

Radio Free Europe/Munich
Office of the Policy Advisor
Background Information USSR

25 August 1959

WORK AND STUDY (II)

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by Edward McCrensky) p. 1
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INTRODUCTION

A major survey of Soviet education, issued with the authority of the North Atlantic Treaty Organization's Scientific Committee, has recently become available (appendix I below). Seen as a whole, it provides one of the most objective and thorough accounts of the probable future shape of Khrushchev's reforms which has yet appeared in the West.

The survey recognizes the effect which production training in engineering and applied sciences can be expected to have on university students, and finds that:

"it is likely to improve the quality of university graduates, even if substantially less time is devoted to academic work. Soviet and foreign authorities have criticized Soviet curricula for being too theoretical..." (page 8, section XIII, para. 43)

On secondary education, the survey is equally precise. Para. 46 makes the statement that:

"The introduction of compulsory eight-year education will mean that children must go to school one year longer,"¹

and draws the inevitable conclusion, which is still insufficiently recognized in the West, that:

"if production training does not exceed two out of six days, the extra year of compulsory schooling will compensate for on-the-job vocational training."

It has been confirmed (Pravda, 20 May, 1959) that there is at present no intention to exceed two days of production training in the average weekly schedule, and this level is in any event only to be reached in the 9th-11th grades.

Para. 47 deals with the evening and shift schools, which are to be attended by those who have an incomplete secondary education. It adopts the same tone of impartial realism:

"in the RSFSR, for example, the number in evening secondary schools is expected to double. Consequently, a larger percentage of youth in this age-group will receive secondary education than before the reform".

The Nato survey can therefore be said to be unambiguous about the improvements to be expected in Soviet elementary, part-time secondary and higher education. It appears to give little or no support to the recent prediction of Mr. Nicholas De Witt that "in the early 1960's in my judgement at least, education of youths 15 and older will have to be sacrificed." (Problems of Communism, May-June 1959)

Moreover Nato's findings can be buttressed by the recent statement of Allen Dulles, Director of C.I.A., who remarked in a speech to the National War College in Washington, D.C.:

¹See also Rheinischer Merkur, 14 August 1959, for a report which supports the conclusions of Dr. Mehnert's article in Die Welt, 18 July 1959.

"Soviet education is being pressed, and while special emphasis is being placed on education in scientific, technical and engineering fields which would add to their industrial and military strength, there is nevertheless, a general broadening of the educational base in the Soviet Union." (UPI Washington, July 28th, 1959)

As for the numbers of pupils in the various educational stages, some useful new data have been released by E. Afanasenko, Minister of Education of the RSFSR, in Party Life (no. 14, 1959, p. 15). Afansenko deals with the position in the RSFSR alone, where he claims there will be in 1965:

almost one million	more pupils in the	1st-4th grades	than now
five "	"	"	"
2.5 "	"	"	"
		5th-8th	"
		9th-11th	than

in the present 8th-10th grades (but many of these 2.5 million will be attending evening shift or correspondence schools; the remainder will be full-time polytechnical students).

These figures should not be disregarded merely because they come from a Soviet source; they indirectly bear out the extent of the demographic losses caused by the war, but they also suggest that the Party realizes the magnitude of the "bulge" in school population which lies ahead, and is concerned with the necessary preparations to meet it.

For example, Afanasenko's Ministry calculates that in 1965 there will be 1,307,000 9th-11th grade pupils undergoing production training at enterprises, about 300,000 at sovkhozy and R.T.S., and 913,000 on the kolkhozy. Hence even in 6 years' time, it is still expected that about half of the Republic's youth will be employed in agriculture. On the basis of 2 days' production work weekly per pupil, Afansenko predicts that 430-440 thousand jobs in industry, 99-100 thousand on sovkhozy and the RTS, and 300-306 thousand on the kolkhozy will be required for training purposes.

His concern at the difficulties in finding jobs for all his graduates is clearly expressed:

"Much work lies ahead in finding employment for youth graduating from the 8 year and secondary schools... in 1965 output from the 8-year schools will exceed 2,000,000, and from the secondary production schools 700,000. In every oblast, krai and autonomous republic, under the leadership of local party and soviet organs, plans for finding work for school leavers should be drawn up and a quota fixed for the factories which guarantees the acceptance of the youngsters. This has to be recalled because in some oblasts insufficient concern is being shown for allotting jobs to secondary school graduates."

The surplus at which Afanasenko hints is in no way surprising when it is recalled that in the USSR as a whole 1,400,000² students graduated from the 10th class this year. Reports of unemployment among juveniles in the Kuznetsk Basin (Trud, 28 July 1959), Orsk, south of Magnitogorsk, (Moscow Radio, 21 August 1959) and in Azerbaijan (lead editorial, Bakinsky Rabochy, 23 July 1959) show that his anxieties are in no way exaggerated.

As regards the detailed organization of polytechnical training, the Teacher's Gazette, Afanasenko's house organ, has published an illuminating review from a school in Voronezh of a year's work on the 9th grade experimental curriculum. Training was carried out at the Voronezh Electrical Factory for two days a week, six hours a day. The main difficulty encountered was the need for the instructors (who are recruited from the better workers) to fulfill their norms, which has made it essential to build a separate apprentice shop so as to avoid disturbing the work of the conveyor belt and production-line machine tools. While from a national economic point of view this arrangement is superior to building an electrical workshop attached to the school, it is not the equivalent of incorporating the adolescents into the production-line staff.

r.r.g.

²200,000 fewer than last year's published figure.

North Atlantic Council
3rd August, 1959
by Edward McCrensky
(extracts)

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II. Higher Scientific Education

2. Higher scientific education is provided primarily by universities and institutes. The former, slowly expanding in number, contain faculties in traditional academic fields. The institutes represent two types: single specialty and polytechnic institutions. Universities are distributed according to historical accident or to suit territorial and national ambitions, but many institutes have been located according to regional economic and industrial needs.

3. Students do not pay tuition in Soviet schools of higher education. The state finances education by stipends to students as fixed by the Ministry of Higher Education. About 80 percent of the 1,178,000 full-time students in institutions of higher education receive stipends, which usually range from 240 to 750 rubles monthly (from \$24 to \$75) but higher in some fields such as mining and chemical engineering with a scale of increases relating to stages of progress through the university. Students with grades of "excellent" in all their courses receive an additional 25%. The official rate of exchange is 4 rubles to the \$1, but the rate of 10 rubles to the \$1 is considered as more realistic.

4. All types of Soviet civilian institutions of higher education are known by the abbreviation "VUZ," (Vissheye Uchebnoye Zavedeniye) meaning Higher Educational Establishment. The Soviet higher education system consists of approximately 750 institutions located in some 260 cities and towns. The total enrollment in 1958 was roughly 2,100,000 of whom 1,200,000 were day-time resident students and 900,000 were evening and extension students. Of these, 400,000 day resident (33%) and 180,000 evening and extension students (20%) were in various fields of engineering. In 1957 about 240,000 students were graduated, including 80,000 engineers, of whom 66,000 were from full-time courses and 14,000 from evening and extension courses. For 1958, the graduates were 290,000 total and 93,000 engineers. Approximately half of the university students (30% in engineering) are women.

5. Graduate programmes lead to two different degrees: the degree of "Kandidat" (Candidate) which may be compared to an American doctorate, and the degree of "Doktor" awarded for major scientific or technical contributions.

6. The number of 10-year secondary school graduates has in recent years exceeded by far the number of available places in higher education institutes which normally admit around 225,000 full-time students. Consequently, higher entrance requirements have been set. For example, in June 1958, the Ministry of Higher Education, USSR, abolished the practice of allowing "Medalist" students to enter "VUZ's" without passing entrance examinations. All prospective entrants to higher education institutions are now ranked on the basis of competitive examinations in several subjects. Science and engineering applicants usually take examinations in the Russian language and in literature, mathematics, physics, chemistry and a foreign language. Applicants must usually score about 95% or higher in the examinations to be accepted.

7. Another significant change in entry requirements, introduced by the Ministry of Higher Education in 1957, states that persons who pass entrance examinations will be given preference if they have had at least 2 years of work experience. The first year the new regulations were in effect, only about 25% of entrants met the prior work requirement. Eventually, it is expected that 80% of "VUZ" entrants will have had at least 2 years work in industry.

8. A 1955 law decrees that 60 percent of university graduates in physics, mathematics, and chemistry and 80% of graduates in biology are to be assigned to secondary schools as teachers. The remaining 40% of the physics, mathematics, and chemistry graduates enter employment in industry or full-time research institutes or pursue advanced training.

III. Research in Higher Educational Institutions

9. The current reorganization of scientific research in the Soviet Union is placing special emphasis on expansion and intensification of research activities at the country's higher educational institutions. The Ministry of Higher Education is responsible for higher academic work and technical instruction in all Higher Educational Institutions and directly administers over 300 of them, including universities and polytechnical institutes.

10. The 767 educational-scientific institutions of higher learning in the USSR are based on the principle that teaching and research must be combined. They therefore make up a major group of research as well as educational organizations. These organizations may be classified into three main groups:

(1) Thirty nine Universities with a total full-time attendance of about 200,000. They are the only institutions where curricula are offered in broad fields of science such as mathematics, physics, chemistry and biology. They educate most Soviet scientists. Apart from teaching, the universities are expected to carry out research in all branches of knowledge.

(2) Polytechnical institutes have diverse technical faculties and train engineers and industrial specialists. For instance, Leningrad Polytechnical Institute trains students in 42 engineering professions, the Urals Institute in 36, and the Tomsk Institute in 37.

(3) Specialized Institutes concentrate in a single area of specialization.

11. An estimated 352 "VUZ's" (polytechnical and specialized) offer technological and scientific training. Trends in these institutions are toward closer liaison between science and industry, a pooling of effort on key projects by members of interdisciplinary research groups and more efficient teamwork by scientists studying similar problems.

12. Higher Educational Institutions in the USSR are expected to replace many of the research institutions now under the control of industrial ministries performing research on current industrial problems. Practical applications of research are being

planned. "VUZ's" will be moved to areas near the industrial installations for which they train specialists and to which they will be expected to give scientific support. The first "VUZ's" to be relocated will be those without suitable urban production bases, such as agriculture, fishing soil improvement, mining, and narrowly specialized industrial "VUZ's".

14. Lack of adequate co-ordination between the scientific work of "VUZ's" and that of the Industrial Institutes has been alleged to be a major deficiency in Soviet scientific research. Measures to correct this situation include: the creation of various coordination councils, the appointment of head institutes as permanent research planning and co-ordinating centers for research in their specialties, the establishment of problem laboratories for interdisciplinary research, the organization of more scientific meetings and conferences for the exchange of information, and the publication of new journals to disseminate research results.

15. Directors of the Higher Educational Institutions have recently been given more independence in deciding internal questions, although they must still report to the Ministry of Higher Education, and in the case of an institution subordinate to another ministry, to that ministry as well. The director, as chairman, presides over his Institute's Learned Council, which assists in planning the scientific research activity of the establishment. Each professor who heads a chair - the primary unit of academic organization - is responsible for its research work and controls the planning and execution of scientific projects by the research groups and laboratories attached to it.

16. Professors and instructors are now being given more time and incentives to conduct scientific work; their suitability for staff appointments has been made dependent on their research results; and measures have been adopted to give them practical industrial experience so that their theoretical research will meet current practical demands.

17. To intensify research in scientific areas of highest priority, the Ministry of Higher Education is establishing "Problem" laboratories at leading institutions. Here outstanding scientists work full-time in research on selected high priority problems. These laboratories will be supplied with the very latest equipment and financed by State budget funds or by the industrial funds of the Councils of National Economy, depending on their type of work.

18. The quality of research among the "VUZ's" as a whole is considered to be very high at the universities, almost as high as the polytechnical institutes, and lower at the specialized schools. This is especially true in such fields as physics and engineering science, which have been chosen for intense application of scientific effort because of their great importance for defence and the industrial power of the USSR. Recent Soviet technological successes such as the launching of the Sputniks, the first ICBM experiments and the building of the TU-114, owe much to fundamental research, which the Soviet Union appears to consider as the most efficient way to achieve end items. The "VUZ's" are doing an ever increasing part of this fundamental research.

IV. Status and Salaries of Soviet Teachers and Professors

19. Salaries of teachers in general schools are fixed by Republic Ministry of Education, but the scale varies according to the region and the teacher's position and years of service. Teachers in areas offering less desirable living conditions get higher salaries than those in cities and other areas usually considered attractive.

20. Salaries of new teachers are equal, in general, to those of doctors and engineers, and they can make extra money by increasing their teaching load or serving as group leaders in Young Pioneer circles. Merit teachers get higher salaries or a bonus. There are periodic increases, according to length of service. Pensions are granted after 25 years, but a teacher with more than 25 years of service who continues to work receives both pension and salary.

21. The base pay of a Soviet professor is 5,000 rubles per month and that of a docent is 3,500 which may be compared to the 800 rubles earned by a skilled specialist. Deans get 1,000 rubles monthly above base pay. Professors are permitted to hold additional jobs which increase their salary by up to 50%. These jobs may involve supervision of sponsored research within their own faculty, simultaneous appointments at other schools or research institutes, position within the Ministry of Higher Education, or the technical councils of other ministries, or editorships of technical journals. A professor may also accept as many short-term industrial consulting contracts as he can fill without interference with his official duties, and standards here appear to be broadly applied.

22. Besides a second regular job and consulting assignments, many professors engage in textbook and monograph writing, which is paid at the rate of 100 to 200 rubles per page, the figure depending on whether the manuscript is accepted as a textbook and on the number of copies printed. Other sources of income are cash prizes for technical achievements, the additional salaries for members of the Academy of Sciences (2,500 rubles per month) or Corresponding Members of the Academy (1,500 rubles). It is estimated that the average income of a Soviet professor is 7 to 10 times that of the semi-skilled worker in the national economy.

V. Recruitment and Appointment of Professors

23. The Ministry of Higher Education now appoints rectors of universities but plans are now being made to have them elected for 3-year period by the university faculties. When a vacancy for a professor occurs, it is widely advertised, and applicants submit statements of the qualifications, their history, and copies of their publications. A committee of the faculty concerned studies the applicant's papers and reports its findings to the Academic Council of Scientists, an all-university body which selects by a secret ballot, the person to be chosen. Appointment becomes final when confirmed by the Ministry of Higher Education.

24. Appointments of professors are for a five-year period, Each position is declared vacant every five years and a competition is announced to fill it. In most cases, the holder of the position

is one of the applicants, and if his performance has been satisfactory, he is usually reelected. This appointment procedure is intended to keep the academic staff alert and to eliminate those who fail to readjust their teaching and research to new technological demands.

25. A faculty member over 60 years of age (55 for women) may voluntarily retire on 40% of full salary. Retirement is not compulsory at any age and many scientists and teachers remain on duty well past the retirement age provided they can secure re-election.

VI. Requirements for Academic Positions

26. The formal requirements for academic positions are closely associated with academic degrees. The position of professor requires the doctor's degree. Similarly the position of docent requires the candidate's degree. In rare cases these requirements are waived. A diploma is sufficient qualification for the position of assistant or instructor; most people in these grades are working for advanced degrees.

27. The Soviet graduate study programme almost completely by-passes course work and concentrates on research carried out apprentice-like under a recognized scientist. The normal working day is six hours, and there are six working days per week. Of this total of some 1,500 hours per year, a professor is expected to spend 500 to 600 on his teaching, 500 to 600 on research and the rest on writing, consulting, editing or as he sees fit. The teaching load of a docent is somewhat higher, varying from 720 to 840 hours. The teaching load includes lecturing, equivalent to three to six hours per week, and in addition, student counseling, laboratory sessions, thesis and project supervision and the preparations of notes for lectures.

VII. Technicums

28. Considerable attention is also given to the preparation of semi-professional technical personnel whose competence lies between the skilled worker and the professional specialist. Such workers are trained in special secondary school establishments, called technicums administered in 852 cities with a total enrollment of 1,961,000 students and a total staff of 96,000 teachers.

29. All technicums follow the same programme for training in a particular specialty. The programme consists of classroom instruction, individual laboratory work, and industrial practice. Students to complete the programme must successfully defend a diploma project or pass a State examination.

30. Until 1951 applicants for entrance to the technicums were graduates of the 7-year school. Since then, graduates of the 10-year school have been admitted to the technicums. By 1956, 60 per cent of all students in technicums had finished the 10-year school. For students who have completed only 7 years, the technicum programme is from 3 to 4 years in length, depending on the specialty. For graduates of the 10-year school, the programme is from 2 to 2 1/2 years.

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31. Most of the graduates of technicums enter industry, however, excellent students may enter institutions of higher education, or continue their studies by attending part-time courses at an institute. Technicum graduates are required to have three years of full-time work experience to qualify for entrance to a higher educational institution as a full-time student.

VIII. Correspondence Study in Higher Education

32. In 1958 more than 696,000 persons were enrolled in correspondence courses. Between 65 and 70 percent of the universities and institutes maintain correspondence facilities.

33. Industrial establishments cooperate in the correspondence study of their employees by paying their wages for a month, once or twice a year during the period when the student is actually at the institution to review the year's study or prepare for examinations. In some industries students doing well in correspondence courses are given shorter hours of work to allow for more study time. To complete diploma work, the student is given 4 month's leave; for the first month he is paid by his employing establishment and for the other 3 he receives a stipend from the educational institution, which also pays the cost of travel to and from the point of employment.

34. A network of "consultative points" are distributed throughout the country where students may discuss questions arising from their correspondence study. At least once a year, all students go to the institution in which they are enrolled to present their written work and to take practical and theoretical examinations.

IX. Current Developments in Soviet Scientific and Technical Education.

35. Changes currently being made in the Soviet educational system aim to provide full-time secondary and higher education for only the most capable students and to introduce a multi-tract system that will divert other students into vocational and on-the-job training. Emphasis in both secondary and higher schools appears to be shifting from a highly theoretical to a more practical and production-conscious base.

X. Secondary Education - the 10 year schools

36. General-education schools, referred to as "10-year schools" form the basic units of the secondary education system. As originally conceived, the secondary schools were to provide education for all Soviet youth, but in reality only a small proportion of school-age pupils completed the 10 year programme. The 10-year school system, therefore, retained only the academically most able. After the 4th, 7th and 10th grades, comprehensive written and oral examinations covering the previous several years' work to be passed before the pupil was allowed to continue to the next level. A pupil that failed left the academically oriented schools and entered any one of a number of special programmes such as on-the-job training courses or labor-reserve schools attached to factories and plants.

37. The intensive university preparatory orientation of the 10-year school curriculum did not seem to equip those

students not proceeding to the university for jobs in industry. Reflecting this opinion, the 19th Party Congress in 1952 ordered "poly-technization" to be emphasized in Soviet education. The "poly-technic" concept apparently means that equal educational emphasis is placed on both theory and application. The Soviet emphasize that students with only theoretical knowledge of scientific principles on which production processes are based are therefore not trained in useful work skills. If only work skills are taught without theory this is not considered "polytechnic".

38. A modest beginning was made in 1954 by the inclusion in the academic curriculum of some "polytechnic" courses (technical and electric apparatus, and visits to farms and factories). Extra hours for these courses were taken from the humanities to keep the science subjects intact. Lack of laboratory and plant facilities, of qualified teachers, and of appropriate pedagogical methods has slowed the process of "polytechnization".

39. In 1956 a new study plan was adopted on an experimental basis in 500 schools. Besides allowing more time for shopwork and work on agricultural plots in the 5th to 7th grades, the experimental curriculum also provides for production training at industrial plants and at state and collective farms as part of the regular secondary school course. Elective courses for 2 hours a week in grades 8 through 10 are permitted, but the students must choose from among practical courses. The elective courses include such subjects as machine maintenance, lathe and milling machine operation, electrical and radio technology, and the handling of cars and tractors. During the 1957-58 academic year, the experimental curriculum was extended from the original 500 test schools to one-quarter of all schools.

XI Work-and-School Plan

40. In December 1957, the Ministry of Education of the Russian Socialist Federalist Soviet Republic, the largest republic inaugurated a new educational programme in fifty 10-year schools extended in 1958 to about 200 schools. This programme provides for 9th and 10th grade pupils to attend classes 3 days a week and work in industry 3 days a week. Rural school children attend classes during the winter months and work on farms during the spring and summer. In order to adequately cover the academic material, the curricula of these particular 10-year schools have been lengthened to 11 years. Upon graduation, pupils receive not only the usual graduation certificate, but also a qualification certificate of specialization (e.g., a lathe hand, a locksmith, or a milling machine operator certificate). This experiment, and the 12-Year Labor Reserve Schools also recently started, diversify the types of schools available to those pupils who prove to be less than "college material".

XII. The Multi-Track Educational System

41. In a speech to the 13th Young Communist League in April 1958, Nikita Khrushchev severely criticized the Soviet 10-year schools, stating that they trained pupils only for entry into higher educational institutions. Suggesting that secondary schools be combined with factory and trade schools, he stated that at a certain grade, pupils should learn a trade. In September 1958, Khrushchev again discussed educational reforms

and criticized secondary schools for turning out graduates lacking in practical training and opposed to working with their hands. In a memorandum directed to the Presidium of the Central Committee of the Communist Party USSR, he proposed educational changes that carried earlier developments a step further. Only the "gifted" would be allowed to continue secondary education in 10 years full-time and be taught a trade or go to work part-time and spend two or three days a week in school, with studies extended to 4 years.

42. A number of factors underlie this change in educational policy. The Soviet state desires all youth to have a wholesome attitude toward labor, to be able to relate theory to practice and to be psychologically prepared to do agricultural or industrial work. The new policy also reflects the Soviet need for additional skilled manpower. Furthermore, in recent years larger numbers of pupils have been graduating from 10-year secondary schools than can be absorbed by Soviet higher educational institutions. The proposed "polytechnical" programme is designed to provide an outlet to immediate industrial and agricultural employment for those not continuing their higher education.

XIII. Reforms on Higher Education

43. Experience in production will still entitle a student to preferential treatment for admission to higher educational institutions. Whether this will be required in addition to the production training and experience in the proposed 11-year programme remains to be seen. Production training in engineering and other applied sciences is likely to improve the quality of university graduates even if substantially less time is devoted to academic work. Soviet and foreign authorities have criticized Soviet curricula for being too theoretical. The diversion of effort to "work experience" for students in the pure sciences may prove a hardship. Nevertheless, the laws' requirement are less stringent for these disciplines and professors are expected to see that their students perform jobs having academic value.

44. In the Soviet environment, with stipends and the pressure for an advance degree, good prospects will not easily give up further schooling. Industry will get some useful labor support from the programme and will therefore cooperate more effectively.

45. The Soviets apparently feel that their supply of engineers has fairly well caught up with present and expected needs, and they are now readjusting the machinery for a situation of slower growth and near balance between the supply and demand for technical personnel. At present some thought can be given to limiting the frustration and maladjustment among young people due to imbalance between secondary and higher education. Apparently, undergraduates in the applied sciences and engineering may have to work in industry for their first two years, studying part-time. The all-union legislation is also specific that students even in the most difficult theoretical disciplines, such as physics, chemistry, mathematics, will study (full-time) for their first two years and work at a later stage in their undergraduate education where every effort apparently will be made to provide work experience in research and similar institutions. In such disciplines only one year of work experience may be required.

The study programmes at universities and institutes, which would make it clearer how the principles of the legislation may be applied, are not yet available.

46. The introduction of compulsory eight-year education will mean that children must go to school one year longer. The "polytechnic" emphasis should better prepare these graduates for industrial and agricultural jobs. Soviet officials claim that the quality of academic work will not decline in the newly organized programmes. If production training does not exceed two out of six days, the extra year of compulsory education will compensate for on-the-job vocational training.

47. Expansion in the enrollment of evening and "shift" secondary schools will come from the group of young workers who previously had not completed their secondary education. In the RSFSR, for example, the number in evening secondary schools is expected to double. Consequently, a larger percentage of youth in this age group will receive secondary education than before the reform.

XVII Incentives and Motivation

63. Incentives to motivate research activity are based on recognition, personal prestige, material rewards and other forms of reward. Scientific journals spur scientists on to more research not only through pressure on them to contribute articles for publication, but also because of the resulting recognition and pecuniary benefits. To encourage a suitably qualified person to leave industry for pursuing graduate research, his full industrial salary may be continued during three years of study, providing as much as 1,000 rubles a month, compared with a maximum of 780 rubles for a graduate student who has not spend time in production.

64. Prizes and awards also stimulate research attainment. First in importance among these are the Lenin Prizes. Two new awards, recently introduced by the All-Union Central Council of Trade Unions and the Committee for Inventors and Innovations of the Council of Ministers, are the title "Merited Inventor", with a gold medal for distinguished inventors and "Merited Rationalizer" with a silver medal for the best production rationalizers. These titles carry awards up to 50,000 rubles for inventions and 2,000 rubles for rationalization proposals. Financial incentives have been raised for scientists, engineers, and consultants who help in the development of inventions or technical improvements. Persons who contribute to the practical application of inventions may get as much as the inventor himself. During the first half of 1957, Soviet inventors and rationalizers submitted 800,000 proposals,

65. Further impetus to carry on research is provided by the regulation that staff in higher educational institutions must justify their retention of these posts in open competition against other candidates every 5 years. A professor with a record of published research has a great advantage.

66. The motivation of the student for superior accomplishment is an outstanding feature of higher education in the USSR. This motivation is based on prestige, privilege, financial reward, and obligation to serve the State. Students have opportunities to work on independent projects and develop their creative ability through such extracurricular activities as "circles". Especially at universities and polytechnical and mining institutes, the Learned Council has established student scientific circles subordinate to the chairs. These circles are usually divided into sections that correspond to the faculties of the VUZ. For instance, at Dnepropetrovsk mining Institute about 1,200 students are working in 32 circles grouped under the following sections: (1) social-economic, (2) mining, (3) shaft construction, (4) geological prospecting, and (5) mining-mechanical.

67. The professor establishes definite plans for circle activity, which is considered an integral part of the institution's scientific work and consists of research and experimental work by students as well as organized meetings with prominent scientists and engineers. Teachers are expected to guide and assist circle members with their projects. More than half of the undergraduates at Kishinev State University and over 3,000 students at Ural Polytechnical Institute belong to scientific circles, and it is by their initiative in the work of these circles that the outstanding students can be spotted. They apparently engage in research outside of classroom hours enthusiastically, without pay or academic credit. At Ural Polytechnical Institute, circle members carried out 843 of these voluntary projects between the spring of 1956 and the spring of 1957.

68. It is difficult to draw the line between curricular and "circle" research, which often seem to overlap. For example, circle studies often grow into diploma projects, which then sometimes furnish the start of future graduate dissertation research. Like required undergraduate research, circle research is expected to fit into both the scientific plans of the chair and the immediate requirements of industry, with resulting conclusions, hypotheses, and estimates experimentally verified under plantship conditions.

69. There are Olympiads or competitions in virtually all fields. The Mathematics Olympiad originated many years ago at Leningrad University. Today there are Olympiads at the school level, the district level, the Republic level. The ablest students from all over the country do advanced work and then compete for the prizes in them. Consequently, there is an incentive for the really outstanding pupils to go beyond the formal academic programme.

70. In their educational literature, the Soviets claim that the development of individual initiative in the student is one of the aims of their laboratory-project system of instruction. Some schools, such as the Moscow Aviation Institute allow third-year students one day a week and fourth- and fifth-year students two days a week without scheduled classes as long as they keep up high scholastic records. The better students are permitted to replace some of their term projects by participation in actual sponsored research projects of the staff.

XVIII. Soviet Policies on Inventions.

71. Under Soviet Civil law, two kinds of rewards for inventions

exist: patent and "certificates of authorship". At the present there is a modification of the remuneration of inventors promulgated as of 1st May 1959. Since the previous methods of dealing with inventions and discoveries by the patent law and the methods of administering these laws did not provide the inventors and discoverers with sufficient incentive, they have been modified. The Soviet patent law recognizes three categories of innovations:

1. Inventions, which are defined as a new solution of a technical problem in the world of technology,
2. Technical improvements, which are defined as a solution of a technical problem new to a given establishment or industry but achieved by methods already known in science and technology,
3. Rational suggestion or rationalization proposal, a solution which requires neither new materials nor new equipment. This rational suggestion can be applicable to production techniques or to organization and administration.

72. The majority of Russian inventors take out "certificates of authorship". The inventor obtains, in exchange for giving exclusive rights to the Soviet government, the right to receive remuneration in accordance with a schedule. This schedule rewards only in relation to the savings obtained by the government's use of the invention. In addition, there are limits placed on remuneration. There are special complex provisions regarding the method of calculating the amount of savings. If no saving is realized but the invention or discovery results in improvement of some sort or another, the amount of remuneration is determined by the head of the government enterprise which accepts the improvement. Consequently, the remuneration an inventor receives for his invention depends upon its evaluation by a number of different government officials who appraise it. Under these conditions, the interests of a Soviet inventor are not fully protected. In the new legislation effective as of 1st May, 1959, there are provisions for further incentives for inventors and also regulations to induce prompt application of inventions and proposals.

73. Filing for a "certificate of authorship" instead of a patent is encouraged. The inventor's name is given to the invention, the first 10,000 rubles of remuneration obtained under the certificate are exempt from income tax, certificate holders have priority for promotions or appointments to better positions. A patent holder is deprived by law of these privileges. The certificate is issued without cost, but an application for a patent requires a special fee.

XIX Utilization of Women

74. Women comprise a sizeable percentage of professionals in the Soviet Union. Among the total number of professionals, about 52 percent, or 1,562,000 are women. The largest number of women professionals in any one single field is found in education. 65 percent or 790,000 of the 1,217,000 professionals in education are women. The field of medicine has the highest percentage of women in one single field: 75 percent or 269,300 of the 359,000 professionals in medicine are women. Engineering has a sizeable 29 percent, 256,000 of the total 882,000 engineers.

75. The data below indicates the percentages of women along all of the professionals. The percentual breakdown is exact for 1958 and projected for 1959.

WOMEN PROFESSIONALS

	Number of Professionals January 1959	% of women	Total number of women
Agriculture	217,000	38	82,000
Economics	176,000	57	100,000
Education	1,217,000	65	791,000
Engineering	882,000	29	256,000
Law	59,000	32	19,000
Medicine	359,000	75	269,000
Others	90,000 (estimated)	50	45,000
Total	3,000,000		1,562,000

Women among advanced degree holders

76. There are an estimated 100,000 advanced degree holders in the Soviet Union as of January 1959. Of these about 20,000 are women. The proportion of women among advanced degree holders has remained fairly constant since 1947; in 1947 - 18,700; 1950 - 16,600; 1955 - 18,700; 1959 about 20,000.

Women in research and teaching

77. Women comprise 36 percent or about 100,000 persons of the research and teaching body of 280,000. An estimated 40-50,000 of them are engaged in teaching work in the higher educational institutions. The percentage of women making up this important body has remained fairly constant throughout the past decade: in 1947 - 51,300 out of 145,600 (35%); 1950 - 59,000 out of 162,500 (36%); in 1955 - 81,600 out of 223,900 (36%); in 1956 - 80,000 out of 240,000 (33%).

78. Data for January 1956 indicate that the total 224,000 in research, technology, and higher education in the Soviet Union about 81,600 or 36 percent were women. Of this number about 18,700 possessed either an advanced degree or had a scientific title. These were distributed as follows:

Professors	600
Docents (Assistant Professors)	4,800
Senior scientific workers	4,400
Junior scientific workers	8,900
Total	18,700

79. The remaining are distributed among the assistants and among those in the group without an advanced degree or without a science title.

80. Of the 13,900 personnel in the USSR Academy of Sciences in 1956, about 5,800 or 44 percent were women. These included two Academicians, 11 Corresponding Members, 141 Doctors, and 2,127 Candidates. More than 100 women head research institutes or laboratories.

Women as members of the USSR Academy of Science and the individual Republic Academies of Science

81. Despite the substantial percentage of women in research and higher education, they comprise less than 5 percent of those elected as Academicians and Corresponding Members of the Soviet Union's Academy of Science. Membership in the individual Republic Academies is very low. Traditionally, these Academies have had primarily male membership.

XX The Councils of National Economy (Sovnarkhozy) and Scientific Research

82. The Councils of National Economy are tied in with future scientific development in the Soviet Union. As Kirillin, a Corresponding Member of the Academy of Science, USSR, pointed out in 13th March 1959, Pravda, many scientific-research institutes have been placed under the authority of these Councils.

83. The Councils of National Economy are the principal economic administrative organs which manage the 105 economic-administrative regions into which the entire Soviet Union has been divided. The principal features of the authority, organization, and operations of the Councils were laid down in the USSR Supreme Soviet decree of 10th May, 1957 and later Republic Supreme Soviet decrees were promulgated during a period of organization and adjustment which continued through the latter part of 1957. They provide the blueprint for a thorough reorganization of industrial administration and planning, and reflect the Soviet effort to make industry more efficient and economic planning more effective, by better planning and administration.

84. Through the instrument of these Councils a concept of direction of industry was introduced, officially styled "administration according to the territorial principle."

85. The exact relationship of the scientific-research institutions to the centralized authority of each individual Council is not clear as yet, since many scientific research institutes were turned over to the authority of the Sovnarkhozy, fairly recently, in early 1959. This institutional phenomenon will have to be studied very intensively in the future since it is inextricably related to the development of science in the Soviet Union.

Types of Scientific Institutions in Soviet Union
and Numbers of Research Workers
as of 1st January, 1956.

(Does not include research personnel in Higher Education Institutes)

	Number of Scientific Institutions	Number of research workers in them (1)
TOTAL	2,797 (3,000) ⁽²⁾	97,800 (135,000)
of which		
Research Institutes	1,064	73,500
Affiliates and Branches of Research Institutes	146	3,800
Scientific Stations	574	6,200
Scientific Posts, Experimental Fields and Bases	184	600
Laboratories	142	2,600
Observatories	38	700
Establishments for Conservation of Nature:		
Commissions, Sections, Councils Committees, Sectors and Affili- ates of Academies of Sciences	60	2,100
Museums carrying on Research Work	392	3,500
Libraries carrying on Research Work	61	2,000
Other Scientific Institutions	62	2,100
Unknown Types	74	700

(1) Research personnel who are part of the Academic and Research personnel group only.

(2) Figures in parentheses: January 1959 estimates.

ENGINEERS

During the 9-year period 1950-58 there has been a steady increase in the annual output of engineers in the Soviet Union. Since the 1950 one-year output of 36,000 engineer graduates, there has been a 160 percent increase in the annual output; i.e., 94,000 engineer graduates in 1958. There has been a 125 percent increase in the total number of engineers since 1950.

Engineering Graduates and Employment

Annual Number of Engineering
Graduates in Soviet Union
(1950-1958)

Total Number of Engineering
Graduates Employed in Civilian
Labor Force of the Soviet Union
(1941-1959)

1950 - 36,000
1951 - 44,000
1952 - 47,000
1953 - 46,000
1954 - 56,000
1956 - 71,000
1957 - 83,000
1958 - 94,000
1959 - 90,000 ⁽¹⁾ (106,000)

Jan. 1941 - 290,000
Jan. 1951 - 392,000
Jan. 1954 - 481,000
Jan. 1955 - 530,000
Jan. 1957 - 721,000
Jan. 1958 - 816,000
June 1959 - 973,000 (983,000)

The 94,000 engineering graduates in 1958 represented 32 percent of the total 291,000 or 39 percent. However, engineering ranked second to the number of graduates in education where there were 113,000 graduates of the total 291,000, or 39 percent. However, engineering graduations totalled 19,000 more than the number of 1958 professional graduates in all scientific fields combined, i.e., 75,000.

On Feb. 8, 1959, as well as on several different occasions, the Soviets announced their plan to produce 1.9 times more engineers during the 7-year Plan (1959-1965) than were produced in the preceding seven years, i.e., about 878,000; this means an anticipated average annual output of 125,000 engineers for the next seven years, beginning with the year 1959. In view of the fact that the 1959 engineering graduations was 90,000 (106,000), the current chances for maintaining the announced pace of the plan do not appear optimistic.

(1) Two contradictory engineering graduation figures have been announced to date: 90,000 and 160,000; the parentheses figures are predicated on the 106,000 figures. Note, a 3.5 percent attrition rate is used for annual loss due to natural causes (serious illness, invalidism, death, etc.), and those due to being called up by the military, doing advanced academic work, etc.

NOT TO BE MICROFICHED

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SCIENCE TODAY AND TOMORROW

Izvestia

9 August 1959

by N. Semenov

The speech of Comrade N.S. Khrushchev at the CPSU Central Committee June Plenum gave a remarkable analysis of the role of science and technology in communist construction. Of particularly great theoretical and practical importance is N.S. Khrushchev's thought that the organization of production must become a basic part of our ideological work. To organize people for work of a scientific, higher quality is party work.

Every scientific worker and engineer must pay particular attention to that part of N.S. Khrushchev's speech pointing out that the increasing automation of production will change the relation of numbers between the workers directly engaged in production and the engineers and laboratory workers between the workers directly in design bureaus and research, the number of the latter growing continuously.

The workers in industry must always keep in mind that scientific and technological thinking is continuously outstripping the development of many production processes and that a good experimental research basis is required for the drafting of new machinery and equipment which, as N.S. Khrushchev stressed, will be in operation for some five years and then become obsolete. The new ideas on the role of science and technology in communist construction voiced by N.S. Khrushchev at the June Plenum set great tasks for the scientists of our country. "A resolute reorganization of the activities of the institutes and laboratories is required. I wish to try to analyze this question regarding the work of the USSR Academy of Sciences, the highest scientific institution of the country."

The main tasks of the Academy of Sciences:

In the period of the Soviet regime the Academy of Sciences has developed from a small institution with a tiny basis of laboratories and research into a powerful, outstanding scientific center with outstanding scientists which in many fields has surpassed science in capitalist countries. The Academy of Sciences, particularly in recent years, has organized on a large scale the scientific conferences of an all-union and international level, and it issues numerous scientific periodicals. "In essence all these measures insure the democratic forms of leadership in the scientific life of the country on the part of the Academy of Sciences."

The reorganization of the Academy was begun by V.I. Lenin. A further essential step was made in the 30's when the academy moved to Moscow. During the war it took an active part in promoting victory. It experienced a new upsurge in the past five to six years when it began to deal more and in a more profound manner with the great problems of technology and science. "Nevertheless, today the academy of scientists is still not what it should be. Therefore, questions of the further improvement of its activities are topical." In his speech N.S. Khrushchev pointed out that it is necessary to reorganize the activities of the academy and that, for example, it was wrong to include

questions of metallurgy and the coal industry in the work of the academy, question with which the academy had not dealt formerly.

The history of science from ancient times to the present convincingly shows that the basic function of science is to increase labor productivity. One may add to this the healing of people and the prolongation of their lifespan. "This, however, does not mean that science is only an appendage to production. Its independent importance is the profound study of nature, the inner mechanism of phenomena, and hence, the mastering of previously hidden forces of nature in the interests of man."

In our time science has acquired enormous power, and this power is growing year by year. An example is the discovery of purely scientific means of the nuclear chain reaction and thermonuclear reaction. There were not even any hints of it in production and, even more, nuclear chain reaction is apparently not performed anywhere in the universe, and thermonuclear reaction only in the distant space. Atomic energy became an achievement of mankind only on the basis of scientific research and the logical development of science. Electro-technology and radio-technology were developed in an analogous manner on the basis of purely scientific discoveries. On the other hand, technology and production have their own logical creative development which influences science and gives birth to new fields of science such as research on heat, the movement of gases and compact bodies, and the process of burning. These new fields in turn perfect the technology which had called them forth.

"Thus there are two sources of industrial progress: first, the logical development of technology and production, second the logical development of science." Naturally, both these processes are to a certain degree interrelated but, nevertheless, the use of the two different words for science and technology is justified.

The design bureaus and affiliated institutes are called upon basically to advance production on the basis of the logical development of technology, while the institutes of the Academy of Sciences, the research departments of universities, and several other higher teaching institutions are also called upon to advance production but on the basis of the logical development of science, with consideration for the achievements of technology.

From now on it must be one of the main tasks of the Academy of Sciences to look for new qualities of matter and new secrets of nature to give man mastery over new forces. The other basic task is to deepen the scientific elaboration of these fields of knowledge which are important for the new forms of production, such as the chemistry of polymers, to supply production with new improved technological processes. The third main direction for the development of science is to make our knowledge in various already existing fields of science more profound. This task must be done on the basis of the activities of the university laboratories and some other higher educational institutions and only partly as a subject of the academy of sciences.

"Does this mean that the USSR Academy of Sciences may deal with research in any direction without thinking about whether this work will be useful for production which is the ultimate aim of society? Naturally not. In the majority of cases, the general trend of the development of the national economy and the already existing data of science show, without fail, the most important fields of scientific research and thus permit us to plan science in a reasonable manner. This is how the academy selects the most important problems. It is to be regretted that several scientists under this cover, independently promote their favorite studies on which they have been working for many years, which may even be useful but which have none or only a very distant connection with the resolving of these basic problems. The leadership of the Academy of Sciences must stop more resolutely such strivings of some leaders of laboratories and institutes."

From among the most important problems, the academy must select those which can yield, more than any other, new technological progress and new principles of machine building and automation. For this purpose every scientist must have a good view of the economy and the direction of technological development of the country and must have the seven-year plan always on his desk.

Research and the plan:

"At the present the Academy of Sciences coordinates all plans of its departments, branches, and associate academies.

"It is impossible, and I think also unnecessary, to coordinate work on all fronts of science. One should by no means turn the academy into some sort of all-union ministry of science."

In recent years the academy has begun to effect correct changes in its planning, changes which consists in selecting the most important problems and in concentrating all forces on these very problems. As these problems are being resolved, and the respective branches of industry reach a sufficiently high level, work must be basically transferred from the academy to the branch institutes.

"Unfortunately, the organization of the joint work of the academy is arranged in a sufficiently correct and large-scale manner, on the level of true state-mindedness, only with regard to a few of the most important problems. The most important thing here is not only the coordination of the work of the network of institutions of all-union and the republican academies, but also of the network of research laboratories of higher teaching institutions, branch institutes, and in the enterprises directly. The unity of planning of scientific and experimental work on new plants can emerge only from a close contact between the USSR Academy of Sciences, the USSR Gosplan, the GNTK (no explanation given; presumably state scientific and technical committee - Ed.), the respective all-union committees and ministries, and also the sovnarkhozes. "

It is much more difficult to plan science in new, still unexplored fields of science where a search is still going on, and where there are none or only very few basic data, and where there are no corresponding branches of industry. Reviewing the history of science, we see that there has been no planning in such new fields of science; it has been a realm of spontaneity where the basis was laid only by the initiative of some individual scientists guided by the logic of the development of science.

From this analysis we realize, however, that planning was still possible to a certain degree in this highest form of scientific work and that, had it existed, the final technological results would have come considerably faster than actually did happen in practice.

The discovery and then the utilization of new forces of nature is of greatest importance. I think that the main difficulty in the general and state planning of completely new problems of science is mainly a psychological problem.

"Although science has for a century continuously surprised mankind with the fact that its abstract formulas and painstaking experiments - which at first glance lack all practical significance - are suddenly materialized in the form of a technological revolution, the people, even specialists cannot get used to it. This happens because such new scientific results do not have the usual analogies in our practice, because they are connected with the emergence of new concepts which are somehow in contrast to our usual realm of ideas." Contemporary science frequently yields simply fantastic results resembling fairytales. "It is difficult for the people to believe the fairytales of science and by no means easy for professional people to seriously plan fairytale fantasies. It is, however, just this psychological transformation which is required in our era of growing power of science."

(Editor's note: Here followed a passage describing, as examples, the discovery of radio and atomic energy from their completely abstract and purely theoretical and apparently useless beginnings up to their practical use.)

"Would it not have been possible to reduce this time (from theory to practical use - Ed.) almost twice if this work had received purposeful support? And what obstructed it? The difficulty of mastering new concepts, and a disbelief in scientific fantasy."

The great importance of the concentration of forces and the direct participation of the state in resolving important problems of science and technology can be shown by the examples of the development of work on thermonuclear energy and cosmic rockets, fields in which our country, with the advantages of the socialist order, has outstripped the United States.

The power of science could at present insure the highest degree of well-being for all people of the world. The capitalist society, however, is not capable of posing this task, while socialism poses it as an all-national and state task. It is possible to list at present new problems of science which would be capable of bearing fruit as important as radio waves and

and the energy of the atomic nucleus? I think that such problems exist in every field of science and that, for example, one of the most important fields of research in theoretical chemistry lies in the border area between chemistry and biology. Live organisms effect chemical processes with a perfection which cannot be reached by modern technology, and I think that live matter has some physical-chemical qualities which are so far unknown and nonexistent in lifeless matter. I believe that discoveries in this field will have an impact on chemistry as well as on biology which will be no less than the discovery of atomic energy in physics.

The strategy of the deployment of forces:

"What organizational measures are required and how must the Academy of Sciences be reorganized in order to perform in the best manner its work in the directions mentioned above? Above all, one must agree with Comrade N.S. Khrushchev that it is necessary to reduce the number of institutes and other institutions of the academy. Those institutes which deal with individual branches of industry, such as the institutes of metallurgy, mining, mineral fuels, and several other institutes of the department of technical sciences, must be taken out of the framework of the academy. In the past, there were no problems and institutes of this type in its framework.

"In the 20's a second scientific center was organized in addition to the academy, or a center which had the task of creating technology on the basis of science, the scientific-technological department of the Supreme Council of National Economy. In this framework such great outstanding institutes as the central aerohydrodynamics institute named after N.E. Zhukovskiy, the optical institute, and many others were created and which became the cradles of technological progress in our country. I think that it is necessary also at present to create, within the framework of the GNTK, corresponding main institutes for those branches of industry which are not united in committees and union ministries to coordinate the activities of the branch institutes and the plant laboratories of the sovkhozes. Without this it would be very difficult to plan scientific-technological work in the country.

"In particular, the majority of the institutes of the academy mentioned above should be included in this system. All forces, means, and attention of the academy must be concentrated on basic mathematical, physical, chemical, biological, geological-geographical, and humanitarian institutes.

"In my opinion it is necessary to reduce the number of departments of the academy. They should be reduced to three: A department of experimental science - mechanics, physics, chemistry, and experimental biology; a department of geological-geographical sciences - geology, geography, descriptive biology, i.e., fauna, flora, ethnography, that means the study of nature, natural resources, and the population; and a department of social sciences - philosophy, economics, history and philology, and sociology. As far as mathematics and computer technology are concerned, they must exist in all departments, having their center in the department for experimental sciences.

"Such a reorganization is required, above all, because the most interesting problems of contemporary science are on the borderlines between the present-day departments of science.

The reduction of the number of departments will make it possible to give them more authority, particularly financial authority. At present the institutes are actually run not by the departments but directly by the presidium of the academy, and since it is impossible for it to manage such a great number of institutions, planning and control to a certain degree acquires a formal character.

"Under the new conditions the presidium of the academy will control the activities of three departments and organize scientific contacts between them - which is of greatest importance since great possibilities for mutual, fruitful cooperation also exist here. The presidium must also distribute the personnel and the funds between the departments after which the departments will have independent use of their funds.

"The scientific institutions of the USSR Academy of Sciences are basically concentrated in Moscow and Leningrad while science must be spread throughout our country, particularly in places where industry is concentrated. This is partly implemented by the branches of the academy in Kazan, Sverdlovsk, Irkutsk, Yakutiya, Vladivostok, etc. Despite the fact that this system is reasonable, it also has shortcomings. Science, with which in my opinion the academy should deal, requires the concentration in individual centers of a great number of institutes dealing with various branches of science - physics, chemistry, mathematics, mechanics, biology, geology, and the humanitarian sciences. This idea was implemented by the party and the government with the organization of a powerful branch of the USSR Academy of Sciences in Siberia.

"I think that it is necessary to establish a second center of this kind in the RSFSR, in the Ural-Volga area, based on Sverdlovsk, Kazan, Saratov or Kyubyshev. I think that this will be sufficient since the other union republics have full-fledged academies. It seems that the Siberian and the Ural-Volga branches, which in scientific respects are subordinated to the union academy, should have their own independent budget. The affiliated institutes of the Academy of Sciences should, in my opinion, be subjected to organizational changes. Stations of all-union importance should remain under the direct administration of the USSR Academy of Sciences. The institutes of the affiliates should be subjected to the administration of the Siberian or Ural-Volga branch. The affiliates themselves should, in my opinion, be transformed into oblast, kray or national academies with a dual subordination; in scientific respect to the USSR Academy of Science, and in the administrative-financial respect to the respective oblispolkom or krayispolkom or the council of ministers of the national republic. The basic tasks of these local academies should be the study of the natural resources of the area, a search for ways of increasing the upsurge of production forces, etc."

A special and very important question in the development of science is the problem of the material-technical supply of scientific institutions. At present, the president of the

academy, the vice presidents, and directors of institutes and laboratories spend a great part of their time and efforts on supply and construction affairs; that means that the most qualified scientists have to devote a considerable part of their time and strength - I personally, for example, devote about a third of my working time - to affairs which have no direct connection with science.

A planning of supply in the academy is actually unreasonable and impossible. Scientific riches cannot be planned like production output. A scientist may plan a certain approach to the solution of a problem, but may suddenly see that it cannot be applied and that it is necessary to quickly adopt another method, that means other instruments and apparatuses. The productivity of science depends to a great deal on how quickly this new material is supplied, otherwise research has to be stopped or continued in an unproductive manner.

Experiencing these difficulties, the scientists order a great amount of any conceivable material, "just in case". This inflates the requests, increases government expenditures, and makes the institutes store unnecessary material. At the same time it is, nevertheless, frequently impossible to get the very thing which is needed. This "system" also causes an inflated supply apparatus attached to the academy.

It is necessary to drastically change this system, to abolish all presubmitted requests, and to arrange the supply or delivery of certain instruments, apparatus, or material required by an institute within a month, outside any other production order, even if it means that the plant in question has to cut down its planned output. The same procedure must be followed in purchasing such material from abroad, when it is not available in the Soviet Union. All this can be done without hampering the national economy since the requirements of the academy are a negligible part of the needs of the national economy. It is necessary that our economic workers realize that in our era science is a state matter of enormous importance.

Work and Talent:

I want to dwell particularly on the problem of the scientific cadres of the academy and the task of the education of cadres for industry. The scientific cadres of the academy, it being the highest scientific institution of the country, should include at least 50% highly talented people with initiative and a passionate love for science. A talented man will perform 10 times better than an average one.

Actually, however, additions to the academy cadres are generally secured in a casual manner. On the other hand, the academy fails to educate cadres of qualified scientists for industry, a task which it could easily perform.

"This question was reviewed by the presidium of the academy and it arrived at the following conclusion: It is necessary to gradually organize matters in such a manner that about half of the staff of the academy is transitional, those being postgraduates (stazher - Ed.) who have been sent to the academy for a period of let us say, three years. These persons

above all, recruited from among the most talented mustates of all higher educational institutions of the country, who are attracted by science. The other source of these persons can be the assignment (komandovaniya - Ed.) of engineers from industry who are capable of scientific work and who are accepted by the academy following a check. The academy will undertake to organize this selection."

After the three-year period the Gosplan and the Ministry of Higher and Secondary Vocational Education will distribute the engineers among the plant laboratories in industry. The academy must have the right to retain for itself 10 to 15 percent of the at its own selection. They will be the basis for supplying the academy continuously with scientific cadres.

One must also dwell on the question of the mutual influence of the experienced leading cadres of the academy and scientific youth. It is the main task of every scientific leader to educate scientists who are capable of surpassing the leader. This must be a matter of honor for him and at the same time a guarantee for the development of science.

"Unfortunately this simple truth is not understood by many scientists who have acquired leading positions. There are also, and fortunately these are rare exceptions, leaders who intentionally select weak assistants who will also in the future be unable to compete with them. Very frequently the great scientist regards his assistants as an auxiliary force who help him to implement faster his idea which may even be very important. He naturally will look for laboratory workers who are blindly devoted to him, who have skilled hands and can resolve a narrow part of his plan, and is not interested in having them develop their own ideas and initiative outside the limit of the narrow task assigned to them."

There is also a third, quite frequent, type of scientific leader. He begins by being a good scientist who is engaged in profound studies in a given field of knowledge.

Gradually he confines himself more and more to this special field, goes into greater detail, and finally ends up by exaggerating its significance. He passes on his views to his students and assigns to each of them a part of his sphere of study, thus creating even more narrow specialists. Thus those students, after becoming scientists themselves, turn out to be some sort of microspecialists, specialists about whom one can say they know everything about nothing.

Science can grow and develop only if schools are set up whose students are full of initiatives. The requirements of young scientific collaborators must be raised, and they must be made to understand that they can remain in the academy and engage in scientific work only if they strive to attain, by independent work, results that are essential to science.

Talented youth must be raised more boldly to leading scientific positions. By youth we mean people of about 25 to 35 years of age and not 40 to 45. The attention of the academy presidium, as regards scientific cadres, must be drawn precisely on youth.

"At present we mainly know of 'old men' and occupy ourselves with them."

The decisions of the 21st Party Congress and the main
of the CPSU Central Committee June Plenum oblige us to devote
deep thought to the tasks facing our science. The suggestions
raised in this article are not a comprehensive plan for improv-
ing scientific work; they are only a summarized presentation
of some considerations which appear to me the most essential.

The workers of the academy of sciences and all scientific
public opinion support with enthusiasm Nikita Sergeyevich Khrushchev's
thought that it is necessary to improve the future activities
of the academy. There is no doubt that from the sum of the suggestion
aimed at achieving this, we will be able to work out a plan of
action which will help us raise the significance of the Academy of
Sciences and the role of all Soviet science in building communism.