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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
INVESTMENT PROMOTION SERVICE, SEOUL
국제연합공업개발기구 서울투자진흥사무소

REPORT ON
RUSSIAN DELEGATE PROGRAMME
FOR TECHNOLOGY PROMOTION
AT IPS SEOUL

2 APRIL THROUGH 1 JULY 1992

PREPARED BY VALERY B. KRAVCHENKO
TECHNOLOGY PROMOTION EXPERT

HEAD OF DEPARTMENT
INSTITUTE OF RADIOENGINEERING AND ELECTRONICS
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The highest quality performance and good will displayed by all staff members at UNIDO IPS Seoul was extremely important to establish necessary contacts with Korean partners in technological cooperation. I would like also to express my sincere gratitude for invitation and permission to take part in short-term delegate programme for technology promotion at UNIDO IPS Seoul.

C O N T E N T S

LIST OF APPENDICES

I. EXECUTIVE SUMMARY

1. The three month UNIDO IPS/Russia technology promotion delegate programme in Seoul, ROK, started on April 2, 1992 and ran through July 1, 1992.

2. More than 100 new technology and materials items were collected from 25 R & D organizations in CIS.

3. Meetings and contacts were arranged with more than 30 Korean companies and organizations.

4. Technical seminars and round-table discussions with technology presentation were organized at four Korean organizations in Seoul, Pohang and Daedok.

5. Two Korean newspapers and two periodicals have conducted interviews with the delegate and published articles.

6. Out of over 100 technology items presented, more than 30 ones received considerable attention from Korean companies and made a basis for five revised technology tranfer project proposals being under discussion now.

7. Follow-up activities will include reporting all findings to project sponsors, parent organization and new possible local partners. All the projects under discussion and requests obtained from Korean companies will be followed up in Russia. All the developments will be reported to UNIDO IPS Seoul, local and Korean partners.

II. PREPARATION STAGE

Preparation for the short-term delegate programme for technology promotion began immediately upon receipt of corresponding Aide-Memoire and Manual for Short-term Delegate Programme from UNIDO IPS Seoul at the end of February 1992.

Because UNIDO IPS Seoul asked to submit the list of potential local partners and project concepts in advance of departure from home country scheduled for beginning of April the time left was sufficient only to prepare a prliminary list of projects and possible local partners.

The following steps were undertaken for this.

1. Meetings were set up with subdivisions of parent organization, Institute of Radioengineering and Electronics of Russian Academy of Sciences, Moscow, Russia and with representatives of enterprises and organizations in Moscow region which showed interest in technology transfer and technology cooperation with possible Korean partners.

2. The enterprises and organizations with offices outside Moscow region were given information via telephone and fax.

3. The information sheets and brochures (if available) were obtained during March 1992.

4. Preliminary list of projects and possible local partners was made and was mailed to UNIDO IPS Seoul. It included 11 projects and 7 organizations (see Appendix 1).

5. General discussions of technology and feasibility levels were carried out with all the local partners. It was understood that the projects include items with good competitiveness. The final proposals were obtained from 25 R & D and industrial organizations in 7 cities of the Russian Federation and Kiev. It was agreed that the information should be presented mainly as end-products for which the technology transfer is possible.

Ⅱ. OBJECTIVES

The goals of UNIDO IPS Seoul for short-term delegate programme for technology promotion were stated as follows :

1. Helping the country who wish to transfer technologies for commercialization to and from the Republic of Korea to identify potential partners.

2. Assisting the Korean potential partners to get reliable practical information from the delegate about technological resources and potentials of the participating country.

3. Facilitating negotiations to reach a conclusion with a knowledge about both partners.

The goals of Russian delegate can be specified as follows :

1. To identify potential Korean partners for the projects presented.

2. To inform the Korean partners of technological level and of particular state-of-the-art technologies at coressponding Russian organizations.

3. To help to general awareness of Korean companies and organizations working in the fields close to the projects presented of technological level of Russian organizations.

4. To promote all the project presented, to relay comments and additional requests from Korean partners to Russian partners on timely basis and to secure corresponding timely replies.

5. To start a dialogue between Russian and Korean partners on as many projects as possible.

6. To help Korean companies and organizations interested in some additional technology transfer from Russia or CIS.

7. To promote ROK-Russia scientific information exchange as a first step of technology transfer and joint development projects.

Ⅳ. PROMOTIONAL ACTIVITY

Types of promotional activity undertaken in Korea in relation to projects presented and to possible technology tranfer in general were as follows :

1. An in-house discussion of the projects was performed at UNIDO IPS Seoul, to identify the most important topics and the channels needed for appropriate promotion. As a result the initial projects were rearranged to cover four topics : solid state electronics (devices and components), materials and equipment, medical electronics and medical treatment methods, fiber optics and sensors.

   The information sheets and technology descriptions available were arranged in these topics. The whole lists of items presented (more than 100 items) as well as some examples of information available are given in the appendix 2. The list included as high-tech items preferably for big companies as end products and materials which can be utilized and produced by small and medium companies.

2. A brief description of technologies available and possible consulting was presented as an advertisement to well-known Korea Daily Trade News as well as a modified version of the description for small and medium enterprises.

3. The information according to item 2 was mailed by fax to information centers of leading Korean companies in the field of electronics (Samsung, GoldStar, Hyundai, Daewoo) as well as to some companies and research organizations working in the field of materials science and electronics.

4. Promotion activities through media included two interviews by newspapers(Korea Economic Daily and Daily Trade News), 2 interview by journals (Information Age and Northern Magazine) (Appendix 4).

5. Using scientific community relations some meetings and seminars were arranged at scientific organizations, such as Korean Institute of Science and Technology (KIST), Electronics and Telecommunications Research Institute (ETRI), Research Institute of Science and Technology (RIST) in Pohang, Yonsei Univ, Physical Department as well as meeting and round table discussions in companies, associations and R & D centers (SsangYong Cement Industrial Co., R & D Center, POSCO Electric Control Co., Koronix Corp, Tong Yang Central Laboratories).

6. Under invitation of the Organizing Committee of International Symposium, " The New Order of Peace, Development and Cooperation in Korea East Sea Rim" a report was presented at the session of the symposium with the agenda "Effort for Cooperative System of New Science and Technologies in Korea East Sea Rim" held in Pohang 14.05 - 16.05, 1992.

7. Based on UNIDO IPS Seoul contacts/direct initiative, over 20 meeting were held with companies and organization to discuss and promote the projects (the list of the companies is given in the Appendix 3).

8. Following the discussion the visits of 2 teams of Korean companies in Moscow and Kiev were organized to study the possibilities of technology tranfer on the spot. Two more visits are under preparation.

9. A meeting with representatives of Small and Medium Industry Promotion Corporation of Korea was held to establish possible cooperation in the field of technology transfer.

It is necessary to stress that all this activity was carried out using UNIDO IPS Seoul (especially its O-i-C, Mr. Y. K. Yoo) experience and facilities, contacts and arrangements which were invaluable for final success of each step.

V. PROJECT PROMOTION RESULTS

1. All topics indicated in the attachments were promoted within three months. Brief summary including mainly items which received the greatest attention and further inquiries from Korean companies is given below for all 4 topics promoted materials and equipment.

SOLID STAGE ELECTRONICS (devices and components).

Technology and design of surface acoustic wave (SAW) filters (1). A number of organizations including GoldStar, Korea Institute of Science and Technology (KIST), Electronics and Telecommunications Research Institute (ETRI), JinBou Engineering Co. were interested in the technology. Because of the complexity of the technology a small-scale R & D project was established by KIST to understand possibilities of the next step.

Technology design and materials for magnetic devices and spin-wave electronics (2) received some attention from Samsung Electronics, ETRI and Korea Technology Institute. Possible projects will probably concern mainly R & D activity.

Semiconductor Ultra-High Frequency (UHF) Devices (5) were appreciated by Samsung Electronics, Goldstar and KPM Information Institute. No definite decisions are made at the moment.

Laser diodes technology, solid state lasers and components (6) were presented to Samsung Electronics, Hyundai Electronics Industries, Lucky GoldStar, KPM Information Institute, ETRI and Young Poong Corp and arose sufficient interest. Additional information was obtained in Moscow and two drafts of technology transfer projects were developed and are now under discusion with Samsung Electronics and Hyundai Electronics Industries.

MATERIALS AND EQUIPMENT

A. Laser and Optical Materials

Non-linear crystals (A2)and optical crystal (A7) as well as possibility of crystal application in jewellery or wrist watch glass prodution. 2 companies made inquiries about possible technology transfer.

B. Functional Materials

Substrates for growth of high-temperature superconducting films (B2). ETRI was interested in supply of such substrates.

Silicon-based and SiC/Si materials for supporting plates, pipes etc (B3). The technology received the greatest and fruitful attention from Tong Yang Central Laboratories which asked for further information concerning technical details and expected expenses of the project and also asked for delegate's help in arranging the visit of customer's research team (2 researchers) to the technology owner. The visit was arranged between 15.06 and 22.06 and the project is now under further discussion at customer's organization.

Heat-insulating materials based on silica and Kaolin fibers (B5). The technology received attention from KeumKang & Korea Chemicals Co, whose delegation (2 researchers) visited the technology owner during their visit to Moscow this April according to delegate's arrangements.
The possibility of transfer is questionable because the company produces similar materials and careful evaluation of expenses and possible advantages of Russia technology is necessary.

Basalt fibers (B6). Keumkang & Korea Chemical Co was very interested in the technology of long basalt fibers because it wants to extend the technology of short basalt fibers it has. A presentation and summary of the technology was given by the delegate in Seoul and shortly after that at the end of April 1992, a visit of 2 researchers from the company to Moscow and Kiev was organized. Now the company is in the process of expenses and profits calculations necessary to make final decision. Meanwhile some preliminary experiments to obtain basalt fibers using Korean

raw materials were arranged both in Moscow and Kiev. The results of the experiments will influence critically on the final decision.

C. Equipment for material preparation.

No items presented had enjoined sufficient attention of Korean companies till now.

D. Building materials

Synthetic granite as a competitive building material was presented to Keumkang Co. but will wait further opportun ties.

MEDICAL ELECTRONICS AND MEDICAL TREATMENT METHODS.

Functional imaging of human organism (1) was discussed in details with Posco Electrics Control Co. (POSCON), Pohang. It is agreed that for this very big project (investments necessary are above 12 million USD) additional information exchange is necessary and further negotiations are to be held at International Exhibition in Spain later on this year where both representatives of IRE and POSCON will be present.

Radiothermograph (5) and semiconductor laser acupuncture device (6) were appreciated correspondingly by KPM Information Institute and Jinbou Engineering Co but the possibility of some real steps is still under consideration.

FIBER OPTICS AND SENSORS

Optical cables for light transmission (1) in short visible and ultraviolet part of spectrum are needed by Yonsei University and Kum Kang Industrial Co. Now the specifications are discussed.

Infrared transparent fluorozirconate fibers for 2-5 mcm (2) which can be used for sensors are interesting for Research Institute of Science and Technology (RIST) and some samples were provided by the delegate.

Erbium doped silica fibers (items 3 and 5) were interesting for ETRI which asked for the samples and obtained them under the delegate's assistance. Now some experiments are carried out to understand the applicability of the fibers for telecommunication systems and the necessity of following steps.
Samsung Electronics showed interest in fiber optic components (7) and different types of micropositioners (11) and these items were included in technology transfer draft which is now under discussion in the company.

Information concerning fiber-optic voltmeters (10) and magnetic field and electric current sensor (11) was discussed by phone and after interest shown in it mailed to Korea Electric Power Co Research Institute as well as to Korea Electroengineering Research Institute.

The joint meeting of the representatives with the delegate was held at IPS Seoul.

Informaiton of methane gas sensor (13) and hydrogen sulfide gas sensor (14) was asked for and was given to KPM Information Institute. General information concerning sensors was presented at seminar held at POSCON, Pohang.

All these discussion were made under the topics presented by the delegate himself.

2. In addition many requests related to possible technology transfer from Russia were given to UNIDO IPS Seoul by Ko. an companies on their own initiative after having seen information published by newspapers and journals. The main ones were as follows.

a) Technology of both-side type and pressure-fastened type-SKM

b) Nd-based magnetic materials
   - Ssang Yong Cement Industrial Co R & D Center

c) Brown-coal-made material for water
   cleaning from oil products - Namyang Enterprises Co.

d) Membranes and liquid crystals technology - Korea Chemicals

e) Production technology of chemical products based on ethanol and its derivatives - Korea Alcohol Industrial Co.

f) Navigation system - JinBou Engineering

g) Technology of special rubber articles for high-voltage electric power transmission lines - Kun Hwa Co.

h) Rubber articles for aircraft and space industry
- Pyung Ha Industrial Co.

i) Technology of silicones, silicone polymers, silicon resins etc.
- Korea Chemical

j) Casting electroslag crucible metallurgy - Young Poong Co-p.

k) Possibility to establish some drawing * drafting team in Russia
- Kyung Il Engineering Co., Orient Drafting Inc.

l) Technology of building materials using perlite & vermiculite
- Dusung Co.

m) Piezoelectric element manufacture technique for piezovibrators and piezo-speaker element - Sun Jin Chemical Co.

And some others. Corresponding requests were made to possible Russian partners but their real identification will need much more time as follow-up actions.

VI. ISSUES AND POINTS OF DIFFICULTY ESTABLISHED DURING PROMOTION ACTIVITY

1. To the moment most of Korean companies contacted do not have sufficient informaiton of possibilities and developments of Russian organizations in technology field.

   Many of Korean representatives met during the programme had no previous contacts with Russian organizations or Russian people. The lack of information and of positive experience creates some uncertainty in fruitfulness of possible future relations.

   Time and considerable efforts are necessary to persuade the representatives in good outlook of these contacts, although they are willing to go into the field. This refers especially to small and medium companies.

2. At the moment the economic situation in Korea seems not to favour great investments because the proifts of many leading companies are decreasing. So the companies are not in a hurry and are very careful in selecticn of fields of possible investments into technology transfer.

3. Korean companies not always know exactly what technology they want and what are the internal Korean or overseas markets for possible new items.

   The best solution for them seems to be "Give me the item in my field", it means, the technology together with already established market possibilities which is quite not always the case for the new technologies.

   UNIDO IPS Seoul tries to overcome the situation using special questionnaire for applicants to think over the future needs and market possibilities, but the results are not always satisfactory. The experience shows that meetings and discussions with companies representatives help them to understand the situation better which can be considered as one of good results of promotion activity.

4. Many questions arose during the meeting concerning political and economic situation in Russia which seems unclear and unstable at present for most of applicants. It is one of reasons why they are reluctunt to big projects with Russia. Besides nobody is aware of real legal basis for cooperation. To overcome this at least partly UNIDO IPS Seoul and the delegate asked for and received from the UNIDO Center for International Cooperation in Moscow brief background on the laws, regulations and taxation system for joint ventures in the Russian Federation. The document prepared by the Center was useful for discussions of legal background for cooperation.

5. The most difficult problem in technology transfer is to identify the proper counterpartner for the technology proposed. Practically all the means available at UNIDO IPS Seoul as well as personal contacts of the staff and of the delegate were used to facilitate the problem solution which by no means requires more time than three months allocated for delegate programme. A possible help for future programme can include organization of a kind of data bank to facilitate mutual informaiton exchange between companies having special technology requests or merely showing interest in some technology fields and organizations having technology transfer proposals. The problem will certainly require much time and work.

6. A serious obstacle met during discussions of possible technology transfer projects is connected with payments for UNIDO trust fund. Most of companies representatives consider the payment as a certain commission fee for match-making between the customer and the technology owner and though may agree to pay such a fee consider existing 13% of project value as a very high percentage. In many cases this may prevent the companies from follow-up actions through UNIDO trust fund scheme after intial negotiations between a company and a technology owner took place using UNIDO facilities. Although the promotion objective to establish dialogue between the parties is achieved in this case, UNIDO itself may have only moral satisfaction.

VI. CONCLUSION

The 3 month technology transfer promotion delegate programme at UNIDO IPS Seoul can be considered as a successful step in establishing long-term technology cooperation between Russia and ROK.

1. Korean companies have shown great interest in possible technology transfer projects proposed by Russia organizations. More than 30 companies were contacted and most of them asked for further information concerning possible partners and details of technology.

2. More than 100 items were proposed by the delegate using development of 25 Russian and one Ukranian organizations, Institute of Radioengineering and Electronics of Russian Academy of Sciences, Moscow, being the parent organization. Around 30 items out of these draw considerable attention of different Korean companies contacted. Some of items were included in 5 projects which are now under formulation and more detailed discussion with interested Korean partners. Final formulations of the projects and especially identification of additional possible Korean partners will require more time and efforts.

3. The technology tranfer promotion programme has to be considered as a long-term one because it is necessary for the customer companies to be persuaded in good level and competitiveness of technology proposed especially in case of Russia where the customers have no experience. It needs also much technical discussions and may be visiting the technology owner on the spot. The delegate carried out some very lengthy technical discussion of possible projects in addition to presentation of tecnologies at technical seminars in research organizations and companies. The technical background and level of discussions and understanding as well as a comparision to international level seem to be quite critical in final decisions of customers on follow-up actions.

4. At the moment the economic situation in Korea seems to be not very good. One of the ways to improve the situation is to increase self-reliance of Korean industry and to decrease of trade deficit is technology transfer.

Severe economic competition on international market of new technology products makes leading Western countries and Japan reluctunt in technology tranfer to Newly Industrialized Countries which are considered as powerful future competitors. Some cases of dumping from Japanese companies in Korea to hamper market possibilities of newly developed domestic high-technology products were mentioned lately by Korean newpapers. In contrast to this many Russian organizations are now aspiring to technology transfer projects because they do not have enough possibilities at the moment to develop quickly competitive local industry of new goods. This creates sound basis for technology transfer promotion in Korea and requires corresponding efforts from Russian organizations to present properly existing and emerging competitive technologies. In addition some joint R & D projects with subsequent commercialization can use properly great R & D potential existing in Russia. UNIDO IPS Seoul delegate programme is of great help in this process of mutual benefit.

IX. FOLLOW-UP ACTIVITIES

1. To relay all findings during stay in Seoul to project sponsors, parent organization and new possible local partners.

2. To continue negotiations on project drafts under discussion in Korea using UNIDO IPS, Seoul facilities and direct communications with Korea partners.

3. To identify possible Russian partners according to requests obtained from Korea companies and to arrange necessary information to the companies through UNIDO IPS Seoul or through direct communication with Korean companies.

4. To research and prepare new projects on possible technology transfer between Russia and ROK considering experience obtained during the delegate programme in case a second three-month delegate programme will be considered feasible and arranged by UNIDO IPS Seoul.

5. To provide help to UNIDO IPS Seoul in establishing some contacts with possible Russian partners upon new requests from Korean companies being in need of some new technologies.

IX. RECOMMONDATIONS

1. It would be reasonable to establish at UNIDO IPS offices in Newly Industrialized Countries a kind of data bank for local companies technology needs and brochures of their present activity which would establish a basis for information inquiries to other IPS offices and to UNIDO Centers and offices in developed countries.

2. It is recommended that UNIDO IPS Seoul provide a possible delegate with information and technology requests available to facilitate the choice of possible technology transfer fields and projects. It means that road to technology transfer has to be bilateral -delegate's proposals plus companies' requests.

3. It is recommended to establish mobile scale of payments to UNIDO trust fund for technology transfer projects (in addition to subcontractor payments) keeping existing 13% (which is still seems to be very high price) only for the lowest-scale projects, say, less than 30-40 thousand USD and decreasing it down to ~5% for projects above 100-150 thousand USD. On the other hand UNIDO IPS office has to provide the possible customers with explicit presentation of advantages which they can obtain through UNIDO trust fund scheme.

4. It is recommended to ask UNIDO Center for International Industrial Cooperation in Moscow to provide from time to time information on legal situation with joint ventures which can be considered as one of possible ways of technology transfer from Russia. The information has to be revised according to regulations existing and appearing in the Russian Federation.

5. It is recommended that technology promotion work at UNIDO IPS Seoul continued for much longer period because the process needs long time for the companies to get and provide information, especially when the field of technology desired is a new one for the company, to assess advantages and drawbacks of the proposals, to compare the variants, to make a project draft and to negotiate. The most reasonable schedule seems to include 3 months stay in IPS for presenting and collecting informations, making some preliminary arrangements with possible partners, and preparing project drafts. Then [illegible] in delegate home country

follows to take all the necessary actions for possible projects discussed including arrangements for customer companies to visit technology owner and to continue the technical and juridical discussions.

At the same time search for new projects according to information obtained during stay at IPS has to be done and then one more 3-month stay at IPS, Seoul to promote the project arrangements presented, to discuss and to promote new projects requested etc.

6. As detailed description of technology presented as possible is necessary for its proper presentations by the delegate who has to enable good technical, scientific and desirably marketing understanding of the technology by possible customer.

   Samples of products and/or videotape descriptions of methods and technology proposed are of great value for final approval of possible technology transfer project so it is recommended that future promotions make use of these types of information and presentation as much as possible.

7. At least some initial knowledge of Korean language in addition to fluent English seems to be desirable for delegate as for everyday life as well as for human contacts during promotion activity.

8. As a basis for long-term technology cooperation joint R & D projects may be useful and should be advised to with possible participation of technology transfer promotion delegate in establishing and promotion of such projects.

APPENDIX 1

LIST OF PRELIMINARY PROJECTS

PLEMINIMARY LIST OF PROJECTS AND LOCAL PARTNERS (CIS)

No	Project	Local partners
1.	Fiber-optic sensors of electric and magnetic fields	Institute of Radioengineering and Electronics (IRE), Moscow
2.	Chemical sensors	IRE, Splav (Kiev)
3.	New building materials	Moscow Institute of Chemical Technology, All-union Institute of Electro-engineering, Moscow
4.	Spin-wave electronics devices (UHF)	IRE
5.	SAW filters	IRE
6.	Powerful UHF magnetron devices for industrial applications	IRE, Torii (Moscow)
7.	Fiber-optic communication system components and blue & green lasers	IRE
8.	Components and antennas for UHF communications	IRE
9.	Health care electronics and curing methods	IRE + medical organizations
10.	Superhard materials for metal working	Splav (Kiev), Technologhia (Moscow)
11.	New tecnology of silicon-based materials	Institute of Solid State Physics Chernogolovka, Moscow Region

APPENDIX 2

PROJECT PROPOSALS BY TOPICS

Introduction to IRE and Its Technologies Transferable Through Delegate Programme of UNIDO IPS Seoul 3 April 1992 - 30 June 1992

Institute of Radio Engineering & Electronics, Moscow, is one of the biggest scientific organizations of Russian Academy of Sciences. It carries out different investigations in the field of solid state electronics, medical electronics, acoustoelectronics, materials science, sensors, quantum electronics, telecommunications, space researches, etc. It has wide collaboration with many scientific and industrial organizations in Russia, CIS and foreign countries. Now a number of possible joint R & D or commercialization projects is proposed for discussion with possible Korean partners. The projects are related to the following main topics :

(1) Solid state electronic devices and components :

- technology and design of SAW filters
- technology, design and materials for spin wave electronic and magnetic devices (filters, rotators, non-reciprocal devices)
- Gunn diodes
- Powerful ultrahigh frequency (UHF) magnetrons and magnetron devices ; semiconductor UHF devices ;
- laser diodes, photodiodes, solid state lasers and components

(2) Medical electronics :

- multichannel system of functional imaging of human body ;
- UHF curing methods and equipment
- electrotherapy device
- radiothermograph

(3) Materials :

- laser and optical crystals and elements ; silica glass optical elements ;
- silicon based functional materials and technology ; carbonized materials
- heat-insulating materials ; basalt fibers
- Sapphire crystals for different applications
- building materials (synthetic granite, slag ceramics)
- AlN ceramics ; superhard and chemically stable ceramics ;
- high temperature superconducting (HTSC) materials and SQUIDS
- substrates for HTSC films

(4) Fiber optics and sensors

- fibers made of silica and multicomponent glasses
- special fibers (high-birefrigent, rare-earth doped, large NA and/or large core fibers)
- fiber optic green and blue lasers ;
- fiber optics components (polarizers, depolarizers, dividers, etc.)
- fiber optics sensors of external pressure, of electric and magnentic field, electric current ;
- chemical sensors

In addition, consultations on other possible projects can be given.

Contacts : Prof. Valery B. Kravchenko
Technology Promotion Expert
Rm 1105, The Teachers Pension Fund Bldg.
27-2, Yoido-dong, Yungdungpo-ku
Seoul, KOREA
Tel : 785-7074 Fax : 782-0689

Solid state electronics (devices and components)

(1) Technology and design of SAW filters
10–1500 MHz, bandwidth 0.1 – 30%

(2) Technology, design and materials for magnetic devices and spin-wave electronics

- 2.1 Soft ferrites
- 2.2 Ferrites and glasses for magnetic heads
- 2.3 Magnetodielectrics
- 2.4 UHF ferrites
  - 2.4.1 ferrogarnets
  - 2.4.2 hexaferrites
  - 2.4.3 ferro garnet films
- 2.5 Magnetostriction ferrites
- 2.6 Hard ferrites
- 2.7 Devices : filters, rotators, nonreciprocal devices
- 2.8 Magnetostatic spin waves filters (300–12000 MHz) delay lines, microwave modulators, phase rotators, convolvers

(3) Gunn diodes – up to 150 GHz

(4) Powerful magnetrons (f= 0.5 – 2.5 GHz, P 0,2–50 KW) for industrial applications and medicine microwave ovens 2.5 KW

(5) Semiconductor – UHF devices

- 5.1 MMIC MESFET control devices (up to 10 GHz) (switches, attenuators, phase- shifters)
- 5.2 Narrow-band transistor amplifiers (up to 20 GHz)
- 5.3 Broad-band transistor amplifiers (up to 20 GHz)
- 5.4 Ga As Beam – lead diodes
- 5.5 Ultrabroadband transistor amplifiers (4 – 12 GHz)
- 5.6 Low-noise parametric amplifiers (up to 60 GHz)
- 5.7 Integrated waveguide transistor amplifiers (up to 39 GHz)
- 5.8 Balanced mixers with low insertion loss (30 – 70 GHz)
- 5.9 Electronically tunable oscillators (30 – 75 GHz)
- 5.10 Low-noise converter-amplifiers (30 – 70 GHz)

5.11 Broadband balanced mixers (80 - 230 GHz)
5.12 Broadband detectors (55 - 260 GHz)
5.13 Ultra-low-noise synthesizers (up to 50 GHz)
etc.

(6) Laser diodes, photodiodes, solid state lasers and components

6.1 Laser diodes 0.86, 1.3 mcm, 1.66 mcm
6.2 Photodiodes 1.3 mcm, 200-510 nm
6.3 Solid state YAG : Nd^{3+} lasers (E_{pulse} 0.5 - 1.3 J, 50 pps)
6.4 Solid state laser components (mirrors, active elements, cavities, EO shutters, modulators etc)

(7) Low delay bulk acoustic microwave line (0.5 - 5 GHZ)

(8) High-temperature superconductor SQUID

(9) Photovoltaic module for protection of car storage battery

(10) Solar power thermovoltaic refrigerator (for medical applications)

(11) Flat gas-discharge graphic displays for screens of public use

(12) He-Ne, Ion-Ar, Nitrogen gas lasers

Materials and equipment

A. Laser and optical materials

A1. Laser crystals : Y A G : Nd, Li Y F_4 : Nd, Al_2O_3 : Ti^{3+}, alexandrite Be Al_2O_4 : Cr, GSGG : Cr,Nd, YSGG :Cr, Nd, $KY(Wo_4)_2$: Nd etc.

A2. Non-Linear crystals : KTP, $LiIO_3$, Li_3BO_3, β- BaB_2O_4, LAP, $LiNbO_3$ etc.

A3. Phosphate laser glasses doped with Nd^{3+},Er^{3+} (λ= 1.5 mcm)

A4. Laser fibers (doped silica and multicomponent glass fibers) with Nd^{3+}/and Er^{3+} dopants (single and multimode)

A5. Special glasses (magnetooptical, optical, fluorozirconate glasses, etc.)

A6. Silica glass lenses, rods, plates, windows

A7. Optical crystals : TeO_2, leucosapphire, $LiNbO_3$, $LiTaO_3$, $Bi_{12}SiO_{20}$, $Bi_{12}GeO_{20}$, $Gd_2(MoO_4)_3$

B. Functional materials

B1. High-Temperature superconducting films

B2. Substrates of Y_2O_3 : ZrO_2, $NdGaO_3$, La Sr GaO_4 for growth of high-Tc superconducting films

B3. Silicon-based and SiC/Si materials for supporting plates, pipes, friction pairs

B4. Carbonized materials for bearings, tightening plugs, contact rings etc.

B5. Heat-insulating materials based on silica and kaolin fibers

B6. Basalt fibers (for tissues and polymer reinforcrg)

B7. AlN and BN ceramics (crucibles, boats, substrates, etc)

B8. Superhard ceramics and cutting tools (WC, B_4C, CrC, SiC etc)

B9. Hard alloy' articles (W, Mo etc) (wheels, cutting tools, crucibles)

B10. Diamond drills

B11. Shaped sapphire articles - tubes, plates, cone-shaped tubes, hollow cones, hemispheres etc

B12. Chemically stable multicomponent nitride - boride-carbide ceramics for nozzles, crucibles, heat insulators etc.

B13. Chromium carbide and metals coatings' technology

B14. Synthetic crystals for bulk acoustic microwave devices

B15. ZnO and AlN films for acoustic transducers

B16. Ferrites (see Electronics)

C. Equipment for materials preparation

C1. Mo C V D system for film growth
C2. Molecular beam epitaxy and ultra-high vacuum elements (10^{-11} torr), more than 50 varieties (pumps, taps, manipulators etc)
C3. Flowmeters for electronics technology
C4. Technology and equipment for conventional Stepanov (E F G) technique, variable and local shaping technique
C5. Automated crystal growth system NIKA (Czochalski + Stepanov methods)

D. Building materials

D1. Synthetic granite
D2. Slag-ceramics
D3. Building materials based on electric power station coal ashes and fly-ashes

Medical electronics and medical treatment methods

1. Functional imaging of human organism

   1.1 Infrared dynamic thermoimaging
   1.2 Multichannel microwave thermometry
   1.3 Microwave thermoencephaloscopy
   1.4 Acoustothermometry
   1.5 Magneto encephaloscopy
   1.6 Magneto cardioscopy
   1.7 Magnetoplethysmoscopy
   1.8 Optical functional imaging
   1.9 Electroballistoscopy
   1.10 System for multimodal monitoring of sceletal muscles (multichannel electromiography, radiothermometry, spectropletismometry)

2. Ultra-high freguency (433 MHz) treatment system (malignant tumors' hyperthermia)

3. Extremely high frequency therapy and equipment

   - haemopoises system protection ;
   - oncology
   - gastroenterology
   - neuropathology
   - post-operative treatment
   - cardiology
   - urology
   - proctology
   - acupunture

4. Electrotherapy device (prostatitis, genitalgy, aminorrhea, disfunctional uterus haemorrage, genital infantilism, functional feminine sterility and other deseases of the genito-urinary sphere)
5. Radiothermograph RT-20 (diagnostics, control, monitoring)

6. Semiconductor laser acupuncture device (λ0.85 and 1.3 mcm, pulse repetition rate 10-20 Hz, output power 5 mW, weight -100g)

7. Solid state lasers for medical applications

   7.1 Er^{3+}, 2.69 mcm, dermatology
   cosmetology, ophthalmology, stomatology

   7.2 Ho^{3+} and Tm^{3+} lasers, 2.09 and 1.93 mcm, neuro-surgery,
   oncology, gastroenterology, pulmanology, urology,
   proctology, laringology, ophthalmology

8. Diamond knives for microsurgery

9. Surgical monoth reads

10. Surgical instrument coatings based on titanium alloys, vanadium and cobalt steels etc.

Fiber optics and sensors

1. Usual silica fibers (fiber module coated with plastics) for 0.85, 1.3 and 1.5 mcm ; optical cables

2. Infrared transparent fluorozirconate fibers (2-5 mcm)

3. Special fibers (high-birefrigent, large NA and/or large core silica fibers, rare earth doped silica and phosphate laser glass fibers)

4. Fiber optic green (W_{out} up to 100 mW) and blue (W_{out} up to 50 mW) lasers using KTP waveguides.

5. Erbium fiber amplifiers and sources for optical communications (1.54 mcm)

6. LD-pumped CW/pulsed fiber lasers, amplifiers, superfluorescence sources for 930 nm, 980 nm, 1040-1200 nm and 1700-2000 nm wavelength regions

7. Fiber optic components (polarizers, depolarizers, dividers etc)

8. Fiber optical microphone (sensor of external pressure)

9. Fiber optical voltmeters for measuring electric voltages and electric field strength.

10. Fiber optic magnetic field and electric current sensor

11. Different types of micropositioners

12. Capacitor type sensor for in-line measurement of the humidity and density of cellulose products-cotton fiber, paper, wood

13. Optoelectronics and optical fiber methane gas sensors

14. Hydrogen sulfide gas sensor

15. Halogenated compounds' sensor (0.05 ppb)

APPENDIX 3

LIST OF COMPANIES AND ORGANIZATIONS

LIST OF COMPANIES AND ORGANIZATIONS
with which meetings and contacts were arranged

No.	Company, Organization	City
1	Korea Institute of Science and Technology (KIST)	Seoul
2	Electronics and Telecommunications Research Institute (ETRI)	Daeduk
3	Tong Yang Central Laboratories	Yongin
4	Keumkang	Yongin
5	Sungyo Co.	Busan
6	Jinbou Engineering Co.	Ulsan,Seoul
7	Samsung Electronics	Suwon
8	KPM Information Institute	Seoul
9	Hyundai Electronics Industries	Icheon
10	Posco Electric Control Co. (POSCON)	Pohang
11	Yonsei Univ. Physics Department	Seoul
12	Hanyang Univ., College of Engineering	Seoul
13	Research Institute of Science and Technology (RIST)	Pohang
14	Korea Electric Power Co. Research Institute (KEPCORI)	Daeduk
15	Korea Electroengineering Research Institute (KERI)	Daeduk
16	Koronix Co.	Seoul
17	SKM	Yongin
18	Ssang Yong Cement Industrial Co.	Seoul
19	Ssang Yong Cement Industrial Co. R & D Center	Daeduk
20	Pohang Institute of Science and Technology (POSTECH)	Pohang
21	Namyang Enterprises	Seoul
22	Namsung Ceramics Co.	Iri
23	Korea Chemicals	Seoul

No.	Company, Organization	City
24	Korea Alchol Industrial Co.	Ulsan
25	Kun Hwa Co.	Seoul
26	Phyung Hwa Industrial Co.	Seoul
27	Young Poong Corp.	Seoul
28	Kyung Il Engineering Co.	Seoul
29	Daewoo Electronics Co.	Incheon
30	Orient Drafting Inc.	Seoul
31	Doosung Co.	Kwangju
32	Sun Jin Chemical Co.	Ahnsan
33	Samsung Corning	Suwon
34	Kony	Incheon
35	Lucky-GoldStar	Seoul
36	Kum Kang Industrial Co.	Kyoungki
37	Korea Technology Institute Ltd.	Seoul

APPENDIX 4

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韓國經濟新聞

原子力문화 振興방안 협의 한국원자력문화재단(이사장 金善昶)은 9일 한전 본사에서 陳稔동자부장관을 비롯한 각계인사150여명을 초청, 원자력문화의 진흥방안을 협의하는 조찬회를 가졌다.

▽徐榮澤건설부장관은 9일 건설부대회의실에서 36개 일급건설종합건설업체대표들과 간담회를 갖고 올해공사입찰예정가를 기준 5%이하의 안정된 수준에서 조기마감해줄 것을 당부했다.

▽李泰動大宇重工業사장은 北方지역 대우(주)상비딜러 협의회를 주관하고 9일오후 귀국했다.

▽金德煥(주)쌍용사장은 中國미팅주재및 中國지역 주요거래선방문을 위해 10일 출국.

▽金一[illegible]고려대교우회장은 11일오후 서창캠퍼스에서 虎像제막식을 갖고 졸업생 재학생 교직원등이 참석한가운데 高大人의 축제행사를 가질 예정.

▽高楨翊방송위원장은 12~14일 미국 라스베이가스컨벤션센터에서 개최되는 92미국방송인협회연례총회(NAB)에 참석키위해 11일 출국한다. 18일 귀국예정.

▽徐正宇延世大언론홍보대학원장은 11일 오후4시 연세대 루스채플에서 언론홍보대학원 개원기념식을 갖는다.

▽申운배한양대교수(토목공학)는 최근 UNEP(유엔환경계획)에서 선정한 「92글로벌500」에 뽑혔다. 「글로벌500」은 UNEP가 지난 87년부터 올해까지 「세계환경의 날」인 6월5일을 맞아 지구환경보전에 공헌을 한 개인 또는 단체를 대상으로 모두 5백명을 선정하는 것으로 우리나라는 지금까지 6명이 선정됐다.

▽孫[illegible]중앙대교수(정경대학장)는 8일오후 조선호텔에서 거행된 「신산업경영대상」수상식에서 경영문화부문상을 수상.

▽安武赫한국발전연구원이사장은 10일 서울힐튼호텔 국화룸에서 「14대총선결과와 한국정치의 지향」이라는 제목으로 정책토론회를 개최.

▽趙[illegible]전북애향장학재단이사장(한국노동교육원장)은 10일 오후4시 전[illegible] 애향예식장(전북투자금융3층)에서 학업성적이 뛰어난 전북출신 대학생 98명에게 애향장학증서와 장학금을 전달한다.

한국기업과 共同R&D 기대

러聯 과학아카데미 IRE소장 크라브첸코 박사

초대석

러시아연방 과학아카데미의 무선공학및 전자연구소(IRE)소장인 크라브첸코박사가 UNIDO(국제연합공업개발기구)서울투자진흥사무소초청으로 최근 내한했다.

전자통신 무선공학분야의 세계적 석학인 크라브첸코박사는 앞으로 약3개월간 머물면서 국내연구기관 기업들과 자신이 연구·개발한 과학기술을 산업화하는 문제를 협의할 예정이다.

그는 「한국기업들의 생산기술과 경영조직이 우수하기때문에 IRE가 개발한 이론을 이용, 국제적으로 경쟁력있는 획기적인 상품을 대량생산할수 있다」고 말한다.

그가 관심을 갖고있는 분야는 인체모니터링시스템을 실용화하는 것.

이시스템은 크라브첸코박사를 중심으로한 IRE팀이 2년전 연구를 완료했는데 혈액 소변채혈등 10가지만 입력시키면 신체각부분의 모든 기능을 자동으로 점검할 수 있는 예방의학의 한 분야라는 설명이다.

크라브첸코박사는 「과학아카데미의 IRE는 旧소련이 군수산업을 발전시키기위해 설립된 기관인 연구소로 美國이나 유럽의 어느연구소보다도 첨단과학이론과 기술을 갖고있다」고 소개한다.

「IRE등과 같은 러시아의 연구소들이 개발한 과학기술을 상품화하기 위해서는 한국기업들과 공동으로 연구하는 R&D프로젝트가 절실하다」고 강조한다.

6월말까지 한국에 머물면서 가능한 많은 기업인을 만날 계획이라는 크라브첸코박사의 연락처는 UNIDO서울투자진흥사무소. ☎(785)7074

<李鉉國기자>

개발理論 이용 획기적商品 가능

93.1MHZ
…과자
…음악실
…의 산책
…의 밝게위에
…다이얼
…음악의 현장
…곡의 전당
…과의 향연

FM 89.1MHZ
…가요범
…의 유행음악
…광장
…쇼
…산책
…는 FM
…투나이트
…원의 인기가요
…음악실

FM 91.9MHZ
…골든디스크
…의 희망곡
…의 데이트
…공접실
…은 내친구
…수의 음악캠프
…디스크쇼
…의 데이트

AM 792KHZ
…종합뉴스
…이름은 여성
…촌24시
…한마당
…레이더
…성공시대
…권 지금
…초저널
…이야기

AM 837KHZ
…천의 생활경제
…에 만납시다
…게 하소서
…산책
…자키
…오강단
… 음악사이에

FM 101.9MHZ
… 새아침
…저널
…잔의 선율
…S 백뮤가요
…을 향하여
…의 마음
…을 밝히고
…길 FM
… 창가에서

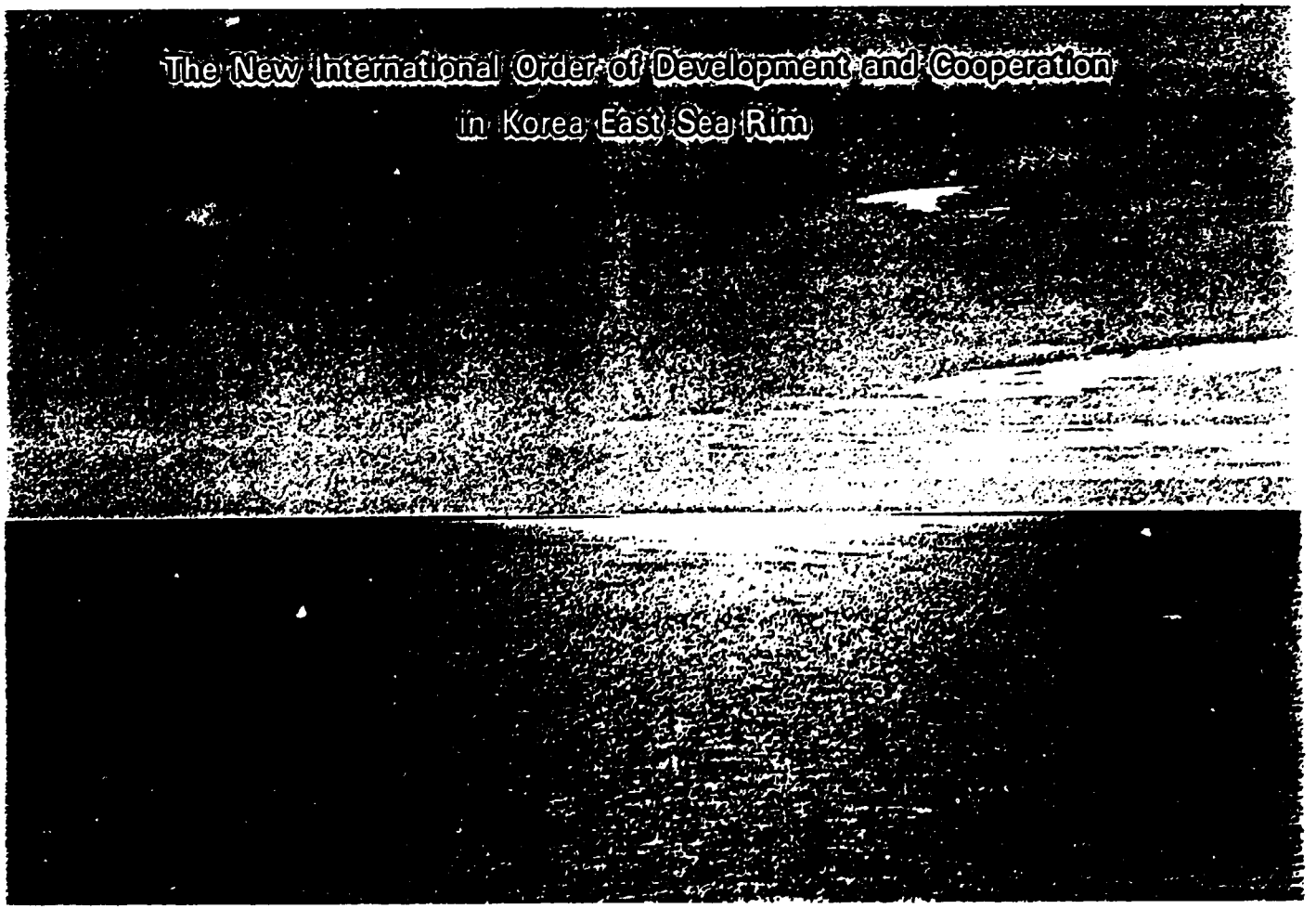
AM 1188KHZ
…의 메아리
…아침입니다
… 성경강해
…의 평안
…로 찬양
…되게 하소서
…논단
…인구
…교회

浦 項 國 際 學 術 會 議

PO'HANG International Symposium

環東海의 開發과 協力의 新秩序

-多者間 네트워크의 形成과 慶北·浦項構想-



1992. 5. 14(Thu)~16(Sat)

시그너스 호텔

Cygnus Hotel, Po'hang City, Republic of Korea

14 : 00~16 : 00 Saturday, May, 16. 1992

PROGRAM

SESSION - V

● AGENDA · 5 : Efforts for Cooperative System of New Science & Technologies in Korea East Sea Rim

○ Chairman : **Young-Hwan Choi**(Director, Science and Technology Policy Institute)

○ Papers : **Sung-Jo Park**(Professor, Berlin Univ.,
Chairman, East Asian Institute)
—「**Possibilities and Perspectives of Technology transfer from East Europe to the North East Asia : Toward a conversion technology fransfer center in po'hang**」

Park, Woo-Hee(Dean, Collage of Social Science, Seoul Univ.)
—「**Technology-based Division of Labor in the North East Asia Region**」

V. B. Kravchenko(Head of Dept, Institute of Radioengineering & Electronics, Russian Academy of Science, Moscow)
—「Some Possibilities of Cooperation in Electronics between Russia and Korea」

Jeon-Yong Lee(Director, Postech Information Research Laboratories)
—「**International Technological cooperation in Korea East Sea Rim through Po'hang Technopolis**」

○ Discummants : **Kazuo Shibagaki**(Director, Institute of Social Science, Tokyo Univ. Japan)
U. Alfrecht(Professor, Berlin Univ. Director, Europe Conversion Center)
Takeda Hiroji(Chairman, Nagai Witten-Herdeke Univ.,
President, Nagai Chamber of Commerce and Industry)
Oh Kwan Kwon(Director, Korea-Soviet Scientific & Technological Cooperation Center, KIST)
James C. K. Kim(President, Korean-Chinese Institute of Technology)
Kong Deyong(President, National Research Center for Science and Technology for Development, China)

Exhibition of Russian Conversion Technology

전자 통신 분야의 세계적 석학 **발레리 크라브첸코** 박사

한·러 기술교류 신기원 열린다

INTERVIEW

현재 박사께서 소속되어 있는 러시아연방 과학아카데미의 무선공학 및 전자연구소(Institute of Radioengineering and Electronics)에 관해 소개해 달라.

무선공학 및 전자연구소 (IRE)는 직원 2천4백명, 그중 연구원 1천여명을 보유하고 있는 러시아 연방 과학아카데미 산하의 가장 큰 기술연구소중 하나이다. IRE는 구소련이 군수산업을 발전시키기 위해 심혈을 기울인 연구소로 미국이나 유럽의 여느 연구소보다도 많은 첨단과학이론과 기술을 갖고 있다. 특히 고체소자공학, 의료공학, 음향공학, 재료공학, 감응신호장치, 원거리 통신학, 우주등의 연구가 두드러진다.

과학기술 분야는 정치적 색채가 적은 탓에 그 어느 분야보다도 일찍 한·소 양국간의 협력이 추진되어 왔다. 과학기술협정까지 맺어진 현재 그 진행 현황에 대해 아는대로 전해달라.

하이테크산업에까지 그 접촉 범위는 상당한 것으로 나는 알고 있다. 양국간 공동연구가 진행되고 있는 것을 몇가지 살펴보면 건축용 컬러유리 제조 기술, 에너지 절약형 조립식 건물, 고속증식로, 유리 세라믹스, 산업용 이온주입기 그리고 각종 소프트웨어 개발 분야이다.

물론 우리 연구소에서도 한국과학기술연구원(KIST)과 여러가지 소규모 재료에 대한 공동 연구사업, 연세대와 고체물리연구소의 인공 크리스탈개발 프로젝트, 평면표시장치 등의 연구 프로젝트가 진행되고 있다.

박사께서는 전자 통신, 무선공학 분야의 세계적인 석학이라고 들었다. 특별히 관심을 갖고 있는 분야는 어느 분야이며, 이번 방한중 어떤 일을 계획하고 있는가.

나는 재료공학 특히 신소재 분야에 관심이 많다. 즉 고체소자공학, 섬유광학, 감응신호장치 이 세분야에 대해서는 누구보다도 많은 전문지식을 갖고 있다고 자부한다.

그러나 현재 나의 최대의 관심사는 인체 모니터링 시스템을 실용화시키는 것이다. 우리 IRE팀은 2년전에 이에 대한 기초 연구를 완료했는데, 이것은 혈액·소변·체온 등 10가지 정보만 입력시키면 인체 각 부분의 모든 기능을 자동으로 점검할 수 있는 예방 의학의 한 분야이다.

그리고 이번 방한중에는 국내 연구기관, 기업들과 내가 연구 개발한 과학 기술을 산업화하는 문제에 대해 협의하고 상담을 해줄 예정이다.

최근 CIS(독립국가연합) 내부 정세 문제로 많은 과학자들이 해외로 유출되고 있다고 들었다. 이에 대한 국가의 대책은 없는가.

그런 일이 일어나고 있는건 사실이다. 나 역시 같은 과학자로서 매우 유감스럽게 생각하고 있다. 이에 따라 최근 이러한 과학 두뇌의 유출을 막기 위한 방편으로 몇가지 인센티브 시스템을 마련했다.

지난 12월 기준으로 연구원들의 봉급을 약 4배 정도 인상시켰다. 그러나 다른 생필품의 가격 인상 등 인플레로 사실상 상승 효과는 없다.

그래서 각 연구소가 갖고 있는 노하우를 이용, 해외업계와 합작회사를 설립하거나 설비 판매, 제조업 등을 허용하고 있고 과학자 개인들이 사업을 해도 좋다는 자유를 주고 있다.

또한 충분치는 않지만 국내적으로 과학 진흥을 위한 특별기금을 조성하고 있고, 혜플리학에서는 미국, 유럽공동체가 주체가 되어 국제 기금은 마련하고 있다.

한국과 러시아연방공화국간의 과학기술협력의 전망과 방안에 대한 박사님의 고견을 듣고 싶다.

무엇보다도 먼저 양측의 과학 기술에 대한 필요성 및 가능성을 숙지해야 하며 그런 관점에서 정보의 교환이 이루어져야 한다고 생각한다. 또 그런 정보 교환에 근거해서 공동 연구 개발 프로젝트를 설정해야 한다. 여기에 이어서 양국가간의 기술 이전이 요구되는데 이를 위해서는 관련 과학자 및 전문가의 도움이 수반되어야 한다.

IRE연구소와 같은 러시아 연구소들이 개발한 과학 기술을 상품화하기 위해서는 한국 기업들과 공동으로 연구하는 연구 개발 프로젝트 마련이 절실하다.

이번 한국 방문은 세번째 방한이다. 그동안 KIST, 럭키금성, 삼성, 현대, [illegible] 연구소와 기업들을 둘러봤다.

방한할 때마다 [illegible] 있다고 느꼈다. 그러므로 러시아와 우리나라의 첨단 기초 기술이 결합된다면 [illegible]

글·사진/김원구기자

로 경쟁력 있는 획기적인 상품을 생산하게 될 것이다.

한국이 소련으로부터 기술 이전을 받을만한 유망한 분야는 어떤 것인가.

의료전자공학 분야를 우선 꼽고 싶다. 앞서 얘기했던 인체 모니터링 시스템과 초음파 진단기가 그 일례가 되겠다.

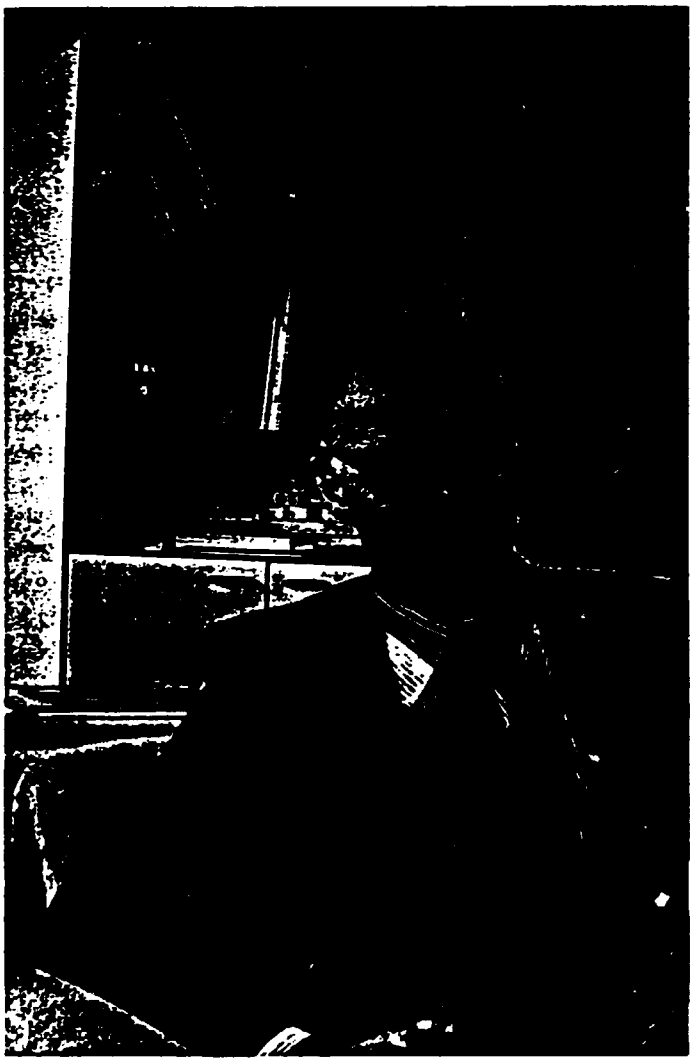
여기서 말한 초음파 진단기는 현재 한국에서 임산부에게 주로 사용하고 있는 것보다 한 차원 앞선 것을 의미한다.

한편으로 내가 이번에 한국에 갖고 온 기술중 하나는 현무암에서 섬유를 빼내는 기술이다. 이것은 지금까지 어느나라에서도 발견된 적이 없는 신기술이다.

현재 서방세계에서 심화되고 있는 기술 보호의 장벽은 결국 전 인류의 발전을 가로막게 된다는 우려의 소리도 높다. 이에 대해 박사께서는 어떻게 생각하는가.

과학자로서 나는 아이디어 교환의 자유가 보장되어야 한다고 생각한다. 과학자의 연구 결과가 누구에 의해 응용되느냐 하는 문제는 중요하지 않다. 어떻게 응용되어 인류생활을 풍요롭게 하느냐가 문제이다. 과학 기술은 국제 교류가 이루어져야 발전하지, 어느 한 국가가 이를 독점해서 발전을 저해해서는 안될 것이다.

과학자로서 과학 및 기술이 인류에게 미치는 영향은 무엇이라고 생각하는가. 그것은 바로 박사님의 인생관이라고 할 수도 있을 것이다.



러시아연방 과학아카데미의 무선공학 및 전자연구소(IRE) 소장인 발레리 B. 크라브첸코박사가 최근 내한했다. 전자통신, 무선공학 분야의 세계적 석학인 그에게 러시아연방과 한국기업간의 과학기술협력에 관한 얘기를 들어본다.

나는 인류에게 더 나은 장래가 있다는 것에 대한 강한 신념을 갖고 있고, 그리길 원하고 있다. 또한 그러한 장래가 빨리 오도록 노력할 것이다.

러시아 시인에 "신을 믿는가 그러나 자신의 기회를 놓치지 말라"라는 말이 있다. 즉 운명에 맡겨도 좋으나 스스로 노력하지 않으면서 매일 기도만 한다고 무슨 일이 이뤄지는 것은 아니라는 뜻이다. 이것이 나의 인생관이기도 하다. ■

전자신소재 분야의 연구개발 파트너 희망

크라브첸코 러시아연방 IRE 연구소 소장

러시아 연방 과학아카데미의 IRE(Institute of Radioengineering Electronics, 무선공학 및 전자연구소)소장이자 고체물리학교수인 크라브첸코 박사가 최근 우리나라를 방문했다.

크라브첸코박사의 주요 연구분야는 센서, 레이저분야의 고체장치에 적용되는 응용물을 포함해 생산유, 광유리, 광자기, 초전도체, 초음파에 관한 논문과 5권의 저서를 집필한 바 있다.

국제연합공업개발기구인 UNIDO 서울투자진흥사무소 초청으로 내한한 크라브첸코 박사의 한국에서의 인정과 국내 경제산업 및 과학기술 공동연구프로젝트에 대한 그의 견해를 들어본다.

— 박사님의 방한취지와 한국의 첨단산업에 대한 견해를 듣고 싶습니다.

한국에는 6월말 까지 약 3개월간 머무를 생각입니다. 한국 기업은 생산라인이 거의 완벽하게 갖추어져 있고 자동화정도나 품질의 수준 역시 우수하다고 생각합니다. 그런데 한가지, 한국 기업들은 대부분 기존의 기반기술 개선에 신경을 많이 쓰는 것 같습니다. 그러나 앞으로는 디지털신호처리(DSP) 분야 같이 미래 유망분야에 투자가 보다 활발히 이루어져야할 것 같습니다.

— 그렇다면 IRE가 개발, 산업화시키고자하는 분야는 무엇이며 공동프로젝트 추진은 어느정도나 이루어질 수 있다고 보십니까.

현재 저와 IRE가 관심을 갖고 추진하고자하는 분야는 첨단전자과학을 의학에 적용하는 것입니다. 우리가 개발한 시스템은 무선 원격조정센서원리로 인체내부조직의 활동과 병원균이나 암세포 등을 조기 발견, 치료하기 위한 인체모니터링 시스템을 실용화하는 것입니다. 이 시스템은 2년전에 완료된 것으로 인체내부의 상태를 파악할 수 있는 체온, 혈액, 소변 등 10가지 정도의 정보만 입력시키면 신체 각 부분의 기능을 자동 점검할 수 있습니다.

현재 우리 IRE에는 1000명의 순수 연구인력을 포함, 총 2500명 정도의 인력이 있습니다. 아직 많은 한국 기업들과 만나지는 못했지만 현재 한국의 KIST와 공동연구개발계획이 진행중에 있고 무엇보다 레이저분야에 있어 한 개인기업과도 공동개발계획을 갖고 있습니다.

— 앞으로 박사님의 계획을 말씀해주십시오.

기대을 경제에 IRE와 러시아기업의 발전에 기초한 [illegible]

Answers for Information Age Co.

1. CV. Valeri B. Kravchenko received Ph. D. degree in Chemistry from the Institute of General and Inorganic Chemistry of Soviet Academy of Sciences in 1963 and Doct. Sci. degree in 1982 from Moscow Institute of Chemical Technology. Now he is Professor of Solid State Physics and Head of Electronic Materials Department of the Institute of Radioengineering and Electronics(IRE), Russian Academy of Sciences, Moscow. His main interests include development of solid state electronics materials such as laser glasses, fibers, magnetic and high-temporature superconducting films, ceramics, different optical single crystal etc. as well as their applications in solid state devices especially in sensors and lasers. He is now UNIDO expert in materials science. He wrote 5 books, more than 150 scientific articles and made over 50 inventions.

2. Purpose of the visit is to promote transfer of technology developed in IRE and related organizations to Korean companies and to promote joint R & D projects with Korean organization through UNIDO Investment Promotion Service.

3. I shall stay at UNIDO IPS Seoul till the end of June 1992.

4. I visited only a few electronic companies till now. The production lines are well organized, automation degree as well as quality standards are high, so impression is good. Unfortunately till now I have no experience with information & communication industries except the fact that there are some Samsung displays at PC in my department and we have no troubles with them.

5. My feeling that Korean electronic companies may have some problems in the nearest future when digital signal processing (DSP) chips will be more widespread, because greater basic scientific background and R & D are necessary for this technology, and the companies are oriented mainly to improvement of existing technologies. It is just a feeling but it would be reasonable to think over the possibilities of cooperation with Russian scientific organizations where basic sciences are well developed.

6. Now this cooperation seem to be not adequate. For instance, our Institute IRE (around 1000 researchers, 2500 total personnel) now has one joint R & D project with KIST and a private company on special ceramics. But we can propose a wide choice of topics for such cooperation. I would mention a few. We developed some diagnostic and treatment methods of

medical electronics. It is possible to obtain functional imaging of human organism using non-invasive methods (developed earlier for remote sensing in radioengineering) such as infrared dynamic thermoimaging, multichannel microwave thermometry, magnetoencephaloscopy and cardioscopy etc. to follow dynamic picture of functioning human body and to discover all the disturbances at the earliest stages. A number of treatment methods developed include non invasive extremely high frequency therapy and equipment, electrotherapy device, radio thermograph to measure temperature inside a body, solid state lasers for different medical applications (wavelengths at 1.9, 2.1 and 2.7mcm) etc. A wide variety of materials and technologies proposed include laser and optical materials, ferrites, substrates, superhard ceramics, AlN and BN special ceramics, sapphire crystals and articles, and special fibers. A number of sensors for measurement of electric and magnetic values, humidity, different gases in atmosphere are developed. Components for telecommunication systems include fiber amplifiers, sources for optical communications, many ultra-high frequency semiconductor devices, and different filters based on surface acoustic waves and magnetostatic waves and covering frequency region from 30 MHz up to 12 GHz and so an.

7. The situation now is rather complicated. Our industry undergoes a painful restructuring including privatization, conversion of military companies, reorientation to the production of mainly consumer goods instead of heavy industry items etc. So industrial companies do not have substantical funds for scientific researches at the moment and funds provided by the state budget are not sufficient for proper development of basic scientific investigations. So main orientation of all scientific institutions toward short-term applied researches is obvious at the moment. I hope the situation is a temporary one.

8. In the nearest future I shall try to do my very best to promote at national and international level some implementation projects based on developments of IRE and related organizations and I hope to continue my activity in the field of new electronic materials.

Daily Trade News

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러시아 첨단 기술이전(합작생산 포함) 상담안내

UNIDO IPS Seoul은 러시아의 Moscow 소재 무선공학 및 전자 연구소(Institute of Radioengineering & Electronics)의 Valery R. Kravchenko박사를 초청하여, 진취적인 국내 중소기업을 대상으로 국제경쟁력이 있는 첨단기술이전 및 공동개발, 생산지도, 합작생산을 돕고자 다음과 같은 분야에 관하여 직접상담 기회를 마련하였사오니 관심 기업은 이 기회를 활용하시기 바랍니다.

1) 신소재(Materials)
① Optical materials(crystals, glasses, lenses) ② Carbon-based materials for bearings, contact rings ③ Chemically stable ceramics for substrates, crucibles, heat insulators ④ Superhard materials for grinding wheels, cutting tools ⑤ Vacuum elements (pumps, taps, input and transient elements, manipulators)

2) 센서(Sensors)
① Methane gas(optical) ② Hydrogen sulfide ③ Electric voltage (fiber-optic) ④ Magnetic field, electric current(fiber-optic)

3) 의료전자 장비(Medical Electronic Devices)
① Electrotherapy device(prostatite and other genito-urinary deseases) ② Radiothermograph(non-invasive temperature measurement) ③ Extremely high frequency treatment device (many deseases of internal organs)

4) 기타 분야도 상담 가능

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UNIDO Investment Promotion Service, Seoul
국제연합 공업개발기구 서울투자진흥사무소
영등포구 여의도동 27-2 사학연금회관 1105호