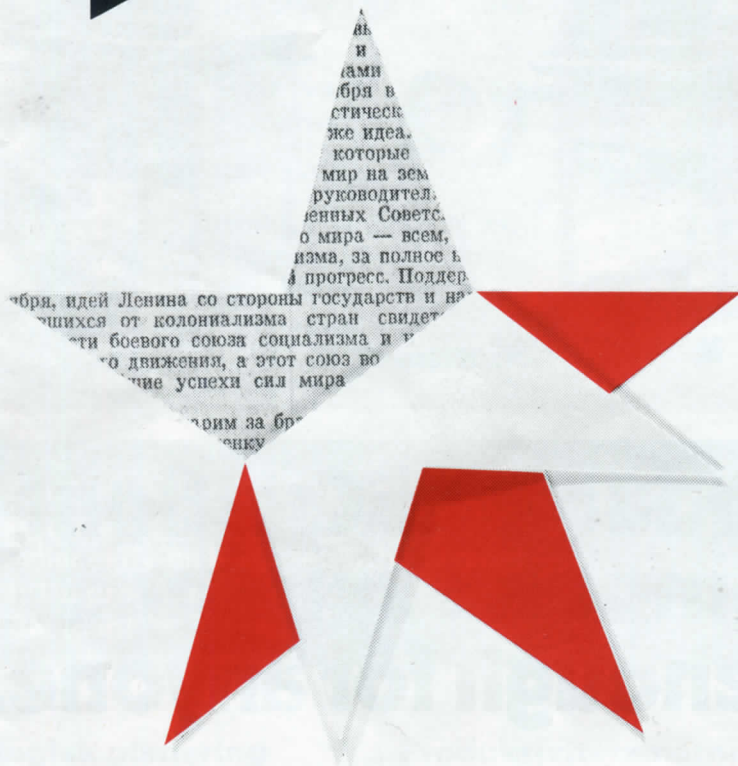# VIEWPOINT FROM A VISIT IN RUSSIA

Mr. H. F. Sherwood has visited the Soviet Union, specially the DP-sector and in the interview with Prof. Ershov a fascinating picture is drawn up about the working conditions in this country. Conditions that we very seldom are able to hear discussed so open-hearted as in this interview. Mr. Sherwoods own reflections show the contrast to the world we are familiar with. The different institutes are presented briefly on the following pages and in the pictures the various interrelationships of the institutes become apperent.

HFS: How many institutes have been established in Novosibirsk?
Ershov: We have 35 institutes which report directly to Siberian division and nine institutes which report to Branches of the Siberian division.

Henry F. Sherwood is a former Vice President of Diebold Europe S.A. and has been associated with information technology since the origin of the disciplin.

In addition, there are three design bureaus here. Also in addition to that there are a dozen industrial enterprises, design bureaus or institutes in Novosibirsk which report to various sectors or agencies but scientifically are coordinated with the Academic Institute of the Siberian division.
HFS: Now, the mission of your centre is to support from a data processing point of view these institutes.
Ershov: Not completely, because many of them have their own computing facilities. But at least part of every day's demands of computing power is provided commercially by the computer center.
HFS: How many professionals do you have in your data center complex?
Ershov: We have about 650 people and about 300 of them are in the computing service group such as Maintenance engineers, organisers, operators, some with software departments attached. We even have some developmental laboratories etc.
HFS: But you don't do product developments as we noted at the Cybernetics Institute in Kiew?
Ershov: No! We have some laboratory kind of work to improve our own equipment, but not much more.
HFS: One of the things that surprised me on this trip was the wide use of COBOL., I was not under the impression that COBOL was of widespread use here. 1)
Ershov: Well, first of all this is a kind of respect to the widely used and good language. COBOL in principle is a good language - specifically for some kind of application. We have some own development of languages which would be oriented to commercial applications, but they were too much ALGOL influenced and the designs were not strong enough to »capture« people. This general positive approach to COBOL resulted that there were no artificial national feeling against COBOL. Instead it was decided to develop a Russian version of COBOL and this work is under way.
HFS: In Kiev at the Cybernetics Institute we met Prof. Dr. Yushenko. She is sort of the Soviet Union's Grace Hopper...
Ershovs: Yes, she is responsible for the Russian version of COBOL. She is an editor of the Russian version of COBOL standard. She is the head of the committee and subsequently the editor of the text. Also she conducts a big programming department which also does COBOL implementation
HFS: What, in fact, is the use of PL/1 here. We only heard it mentioned once during our visits.
Ershov: It is difficult to explain: there are people who have some experience with PL/1, but its application in this country is definitely undermined by the low quality of PL/1 compiler, which again RIAD

1. In fact an IBM Vice President quoted Prof. Ershov at the Future Architecture session of the National Computer Conference, June, 1977 in Dallas as having said that »we are planning to bypass COBOL and Fortran and use Algol '68, PL 1 and Simula '67 for programming Soviet machines«.

computers are very close to PL/1 compiler F-level. For our standards its implementation, specifically in comparison with the implementation of ALGOL compilers - well it's below in performance. So, big scientific computations are not so often conducted in PL/1.

As to our institue, I mean the computation center, so far we have no specific project of designing a complete language to be properly implemented. We research and study implementation problems for such languages as PL/1, COBOL '68, SIMULA '67 and other major languages. But we have some interests and work-plans about a good system implementation language.

We are also thinking about the problems in principle how to design for example good cross compilers for mini- or micro-computers. We have started to think about it. Maybe there will be some conversion with our YARMO approach and its future development for these new kind of Computers, but it is too premature to speak about specific approaches.

There is another field of our interest which probably may result in some language a few years later. I mean a language for description of parallel processors. Dr. Kutuv, who is the head of the laboratory of theoretical programming, worked much on the study of basic concepts of parallel programming languages. He has developed models of such concepts and probably will design a language. Also we are working so far in a more theoretical fashion, looking at a language which could be a basis for semantic unification of languages. We call it »internal language« in a sense, that it is not intended for product programming, for production programming in this language but it is to be used for uniform semantic representation of various source languages. This approach to develop such a semantic base or semantical language for a variety of source languages is a part

of our long term project, the so called »BETA«-project. We try to find such a language in which the basic language concept can be expressed in a coherent way, because we still believe that the number of languages will be proliferated and the more specialised the more stable they will be, and some uniform thechnology for the implementation has to exist because otherwise you have to put too much effort in implementing a specialised language.

HFS: Including the documentation.
Ershov: Yes, certainly. So to this end we first try to elaborate the concept of more or less industrial like style of production of compilers for a variety of languages and also to study this problem theoretically in developing a semantic base for a variety of languages.
HFS: That suggests an interesting question concerning meta compilers, very high level languages.
Ershov: This is another point. Of course I missed this important point. We have a group which works on a very high level language. It is not a meta compiler, it is a direct compiler but for a very high level language. This is a part of our regular cooperation with Professor Jack Schwarz from New York university and a part of an official cooperation program between the USA and the USSR. We started just with experimental implementation of that language as it has been designed by Professor Schwarz and succeeded in achieving a reasonably good implementation. We have used it broadly as an experimental tool in our projects in artificial intelligence and natural language processing, specifcally because it makes programming concise and very quick and in some sense very reliable, because it is much

easier to control the program text using very high level concepts. The quality of the object code is reasonbale enough to use it for a pilot implementation.
HFS: Now, we visited the Cybernetics Institute in Kiev, which raises an interesting question: There are similar Institutes in other Republics of the Soviet Union. One would assume - not necessarily as a negative statement - that there is some duplication of effort. Some . . .
**Ershov:** Well, not much. Any Academy in each Republic has a Mathematical Institute, but nobody says anything about redundancy in mathematical research. It is essentially the same in the field of computer application, which is so big that we now have a very simple approach: As more people work in this field there will be no problem about redundancy because the scientific interests, or just coordinating processes, or any other means for organisation or scientific communications will prevent too much redundancy. Some redundancy is necessary and our computer business is highly redundant.
HFS: How do you, from an organisational point of view, coordinate. Do you meet with your colleagues once a year some place and review what you have done, or do you correspond only in writing? There must be some instrument where the direction is given, priorities are set, and so on?

Ershov: There is not too much administrative regulation because the director of an Institute or Academy Members are very independent on the definition of their scientific interests. There exists a coordinating body for some specific projects which require really proper coordination, when it becomes a kind of joint work. You see, certainly from some over bureaucratic point of view you cannot consider all the sciences a joint work this has to be carefully measured, resources carefully allocated with no repetitions, no redundancy. You see, any person to make a discovery as it has been ordered. It is not that case.

First of all, we have some mechanism for making informal coordination such as general meetings of the Academy of Science, conferences... It is a main medium to integrate and to coordinate people.
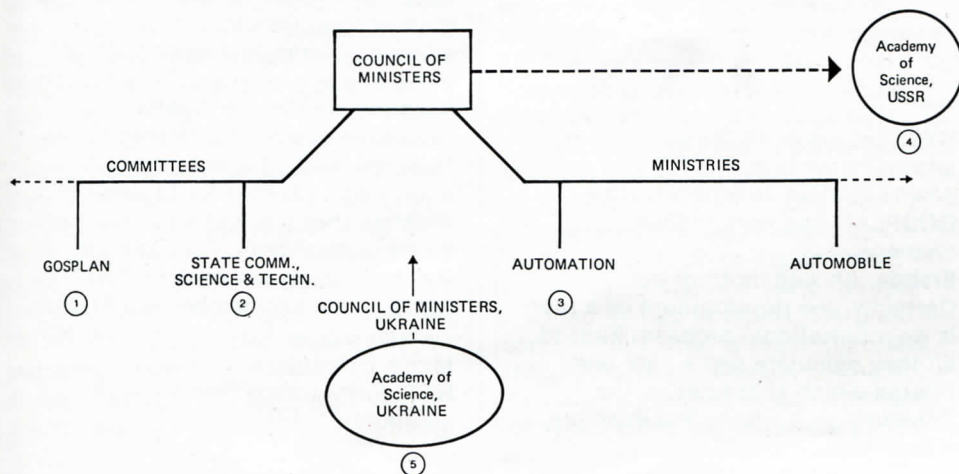
But for some specific urgent problems a Scientific Council exists, which has the right of coordinating in a sense that e.g. Siberian division has a program of introducing computers into scientific research, just how to make computer use in research more efficient. There exists a coordinating plan which is headed by one of the Academy members. Let us suppose an institute decided to join this coordinating plan. In its activity, which is by definition related to this coordinating plan, it has an obligation to report about its success and moreover sometimes this scientific council has a right to control the money spent in this direction. This is a point, where for example, some coordination becomes forced with some instrument. Controlling resources is a way to coordinate something. - and this is done.

HSF: Now, there is another very interesting thing: When we were in Novosibirsk, we visited an Institute, I believe it's called »NII«, whose function I believe was to act as an intermediate agency to transfer some of the knowledge developed in the 35 institutes to the industry. Did I understand that correctly?

Ershov: Well, not exactly that way. This Institute is not an intermediary. It is a development institute which makes a product. In this particular case it is management information systems and their intermediate role is only in a sense that having this institute here in a right to look how it works and asking the director, for example, reporting to the Presidium of the Siberian Division about the Scientific content of their activity.

Abstract knowledge is one substance and take a management information system as some materialised knowledge. So in this case we can say that this Institute is some intermediate channel which converts this abstract science into applied science, incorporates it in management information systems.

HFS: Along the same lines we also visited the Institute of Economy, Production Organisation. We talked a great deal about global models and regional models and in two other places during our trip, once in Moscow, once in Kiev, the same subject came up. Eventually these models are created to be used. What is the process of . . . and this becomes

more difficult because here are sometimes conflicting theories . . . , what is the process of seeking out the »best solutions« to apply when Gosplan starts to take another look at the next five year plan?

Ershov: I am not sure that I will be able to elaborate in great detail as I was never involved in this kind of activity. So, there are some remarks as an observer. Professor Smirnov, Vice Director, Political Economy, told us correctly that their institute gives proposals and makes a review of planning documentation concerning specific problems in form of letters or reviews or other documents, e.g. to the planning organisation of the Russian Federal Republic. Sometimes, in order to be able to say something, they have to develop a model, it's their sole responsibility. Whether it is a good or bad model, they use this model as a base of their scientific responsibility. They give some recommendations. There is another way of using models: When a model is used by a research institute to say something about real life. Another one is when a model uses mathematical means to get some real final figures from some source data. You see, this is a so-called working model. This kind can be used, for example, by the Computing Centre of the Planning State Commission.

Very roughly you can say, certainly there is some experience, there are some experiemental computations. What is most important - there are some very specific questions which ask for such a mathematical model installed in the computing centre of the planning commission. So these two kinds of models are not developed independently. Sometimes a model which is developed in the Academy of Science is taken by the people from the computing centre of the planning committee and is used as working tool of actual figures in the plan.

HFS: Let me pose the question in another way: Is it a bottom-up or top-down situation. In other words, GOSPLAN has tremendous challenge?

Ershov: Ah well, both of course. Certainly, the development of a plan is an international process. First of all they calculate some very few figures which characterise the Economy as a whole. For example,

they have an ad hoc idea that, ok . . . it seems to us that it would be reasonable to expand our industry during the next 5 years, say 50 percent. They are experienced people, so they begin to understand: OK, 50 percent what will be the main contributions of light industry, metal industry or agricultural or whatever. After having such hypothesis they can specify this question more correctly. Then they have some balance calculations, which shows that an idea to achieve this growth through agriculture is not well justified, because of the simple prognosis for harvest are 10 percent below than expected. So let us reconsider goals or to put more money, to get more harvest or what else. This is a rather complicated process with many variants.

For example, they can assure that it will be pretty nice if we can within 5 years develop a very big automobile plant somewhere in Siberia, and it would be a very optimal for various reasons. But, for example they than discover that in order to do that, they have to settle in this territory, for example, one hundred thousand people. Through demographic research they then discover that there are no chances to move such an amount of people. So again, it is a problem of reconsideration, what to do, either to give up the idea or reduce the output of the factory.
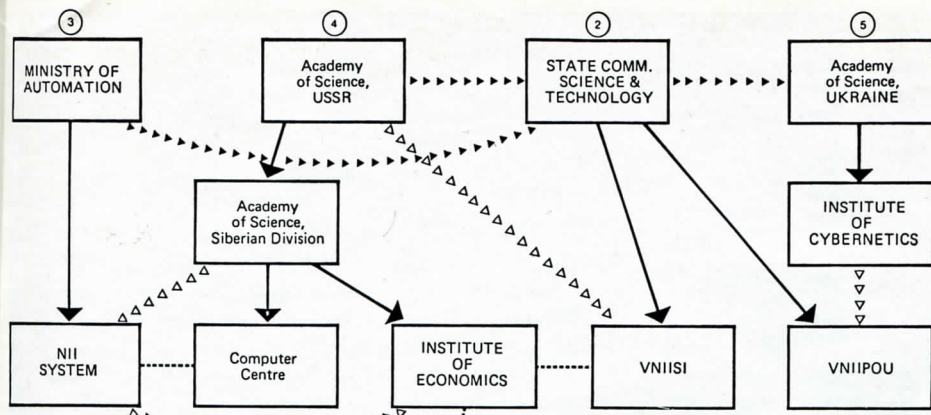
HFS: There was another observation we made during this trip and that is, that a great mixture of equipment is being used. Some foreign, some Russian domestic, then the RIAD service etc. Doesn't this pose a problem in terms of portability of programs for example, and transfer of applications?

Ershov: The place where there is a real mixture of various equipment and a great number of programs are accumulated and so on, are not too numerous. Most of the installations are rather uniform. Just because they are not so big.

HFS: The individual installation?

Ershov: Yes! Probably it causes some problems, but again I do not think this is a very special situation because also in the Western Countries you have different manufacturers and different kinds of equipment. So they try to solve this problem through technical standards. Same is done here. For example, we are developing a model 1025 or 1035 RIAD - I don't remember which model - which will be fully compatible with Minsk computers.

HFS: Fully compatible through emulation?

The complex relationships of Russian EDP administrations

Diagram labels:

(3) MINISTRY OF AUTOMATION
(4) Academy of Science, USSR
(2) STATE COMM. SCIENCE & TECHNOLOGY
(5) Academy of Science, UKRAINE
Academy of Science, Siberian Division
INSTITUTE OF CYBERNETICS
NII SYSTEM
Computer Centre
INSTITUTE OF ECONOMICS
VNIISI
VNIIPOU
(1) GOSPLAN
Computer Centre

Legend:

↓ REPORTING
┊ COOPERATION
▼ COORDINATION
▽ SCIENTIFIC SUPERVISION

Ershov: Well, certainly through some micro programming and other things. Such a transition period was also very typical for the United States where they also have plenty of experience with emulation to do simulation.

HFS: I know some installations where they still today are emulating 7090's on 370's . . .

Ershov: Yes, yes.

HFS: The bottleneck here seems to be in the storage area from an application point of view, particularly in the disk area.

Ershov: Yes, I would like to have more disks and large disks, I agree with you.

HFS: Let us finish by talking about people we met. In all, there must have been, - if you total the audiences that we had in our workshops - more than 500 people, some of whom we met personally. I believe I can say that I was very much impressed by their dedication and knowledge and the very good questions during the sessions we had.

In Novosibirsk in particular, there seemed to be another kind of special loyalty - if you can say that - to Siberia. It reminded me a little bit of some areas in the United States, notably Texas or California, where people who live there feel that the United States consist of their state and some other less important states. How can you explain this phenomena?

Ershov: The siberian phenomena can be explained in that it touches, moves people, because very often the scale of their lives becomes greater when they come to Siberia and so they feel themselves stronger, more productive with more potential.

HFS: But, why does it become greater?

Ershov: Well, it seems to me because it is a rich country which has many resources, many points of application, where you have no need to »work elbows« to do something, we have to work with our heads instead of elbows.

HFS: One of the people we met, made a point that indeed it may be extremely cold in the winter, but offsetting that was the fact that you don't have the - I believe - so-called »bureaucratic pressures of Moskow«.

Ershov: Well, certainly there exists some difference between the centre of hierarchy which is usually typical for a capital, and this is characteristic for the development in the Soviet Union in the last several years. In old Russia, the so-called Czarist Russia, the capitals were the real point which took resources from all the country for their eminence, prosperity and cultivation and some other things, very highly concentrated in several zones. It is essentially due to the changing of the system as certainly - some other historical events stimulated this, to see a more uniform expansion of national resources for all the country. The people still feel the benefit from such an expansion and sometimes they express it in such terms. It is not much related to some specific bureaucratic actions which certainly can be seen in any place in a disciplined society, I would say. But the proportion of the so-called free initiative, the number of people to whom he has to report, the great responsibility, that is most important.

HFS: Perhaps another element which one cannot overlook is that there are, I believe - some ten thousand people living in a scientific community with a unique opportunity of professional exchange.

Ershov: Oh, this is another thing. It has nothing to do with Siberia. It is just a general atmosphere of this very good and nice environment, which itself is very attractive, of course. It is impossible to separate one from another.

HFS: In addition to the visits to the various institutions and computing centres in Novosibirsk, Kiew and Moscow, we also visited the automobile plant at Togliatti, which produces about some 700 thousand cars a year. This visit was interesting, not only because of the fine production facilities but also because we talked to many people in the data centre and discovered - among other things - that from an applications point of view they were able to reduce the so-called buffer between production and assembly to a virtual minimum.

Ershov: I personally was most impressed with their system which synchronises activities on the main assembly line with a variety of individual configurations of cars and their corresponding supply. It is a good combination of individual information about the cars which are going along the assembly line combined with special orders. All their activities are computerised and synchronised with a real-time system consisting of two General Electric 120's. This is the only system of that kind which I know of in the Soviet Union, and it was completely designed in the factory. So, this accomplishment definitely shows that computerisation not only exists in principle but works very efficiently, regardless if it is not the most modern equipment or any other real-time difficulties.

HFS: In fact some of the data collection terminals involved are Olivetti stations of a past generation. But nevertheless the system works.

Ershov: To this end I appreciate very much your strong remark that it is necessary to distinguish economic and technological absolvence. And it is specifically true for industrial systems in which economic consederation must be taken into account as well as various ideas or novelties.

HFS: Thank you, Andreij Petrovich, for this interesting discussion. ■
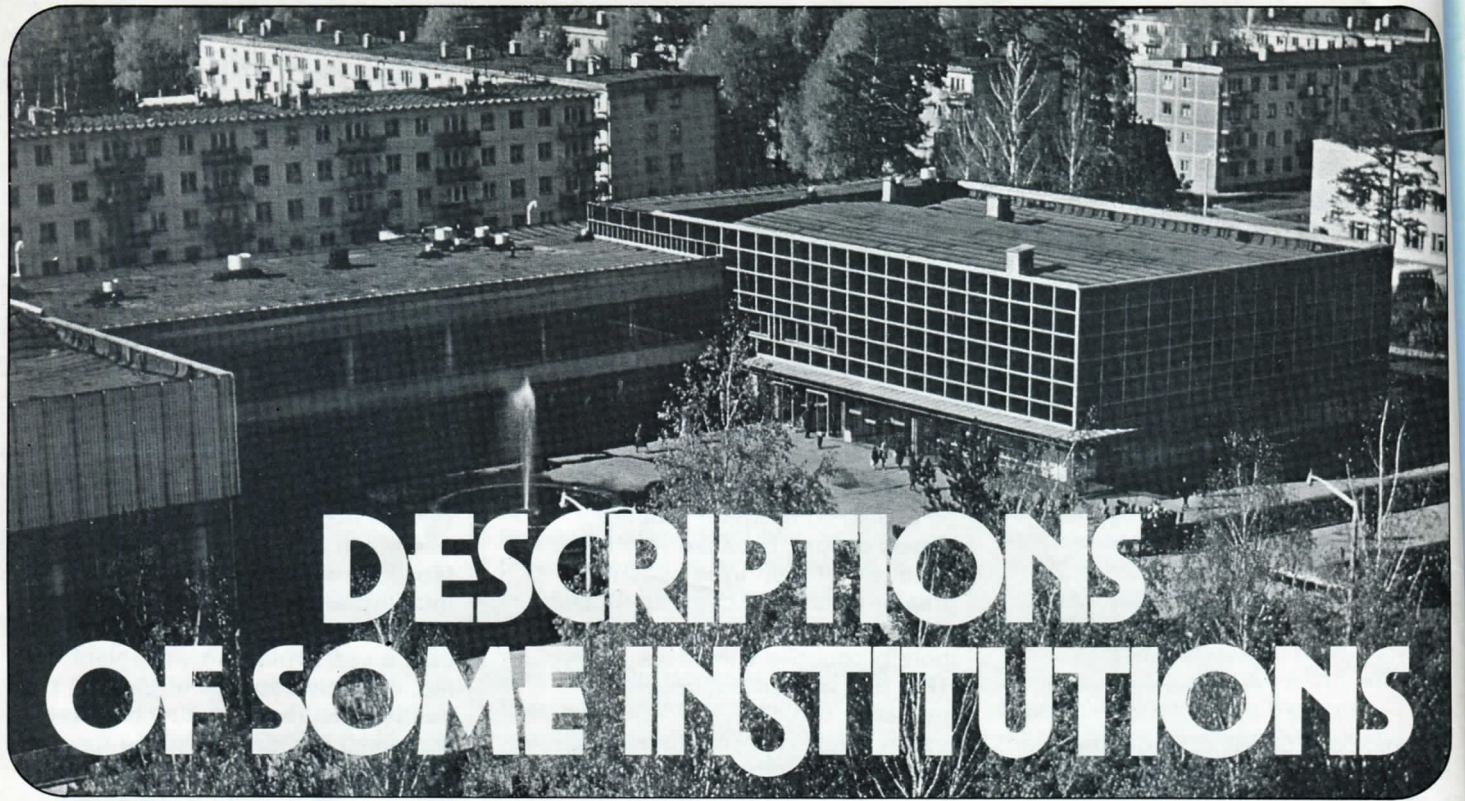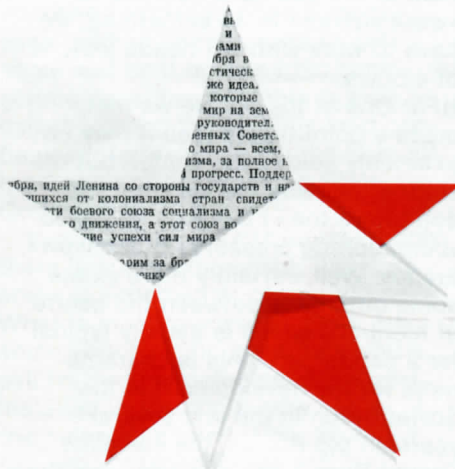
DESCRIPTIONS OF SOME INSTITUTIONS

Computing Center Novosibirsk

There are, outside of the space/military installations, two centers which appear to have first cut on equipment. This center is one, and the other is the computing center of the state planning commission, (note seperate report). It is therefor interesting to note what is and is not there. The center, at the time of my visit, was equipped with

    3 × BESM 6 - each 1 mb
    1 × RIAD 1050 (approx, 500 instructions/second)

A RIAD 1060 is on order, one of the BESM computers is linked to a besm plotter system. The disks are 7,9 mb, but what is really old, are the card punches which seem to date from before the war!

The center serves a unique purpose already covered in the interview, one of the application areas it sponsored is a management information system called »ASU«, an organisational controlsystem, work on this application began in 1971 under the guidance of prof. Igor Bobko, and the pilot work was conducted with the radio plant in Barnaul. This plant has 5000 employees, and with about 250.000 parts produces around 40 to 50 end products. This plant was also chosen as a pilot installation because its management understood the importance of computerization, having had difficulties in the past with operational planning. The project began with re-defining data aquisition and covered the usual areas of stora-

ge, updating, retrieval and data base management. After successful implementation in 1974 (using a MINSK 220), it was then transferred to 150 other plants and thus became the first »common system« in the Soviet Union. Incidentally, the MINSK used is a 4k word machine, and there are four tape units attached.

A new version of this common system called »Sigma« is now being completed and will be used with RIAD 1020 equipment, with more modern disks and tape units.

Chief of the center, of course, is prof Andrei Petrovich Ershov, not unknown in western DP circles. His office is perhaps the best staffed library on computer science in the Soviet Union - yes, and of course Datamation is represented.

One final interesting point. As in Kiev, a workshop was announced to discuss computer developments, he-

re on three seperate afternoons. On the first day 28 showed up, on the second day 100 and on the third day, no less than 130 members of the computing center. On all three days, discussion was excellent and reflected a good standard of knowledge and competence, both from a practical and theoretical points of view.

Institute of Cybernetics, Kiev

This institute was founded 20 years ago by Academician Lebedev, originally staffed as a research activity with 40 professionals, it now has over 4000 in the following sectors:

    Theory and economics of
    Cybernetics
    Software
    Technological cybernetics
    And a design activity for hardware with an experimental production line

The latter produces its own line of small computers. During the (obligatory) visit to the exhibition showing the accomplishments of the institute, one is shown the various products developed over the years. At one point I was told that a certain piece of second generation equipment on exhibit contained some features which **will be** part of fourth generation processors. I asked what that may be and received the reply from the guide that he didn't really know, but would find out. (Apparently this was part of his canned talk to visitors). Next day he had to admit that he couldn't find out just what that was.

He was embarrased and the subject was dropped.

More interestingly, one showcase displayed wafers 0,25 mm in diameter each (they told me) containing 16Kbits with a resolution of 0.1 microns. Clearly this was impossible to check, but the surprising statement followed that a factory is being built that will be dedicated to mass producing this VLSI technology. Indeed ground was broken and plans could be seen. Development work, they said, was done with help of the Kiev 70 computer.(CAD)

Considerable work is being carried out in robotry and speech recognition. One BESM 6 computer has been programmed to recognize up to 100 sounds, albeit from one person. (NB: This computer is approximately equivalent to a 370/145). This same computer is attached to a number of robot devices, similar to those used by Minsky at Mit. One interesting experiment involves the attachment of diodes to two people, with the computer acting as a control & forward device. When person A lifts his left arm, person B, who cannot see person A, follows exactly the same movement. Very useful, it seems, for rehabilitation.

I spent two days at the Institute and met a dozen people. In addition, a »workshop« was organized which about 50 people attended, my impression was that these were for the most intelligent and qualified people, motivated by the challenge of the field in which they work. Some indeed were outstanding, and from a personal point of view, a woman, prof. Yushchenko - The Grace Hopper of The Soviet Union - was the most pleasant.

The working conditions, compared to similar instutions in Europe and The United States, were nothing less than apalling, the offices were small, cramped, ill equipped and poorly lit. The sanitary facilities were unbelievably primitive, (No toilet paper!) and partially not in working order or sufficiently aired. The projection equipment is very old (hand-fed slide projector) and the building itself, although fairly new, in a bad state of repair. Worst of all, and I suppose this applies to most of the places I visited, no one smiles - it's a rather grim or at least serious working climate, so different from the cheerful halls and faces seen in our part of the world. Is comparison justified? I don't know. But the facts are there. Cause or effect?

Automobile plant at Tolyatti

Built in cooperation with Fiat, this is a huge complex some 500 miles southeast of Moscow. It is dedicated to the production of passenger cars, but is now adding a line of jeep type (four wheel drive) vehicles suitable for the rough terrain of many parts of The Soviet Union. About 700 000 vehicles are produced each year with the help of a substantial amount of western (mostly European) capital-equipment. All of the EDP equipment comes from the west and is situated in a temporary but well suited facility, there are nine systems as follows:

    3 × GE 425
    2 × GE 130
    and 4 × GE 115

Peripheral equipment dates from that period and includes 400 Olivetti Paper tape terminals. Closed shop, all programming done centrally for this vertically integrated plant. Most of the work is done on a one-day turnaround during the third shift. Over 98% of the input is paper tape generated. There are about 410 people in the EDP operation as follows:

    Systems Analysis, Programming & Technical
    Assistance: 100
    Hardware maintenance& Process Controll: 150
    Operations and software Maintenance: 150
    Output (including a print shop!): 10

The operations and software maintenance group is divided into 100 people for operations (center only), 20 for software maintenance and the rest for support activities. It was interesting to note, that when asked about the number of people employed in these activities, only approximate figures could be given.

The principal language used is Cobol. Basic assembler is used about 10%, in time critical parts of programs. Almost all professionals were trained on site, continuing training is a problem because of the isolation. I gave a lecture there on future technology which was announced the day before our arrival. Attendance was voluntary, over 150 DP'ers attended, virtually bringing the operation to a standstill. A photographer took photos of every slide, and every word was recorded. Participation from the group in the form of questions was good and the questions reflected professional competence. The audience was nothing less than stunned with the state of the art and what is coming along. When viewed from a second generation perspective and with little input from the outside world, what else can you expect? Datamation was not to be seen, but they did have a private radio station for the plant (music and political matters), and the facilities for employees were not bad.

One more point. I was apalled at the lack of safety measures in the plant.
NOTE: Not mentioned or seen was the process control computer. I believe that it is based on a BESM 3 system and linked to the central processor operation.

Afterthought: What these people have accomplished with limited means and knowledge is truly to be admired. It may be a crude on line - real time system, for example, but it works. They claim to have »eliminated« the buffer for the line, but the evidence - walking through - indicates that at best this buffer has been kept to a very minimum. That's an enormous accomplishment if you consider the well known USSR problem of the big push in the third of the planning month. (We were there on the 22nd of July, i e in **that** period.

Some general observations

Tapes: Without exception, all of the tapes I saw throughout this trip were Scotch brand.

RIAD: Once there was a dream that RIAD would be the system for all the socialist countries, for all applications, manufactured according to a common plan with distribution of production, design and engineering etc. Reminds me so much of the PL 1 dream (have you forgotten?) of one language....

Fact is that RIAD is seriously behind in its original goals, that there are open jeallousies among the participants about who does what to whom, and that the Soviet Union itself is busy developing its own systems, such as the NAIRI 4 (in Armenia), successors to the MINSK series, and the KIEV computers, as well as the BESM series (10 and 16).
Peripherals: Still the big bottleneck, especially tape units and disk drives.
Data communication: Well, to begin with, they need to develop voice communication. Big plan now to do something about that.
Service centers: Plan being considered to develop these on a regional basis. To be tied together with communication links. Note above. Kiev Institute suggests mini computers make this plan a bit late. They develop mini computers. ∎