk Kraykom provides another example of a local Party leadership that has intervened actively to promote and integrate regional development of science, technology, and production. Party involvement is prompted by the scale and priority of the S&T problems at issue. The Krasnoyarsk Kray covers 10 percent of the total territory of the USSR. Within its boundaries are located some of the nation's most expensive crash development programs and most massive construction projects. Among the five major territorial-production com-

plexes being developed here are the North Yenisei complex which includes the giant Norilsk mining and metallurgical combine, the Sayansk TPK and the Sayano-Shushenskaia Hydroelectric Power Station, and the Kansk-Achinsk fuel and energy complex, which will be the largest of its kind in the world. These TPKs are the points of end use for some of the USSR's top priority S&T programs. In the period 1971 to 1979 more than 21 billion rubles were spent on capital investment in the Kray, including more than 13 billion rubles for construction and installation work.⁹⁴ Nowhere in the Soviet Union does the scale of construction come close to that in the Krasnoyarsk Kray.

Actually the Krasnoyarsk Kraykom has utilized for some time two public councils to advise and assist the Party Committee on S&T matters. In 1967 a Science Council was created under the Kraykom to coordinate research, to focus scientists' efforts on the most important areas, and to accelerate the practical application of results. The Party Committee also relied upon recommendations of the Council on how to develop a system of scientific research and development organizations for the Kray.⁹⁵ Even today applied R&D in branches such as oil extraction, oil refining, gas extraction, chemistry and petrochemistry are still poorly developed in Siberia. The testing and debugging of engineering designs and technological processes are complicated due to the lack of centralized and interbranch support and testing facilities in the region.⁹⁶ The Krasnoyarsk Affiliate of the Siberian Division began to be formed only at the end of the 1970s. To a large extent, there has been no coordinating center for S&T activities apart from the Kraykom.

A Technical-Economic Council also exists under the Krasnoyarsk Kraykom. Prominent scientists and production specialists sit on the

Council and make recommendations on pressing issues of regional development. Along with the Leningrad Obkom the Krasnoyarsk Kraykom has been in the forefront of long-term comprehensive regional planning. Planned targets for the development of production forces for the period 1971 to 1980 were laid down early in the past decade and were incorporated as special addenda in the Ninth and Tenth five-year plans. Currently, the Kraykom is formulating a Comprehensive Program to introduce technological innovations into production up to the Year 1990. The program includes 14 branch subprograms (e.g., coal industry, ferrous and nonferrous metallurgy, and geology) and 5 interbranch subprograms (e.g., greater use of industrial robots and mechanization of loading and unloading operations and warehouse work).⁹⁷

The integrating functions performed by the Krasnoyarsk Kraykom in breaking institutional barriers have taken other forms as well. The Bureau of the Party Committee, for example, has adopted the practice of taking joint decisions with appropriate ministries and departments in order to solve critical problems. Such decisions have concerned the development of the construction industry and of railroad transport in the kray. In all, more than 30 joint decisions have been taken.⁹⁸ The practice has also developed of joint work between the party committees of client enterprises and of construction organizations along with the creation of joint temporary party groups at construction sites. The kraykom has also developed socialist competition for the ahead of schedule commissioning of production capacities and installation of new technology. Here an important role is played by special staffs that are set up at shock construction sites and headed usually by gorkom or raikom secretaries. These staffs review and re-

solve all questions which arise in the course of fulfilling socialist obligations, coordinate the work of construction and assembly organizations, and cope with supply problems. For the 18 most important construction projects during the Tenth Plan socialist competition was developed along the lines of the Leningrad initiative in the Sayano-Shushenskaia Hydroelectric Power Station project with the participation of organizations from different parts of the USSR. To strengthen coordination and control over the most important construction objects in the Kray the Bureau of the Kraykom formed a special operational group with representatives from the kraykom frequently in the field. At the largest construction sites, such as the Sayano-Shushenskaia Power Station, the Krasnoyarsk plant for heavy excavating equipment, and the Kansk-Achinsk fuel and energy complex, coordinating councils have been established. Headed by secretaries of the kraykom, these councils include representatives from various ministries and agencies who can resolve disputes on the spot rather than have them pushed up the administrative ladder for delayed decisions.⁹⁹

Other party organizations exemplify a wide range of activities and initiatives in science and technology policy. In concert with the Western Center of the Ukrainian Academy of Sciences the L'vov Obkom has organized special interdepartmental research and production complexes in order to maximize local resources in tackling key problems. These complexes bring together organizations under different administrative jurisdictions--Academy, branch ministry, and ministry of higher and specialized secondary education. Research and production complexes have been created in the areas of machine-building, instrument-making, geology, and agriculture. Plans are presently underway to form a fifth complex for chemical technology. These complexes are led by a collegium

which includes representatives from the participating organizations. Although the head of each complex is a scientist, his deputy is the head of the appropriate branch department of the L'vov Obkom. These complexes are conceived as structural frameworks by which to promote the broad introduction of innovations and the conduct of a unified technology policy within the region. Among the major innovations achieved have been improved quality cathode-ray devices, better means of geophysical prospecting for gas and oil, and methods of inductive heat treatment of high-strength heavy-balanced drill pipe. Commenting on the experience with these forms of linking and spanning the research to production process, the First Secretary of the L'vov Obkom recently wrote:

I would like to stress that interdepartmental complexes offer new viable alternatives for territorial management of many branches of the economy of the province and even of the whole economic region. Therefore, our party organization sees its task in the very careful study, in an attentive attitude, and in active aid and support of creative 'science is production' complexes.¹⁰⁰

In Kharkov, a major machine-building center, the city party committee created in the early 1970s a Council on the Introduction of Scientific and Technical Achievements into Production. Formation of the Council was prompted by the realization that the episodic nature of the gorkom's involvement in science and technology prevented planned and comprehensive party influence on the acceleration of technical progress. Through the Council local Party authorities have since taken a direct role in spurring innovation. In 1974 the Council introduced 111 innovations with an estimated savings of 8.6 million rubles, and

in 1977, 273 major innovations worth nearly 21 million rubles.¹⁰¹ Besides various branch and interbranch commissions, the Council also includes within its structure a Council of Directors of major enterprises in Kharkov along with a Council of Chief Engineers. The latter Council meets monthly to examine progress on plan fulfillment for new technology and other measures to speed technology development and delivery. The Council on S&T Achievements also holds seminars for interested parties and influential innovation decision-makers.¹⁰² At the level of the Kharkov Obkom, the Council on S&T Progress supervised the implementation of a comprehensive regional plan, developed by the obkom, to raise the technological level and production efficiency of machine-building enterprises during the Tenth Five-Year Plan.¹⁰³

To promote closer interaction and cooperation between science and industry the Novosibirsk Obkom through its Council on S&T Progress has encouraged party committees of research institutes and production enterprises to hold joint meetings.¹⁰⁴ The practice of joint party meetings is also pushed by the Donetsk Obkom. The Donetsk regional Party leaders have also supported the idea of cooperative agreements between R&D and industrial organizations. These agreements may be geared to one specific project or encompass a range of activities to be performed within a year or longer time frame. In 1978 more than 700 such agreements were signed. The Donetsk Obkom has also recently created public commissions to accelerate technological innovation under all the branch departments of the obkom. In addition, the obkom is one of the few regional party organizations to have developed a Com-

prehensive Program for S&T Progress and Its Social and Economic Consequences to the Year 2000 for the province.¹⁰⁵ In Tomsk the obkom has formed a Coordinating Council for Science under the obkom's Department of Science and Higher Educational Institutions while the Saratov Obkom has created besides a Council on S&T Progress a separate Science Council to advise and assist on major development problems in the oblast.¹⁰⁶

Unfortunately, it is difficult to assess the effectiveness of these new instruments and directions of party involvement in science and technology policy. Data is lacking on the details of activity, much less the end results. Though some of the new integrating structures for promoting technical progress and innovation have come into view, the processes and political dynamics that underlie these structures are still wrapped in mystery. Moreover, it is important to avoid confusing the condition of change with that of progress. A condition of change does not necessarily reflect a measure of progress toward objectives.

On balance, however, it appears that local Party organs are beginning to play an increasingly important, if not entirely effective, integrating role in the development of science and technology, the importance of which transcends their own regional boundaries. As Jerry Hough has noted, the direct impact of the local Party organs is probably not as great as the indirect impact. The various councils and commissions made up largely of outside specialists probably continue to have their greatest influence through persuading administrators to take action rather than through providing the basis for local Party compulsion. As Hough explains, "To the extent that the local Party organs

play a significant role in this realm, it is not because they are forever intervening to impose their will but because they provide a local channel of communication which increases the probability that local technical decisions are made only after objections to them are given serious scrutiny."¹⁰⁷ In general, Party authorities largely through nonstaff "volunteer" structures have directed their efforts at getting the team play needed for successful innovation, at bringing the various participants in the research-to-production process together, and at building a unity of purpose and a commitment that transcends the parochial preferences of each player.

The Party as Modernizing Agent

On a broad level, the response of Kremlin leaders to the contemporary revolution in science and technology reflects not only distinct Soviet influences but also the continuing effects of inherited Russian scientific and political traditions and patterns. Brezhnev's emphasis on the indivisibility of socialism and science echoes the definition of Communism as "Soviet power plus electrification," formulated by Lenin more than a half century ago. Similarly, the "historic task" of combining the achievements of the STR with the advantages of the Soviet system, laid down by Brezhnev in 1971, has a familiar ring. Early in the life of the regime, Lenin, too, insisted, "The Soviet Republic must at all costs adopt all that is valuable in the achievements of science and technology. The possibility of building socialism will be determined precisely by our success in combining the Soviet government and the Soviet organization of administration with the modern achievements of capitalism."¹⁰⁸ The bolshevik leader, however,

was following the path taken by Russian rulers, as far back as Peter the Great, who looked to science and technology as indispensable tools for overcoming Russia's backwardness. The practice of using the bureaucracy to foster development and change is also a well established pattern in Russian history. Indeed, the problem facing Soviet leaders in the 1980s is largely the same one that has bedeviled their predecessors for centuries: "how to run a country effectively with the sole aid of an outmoded autocratic system, and at the same time aspire to modernization."¹⁰⁹

To phrase the issue somewhat differently, the real challenge of the STR consists in breaking the continuity of history and developing within the Soviet system a capacity for innovation and adaptation that has been fundamentally lacking in the past. It is true that the Soviet Union has demonstrated remarkable innovative behavior in military technology. But the military sphere operates under different rules, motivations, and institutional arrangements than the civilian economy. Outside the defense sectors the regime has never been very successful at innovation and technical progress, except in a few select areas. The absence of an internal dynamic and adaptive capacity has resulted in the general pattern throughout Russian history of change largely by "fits and starts." Intermittently, the state is forced to administer the shocks of adjustment in the form of modernizing "revolutions from above." Typically, change is accomplished by heavy doses of technological borrowing from abroad and administrative coercion from within. In the Soviet period during the late 1920s and early 1930s when the machinery of government proved unwilling and unable to implement Stalin's policy of forced industrialization, it fell to the Communist

Party and its apparatus to administer the shocks of adjustment and to serve as the modernizing arm (or fist) of the political leadership.

At issue today from the Soviet perspective is not the question of building an "innovative society" per se, since the participation of "society" in the innovation process is still seen in rather limited and controlled terms. For all practical purposes, the dominant Soviet approach to technological innovation remains fundamentally management-centered rather than entrepreneur- or market-centered. Just as industrial advance is the product of state initiative and administration, the spur to innovation also comes from central political authorities. Since the mode of advance is predominantly "innovation by order" from the top down, heavy reliance is placed on administrative levers and bureaucratic instruments to drive the whole process. Indeed, the real issue turns on how to prod, persuade, teach, and transform the ruling establishment--the regular administrative machinery--into an "innovative bureaucracy." Consciously or unconsciously, willingly or unwillingly, contemporary Soviet leaders--like their predecessors--are finding themselves thrust into the role of a modernizing elite. Moreover, the Party and its hierarchy are once again being increasingly called upon by top Party leaders to serve as the instrument of reindustrialization, to overcome inertia and opposition to change in the bureaucracy of government.

In general, the relationship of the Party to the contemporary scientific and technological revolution has not been adequately addressed by Soviet writers. Little attention has been given to the impact of the STR on the leading role of the Party either in the unfolding of the STR or in post-STR--"post-industrial"--Soviet society. That is, the STR as an analytical category and organizing construct has not yet

been really worked into the subject of "Party construction." Unlike the proliferation of science policy studies in the USSR since the late 1950s, the literature on the Party and the STR remains relatively limited. Although Soviet research and analysis in the area of S&T policy have grown quite sophisticated and are rich in information and insight, discussions of the Party continue more or less in traditional terms. Furthermore, the Party's connection with S&T policy remains relatively unexplored in the general literature on science and technology.

In practice, however, the Party's role in the STR generally and in S&T policy specifically is being defined increasingly by the political context of the need to adjust the Soviet system to the changing conditions and new demands of the times. The Party is being called upon to close the gap between policy design and implementation. On the one hand, the Brezhnev leadership has made conceptual advances in reorienting policy toward technical progress and innovation. On the other hand, its efforts at restructuring the government to support conceptual change and the new policy orientation have run into problems of implementation. Institutions have proved stubbornly resistant to change. The leadership has found it extremely hard to recast the structure and attitudes of both a scientific and bureaucratic establishment that have taken decades to shape. More and more, the Party's deepening involvement in science and technology development is directed at overcoming departmental barriers and coordinating efforts to speed the innovation process, to prod bureaucrats and scientists alike in the pursuit of technical progress.

To be sure, the expansion of Party involvement in S&T development is prompted in part by design--to maintain its leading role in society and to increase party control over that sphere of action which is determining more and more the course of development of the USSR and its place in the international order. At the same time, however, this growing intrusion of Party organs is prompted in large part by default as well--by the failure of the Brezhnev regime to implement meaningful reforms and to make Soviet organization a force for rather than an impediment to innovation. Expanding the use of the Party to perform linkage and integration functions reflects the failure of the leadership to erect effective coupling and coordinating mechanisms within the system to facilitate and speed the research to production process. Here the Party is not so much usurping a role as filling a functional and institutional void that continues to persist. Similarly, the increasing resort to traditional mobilization techniques and political pressure tactics, such as socialist competition, reflects the failure to build an adequate incentive structure for innovation and to cope with the motivational and collaborative issues left unattended by previous approaches to innovation. In short, the deepening involvement of Party organs in S&T matters underscores the inability of the Brezhnev leadership to manage and execute its new strategy for science, technology, and economic growth, to reorient effectively its institutions and structures toward technical progress.

On another level, the new tasks being imposed on the Party tax its own adaptive capacity and its institutional capabilities to act as an integrating force for innovation. Indeed, the STR challenges the Party to be an "innovative organization." Although certain links

of the Party hierarchy appear to be responding to the challenge, the apparatus as a whole has been slow indeed to adjust its own internal structure and external relations to accommodate the STR. Bureaucratic opposition and inertia appears to be as rampant in the Party apparatus as in the governmental machinery. Restructuring the Party toward technical progress has made little headway under Brezhnev. Indeed, it is the similarities rather than the differences between party and government development that stand out.

As a result of the particular course followed by the Soviet Union in science, technology, and economic growth essentially two systems have evolved within the governmental structure for guiding technical progress. The primary line of influence is the basic economic system. This structure was created in the prewar years and evolved in response to the demands of rapid industrialization. Science and technology did not provide the principal motive force for its operation. Bearing a strong anti-innovation bias, this system remains fundamentally oriented to the expansion of existing patterns of production and technology. A secondary line of influence is exercised by a special set of structures and mechanisms which began to take shape around the mid-1950s with the burgeoning growth of the Soviet R&D effort. This supplementary system attends to the problems of science and technology policy and performance. Acceleration of the rate of innovation is one of its main goals. Each system has its own plans, budgetary practices, incentive schemes, and integrating administrative organs. Typically, however, there is a lack of coordination between the basic and supplementary systems. Indeed, they frequently work at cross purposes to each other.

In general, the focus of Soviet S&T policy in the 1970s centered largely on how to improve and integrate these two guidance systems. For the most part, the target of attention and action has been the supplementary system. This prompts one Soviet analyst to exclaim, "We must think of improvements in the basic system and must not confine ourselves to improving supplementary systems for the stimulation of S&T progress."¹¹⁰ At issue is largely the role and future of the supplementary system. On one side are those who question the need to improve and to preserve this secondary line of influence. For them the central issue is making the basic system work for science and technology. If the economy as a whole is not altered to inspire and promote technological innovation, then improvements in the supplementary system, no matter what, will be of no avail. If the fundamental workings of the economy can be so modified, then a supplementary set of S&T mechanisms will be unnecessary. On the other side, there are some who focus almost exclusively on improving the latter machinery. They tend to inflate its role and potential for accelerating S&T progress while downplaying the need for general system reorientation and change.¹¹¹

To a certain extent, it is also possible to see two systems within the Party structure for guiding technical progress. The primary line of influence is the basic party apparatus. This structure has taken traditionally a narrow view of science. Science was separated from production within the apparatus, which continues to be organized along branch lines. In general, Party officials have also had a "production bias" as their own self-interest has tended to coincide with that of economic managers. In addition, the apparatus has had a rather negative political orientation toward and adversarial relationship with science

with a strong focus on ideological control. A secondary line of influence is exercised by a special set of councils and commissions which began to emerge in the late 1960s and early 1970s. This supplementary system is focused on spurring technical progress and innovation. It is primarily a volunteer nonstaff structure that provides policy guidance and recommendations regarding S&T development but is clearly subordinate to the regular staff structure.

Similarly, the same kinds of arguments can be advanced with respect to the development of these two intraparty systems as with the two guidance systems in the governmental structure. Like the latter, the two systems within the party sometimes work at cross purposes. Above all, however, the supplementary system in this case has limited potential to influence appreciably the cause of innovation. The basic structure of the apparatus must be improved and oriented to technical progress. For the Party to function effectively as a modernizing arm the regular party hierarchy must be revitalized and made to work for science and technology. To date there has been little progress in this direction. Science and technology policy functions appear to be as fragmented and compartmentalized in the party as in the government, and severe departmental and psychological barriers exist within the Party structure that impede its own structural leap to an effective integrative force for innovation. If the Party hierarchy is to restore a sense of purpose and dynamism to the Soviet system, it must first overcome its own internal bureaucratic opposition and inertial forces.

NOTES

1. For discussions of contemporary Soviet science policy that take this more traditional approach and emphasis on party control, see Zhores A. Medvedev, Soviet Science (New York: W. W. Norton and Company, Inc., 1978) and selected essays in John R. Thomas and Ursula M. Kruse-Vaucienne, eds., Soviet Science and Technology: Domestic and Foreign Perspectives (Washington, D.C.: George Washington University, 1977).

2. Gregory Grossman, "The Party as Manager and Entrepreneur," paper prepared for the Conference on "Entrepreneurial Response and Economic Innovation in Russia and the Soviet Union," held at the Kennan Institute, November 1978, p. 19. The following observations on Berliner and Campbell are also taken from Grossman (ibid.).

3. Joseph S. Berliner, The Innovation Decision in Soviet Industry (Cambridge, Mass.: MIT Press, 1976), p. 41.

4. Robert W. Campbell, "Management Spillovers From Soviet Space and Military Programs," Soviet Studies, XXIII: 4 (April 1972), 586-607.

5. Grossman, "The Party as Manager and Entrepreneur," p. 23.

6. See Andrei Sakharov, Roy Medvedev, and V. F. Turchin, "Letter of Appeal of Soviet Scientists to Party and Government Leaders of the USSR," March 19, 1970, reprinted in Survey, no. 76 (Summer 1970), pp. 161-70.

7. See Erik Hoffmann, "Soviet Views of 'The Scientific-Technological Revolution,'" World Politics, XXX (July 1978), 615-645; Julian Cooper, "The Scientific and Technical Revolution in Soviet Theory," in Frederic Fleron, ed., Technology and Communist Culture: The Socio-Cultural Impact of Technology under Socialism (New York: Praeger, 1977), pp. 146-

179; Paul Cocks, "Science Policy and Soviet Development Strategy," in Alexander Dallin, ed., The Twenty-Fifth Congress of the CPSU: Assessment and Context (Stanford, California: Hoover Institution Press, 1977), pp. 39-52.

8. XXIV S"ezd KPSS: Stenograficheskiy otchet (Moscow: Politizdat, 1971), I, p. 82. This task was reaffirmed at the Twenty-Fifth Congress. (See XXV S"ezd KPSS: Stenograficheskiy otchet (Moscow: Politizdat, 1976), II, p. 237.

9. Leonid Brezhnev, Leninskim kursom, III, p. 113.

10. Pravda, October 8, 1975. He repeated this point at the 25th Party Congress (See XXV S"ezd KPSS, II, p.).

11. This statement was made before the December 1969 plenary meeting of the Central Committee. See L. I. Brezhnev, Ob osnovnykh voprosakh ekonomicheskoi politiki KPSS na sovremennom etape: Rechi i doklady (Moscow: Politizdat, 1975), I, p. 418.

12. XXIV S"ezd KPSS, I, p. 80; XXV S"ezd KPSS, II, p. 24.

13. N. K. Baybakov, "O sovershenstvovanii planirovaniia i upravleniia ekonomikoi," Vestnik Akademii Nauk SSSR, no. 5 (1980), p. 13. Meanwhile, a Vice President of the Academy told the same gathering: "The issue now is about developing and implementing a new conception of economic growth which relies on intensive development. But how do we understand intensification? There has still not evolved either in science or in economic practice a uniform perception of the essence and criteria of intensive growth." See P. N. Fedoseev, "Teoreticheskie problemy sotsial'no-ekonomicheskogo razvitiia na sovremennom etape," ibid., p. 27.

14. XXV S"ezd KPSS, I, p. 73.
15. Pravda, June 13, 1970.
16. Dzherman Gvishiani, Organization and Management: A Sociological Analysis of Western Theories (Moscow: Progress Publishers, 1972), p. 172.
17. For further elaboration of these points, see my "Rethinking the Organizational Weapon: The Soviet System in A Systems Age," World Politics, XXXII, 2 (January 1980), 221-257 and my "Organizing for Technological Innovation in the 1970s," paper presented at the Conference on "Entrepreneurial Response and Economic Innovation in Russia and the Soviet Union," held at the Kennan Institute, November 16-18, 1978.
18. XXIV S"ezd KPSS, I, pp. 179-180.
19. P. Danilovtsev and Yu. Kanygin, Ot laboratorii do zavoda (Novosibirsk: Nauka, 1971), p. 40.
20. L. I. Abalkin, "Khoziaistvennyi mekhanizm: nazrevshie voprosy sovershenstvovaniia," Ekonomika i organizatsiia promyshlennogo proizvodstva, no. 1 (1979), p. 11.
21. XXV S"ezd KPSS, II, p. .
22. Baybakov, "O sovershenstvovanii planirovaniia i upravleniia ekonomikoi," p. 13.
23. Brezhnev, Ob osnovnykh voprosakh ekonomicheskoi politiki KPSS na sovremennom etape, II, pp. 355-356.
24. Pravda, February 25, 1976.
25. Sovetskaia Belorussia, September 13, 1979. Commenting a few months later on the need for a fundamental reorganization of the economic mechanism, Masherov again insisted, "Without this it is impossible to count on any real progress--a fact that is important for all of us to understand." See Pravda, February 8, 1980.

26. See T. H. Rigby and R. F. Miller, Political and Administrative Aspects of the Scientific and Technical Revolution in the USSR (Canberra: Australian National University, 1976), Occasional Paper no. 11, p. 4.

27. Ibid., p. 79.

28. Pravda, March 31, 1971 and Brezhnev, Ob osnovnykh voprosakh ekonomicheskoi politiki KPSS, p. 437.

29. See, for example, D. Gvishiani and S. Mikulinskii, "Nauchno-tekhnicheskaiia revoliutsiia i sotsial'nyi progress," Kommunist, no 17 (1971), p. 23; "Partiinye organizatsii i nauchno-tekhnicheskii progress," Partiinaiia zhizn', 16 (1973), p. 30; "O dal'neishem sovershenstvovanii khoziaistvennogo mekhanizma i zadachakh partiinykh i gosudarstvennykh organov," Kommunist, 12 (1979), p. 4; Suslov's speech in Bryansk reported in Izvestiia, September 19, 1979.

29b. Pravda, February 25, 1976.

30. See Loren R. Graham, "The Development of Science Policy in the Soviet Union," in T. Dixon Long and Christopher Wright, eds., Science Policies in Industrial Nations (New York: Praeger Publishers, 1975), p. 34.

31. See M. Sviridov, "Partiinaiia zabota o vospitanii nauchno-tekhnicheskoi intelligentsii," Kommunist, 18 (1968), pp. 44-45 and P. N. Zavlin, A. I. Shcherbakov, and M. A. Yudelevich, Trud v sfere nauki (Labor in the Sphere of Science) (Novosibirsk: Nauka, 1971) as translated in JPRS 56945 (September 5, 1972), pp. 299-303.

32. Partiinaiia zhizn', no. 12 (1971), p. 36 and no. 17 (1972), p. 5. Also included in the figures are educational institutions, cultural establishments, and medical and health facilities; that is, in essence the "nonproduction sphere."