

**WORKSHOP ON INTELLECTUAL PROPERTY RIGHTS AND GOVERNMENT-FUNDED
RESEARCH IN RUSSIA**

Obninsk, 22-23 October 1996

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Paris

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FOREWORD

The Workshop on “Intellectual Property Rights and Government-Funded Research in Russia” was organised in Obninsk in October 1996. This workshop forms part of the programme of the Centre for Co-operation with the Economies in Transition (CCET), for policy dialogue and co-operation with the Russian Federation, as it undergoes economic transition. Representatives of Russian and OECD Member governments, businesses, scientific institutes, educational facilities and members of other international organisations attended the Workshop. It was funded in part by a voluntary contribution from the Canadian government.

The Russian Federation has one of the world’s largest scientific research establishments. Russia’s transition to a market-based economy is, however, creating serious disruptions within this community. Under severe budgetary constraints the Russian state can no longer afford to support science at past levels. Russian industry, still mired in economic decline, also remains unable to provide substantial financial support to science. To escape this budgetary squeeze, the commercialisation of research results is becoming increasingly important to some parts of the Russian scientific community. It is against this economic background that Russian and OECD country intellectual property specialists met in Obninsk to exchange their experiences.

The papers prepared for this meeting deal with four general themes: government-funded research and patenting; the legal framework for intellectual property developed through contract research; managing intellectual property developed at universities or research centres; and the enforcement of intellectual property rights. They were prepared by Russian and OECD country experts in order to exchange information on the variety of approaches used in dealing with many of the practical issues facing research institutions and as a way of highlighting support for the legal protection of intellectual property.

There were several proposals for follow-up to the workshop, namely that:

- an informal network be created among intellectual property and research contract specialists at universities and major scientific research institutes in the Russian Federation and that it be integrated as much as possible into existing networks in the OECD area;
- training programmes be established to share the relevant experience of OECD countries with Russian contract and intellectual property specialists;
- an information channel be developed for helping Russian institutes gain access to needed information and advice on commercial potential and patenting abroad; and
- there be funding of an information infrastructure for the patent and licensing departments of Russian universities and research institutes to enhance their access to relevant material, including current patent literature and commercial information.

This report is intended to serve as a brief record of the workshop and is comprised of a summary of the proceedings, the draft annotated agenda prepared before the meeting, three discussion papers, a list

of workshop documents, a list of participants, and a selection of eight background papers. It is published on the responsibility of the Secretary-General of the OECD.

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SUMMARY OF THE WORKSHOP ON INTELLECTUAL PROPERTY RIGHTS AND GOVERNMENT-FUNDED RESEARCH IN RUSSIA

The Department of Science and Technology (DSTI), in the framework of its programmes with the Centre for Co-operation with the Economies in Transition (CCET), sponsored a joint OECD/Russian Federation workshop on *Intellectual Property Rights and Government-Funded Research in Russia* on 22-23 October 1996. This workshop was organised in co-operation with the State Committee for Science and Technology Policy and the Russian Patent office (ROSPATENT). It brought together OECD experts on patenting issues with over 100 Russian representatives, including government science administrators, technology managers from defence and civilian research organisations, officials and researchers from the Academy of Sciences and universities, and businessmen.

Many participants believed that the continued financial and structural problems of much of Russian industry was acting to deprive Russian research institutes of an essential market for their innovations. As a result, state financing and grants remained important to many research institutes. While individual pockets of research excellence appeared to be adjusting to this harsh fiscal climate, the general outlook remained quite difficult -- with 1997 budget financing likely able to support only about one out of five current scientific researchers.

Intellectual property rights issues, particularly ownership rights to inventions, remain a sensitive issue in the Russian Federation and other newly independent states of the former Soviet Union. Concerns centre on providing adequate incentives to researchers and inventors. Possible legal changes in this area are creating some apprehension. A majority of participants shared the view that during the transition period from the old system of "inventor certificates" to the new system of broadly defined intellectual property rights, the inventor should receive a higher share -- rather than a lower share -- of the benefits from a successfully marketed innovation. Several OECD area participants in the workshop noted that, in their countries, previous arrangements which gave the state ownership and management of state-funded inventions had proven unsuccessful. OECD governments now look beyond the direct profits of an innovation to its wider social benefits, such as job creation.

Economic reforms in Russia foresee the use of research contracts as an important element for managing scientific research and the intellectual property that might result from it. Participants agreed that, as the Russian economy develops into a fully-fledged market economy, the technology-push mode of technology transfer -- which currently characterises the Russian transfer situation -- should be abandoned progressively in favour of a more demand-pull mode and a market-oriented approach to technology transfer. The move towards a more market-based system will require a system of sanctions and a dispute settlement mechanism.

The general discussion on "background" intellectual property noted the importance of procedural steps, such as careful identification and the use of non-disclosure agreements, and stressed the correct management of intellectual property as an important element for making research institutes attractive to potential research sponsors. However, the valuation of "background" intellectual property and its influence on the price of research contracts remained an area of disagreement.

Other topics of discussion at the workshop included:

Commercial secrets -- A distinction was drawn between state secrets and commercial secrets. For the latter, the economic essence of the research is central to confidentiality and achieving appropriate controls will require considerable work with researchers.

Foreign patenting -- The past administrative system for patenting abroad was dismantled and, in addition to the high financial costs of foreign patenting, filing abroad is complicated by difficulties in getting the necessary information and advice. A representative from the *World Intellectual Property Organisation (WIPO)* explained how filing through the Patent Co-operation Treaty might ease some of these difficulties.

Marketing -- OECD experts presented their different IPR systems and methods for commercialising intellectual property. Marketing was highlighted as a crucial element for any intellectual property office, the moment of invention being only a first step along a long road that involved many commercial decisions.

Enforcement -- Progress is being made in strengthening enforcement of intellectual property rights in Russia. This will become increasingly important for all those engaged in patents, inventions and innovation and is a key element for investment by industrial companies and economic progress.

There were several proposals for follow-up to the workshop which could be undertaken internally and/or with the support of various aid organisations:

- **An informal network** could be created among intellectual property and research contract specialists at universities and major scientific research institutes in the Russian Federation. Consideration might also be given to how this network could be integrated into existing networks in the OECD area.
- **Training programmes** could share the relevant experiences of OECD countries with Russian contract and intellectual property specialists, who increasingly rely on the use of research contracts as an R&D management tool.
- **An information channel** could be developed for helping Russian institutes gain access to essential information and advice on commercial potential and patenting abroad.
- **Funding the information infrastructure** for the patent and licensing departments of Russian universities and research institutes would enhance their access to relevant material, including current patent literature and commercial information. Lack of information is a major roadblock to the market analysis that has now become an important part of the work of patent and licensing departments world-wide.

INTRODUCTORY REMARKS BY THE RUSSIAN CO-CHAIRMAN

Sergey A. Tsyganov

Executive Secretary of the Fund of Fundamental Research of Russia

The international workshop "Intellectual Property Rights and State Financing of Research in Russia" takes place at a time when Russian science is in a very difficult situation. Russian Federal budget data on the actual 1996 outlays made for financing fundamental research and for facilitating the scientific and technological progress reveal that science is not yet a priority sphere for the executive authorities. Even salaries, which the Federal Law "On the Federal Budget for 1996" stipulates to be a protected expenditure category for science, are being financed at less than 60 per cent of their appropriated amounts.

Of the several possible sources which might have been used to finance science and technology -- funds from the Federal Budget, from regional budgets and from various extra-budgetary sources -- science is in fact only financed by the state. The most difficult situation for the state's financing of science has arisen during the past several years. Comparative evaluations reveal that expenditure for science and technology in Russia fell by more than 20 times from 1985 through 1995. Over the same period (1985 through 1995) the number of scientific organisations and employees working in the scientific and technological sphere fell dramatically. The most significant outflow occurred in 1992 when the number of scientific workers fell by 25 per cent.

This extremely scarce financing for science has caused an outflow of scientific workers and of the objects of intellectual property from the country. The humiliating material conditions in which Russia's scientists find themselves leads them to sell or transfer the results of their research, which was previously conducted at state organisations financed by the state budget, to any interested person.

In this situation the problem of protecting intellectual property, industrial property, and the state's rights and ultimately the problem of ensuring the nation's economic security become the central questions for the state's activities in the sphere of science and technology. These issues become the key issues for preserving the national scientific and technical potential.

The Russian Federation government is taking steps to eliminate factors that adversely affect the protection and utilisation of domestic innovations.

Heated debates during the discussion of the Federal budget for 1997 have resulted in an estimated allocation of Rub. 15 257 billion for science, a 30 per cent increase over 1996. Allocations for fundamental science (the Russian Academy of Science, the Fund of Fundamental Research of Russia, etc.) were increased substantially (by 1.5 times). However, the funds earmarked for scientific research still comprise a share of the Federal Budget's total expenditure that is far below the amounts stipulated by the Federal Law "On Science and the State Science and Technology Policies" of 1996 (4 per cent of the total budgetary expenditure). Towards the end of 1996, the government of the Russian Federation had approved basic measures directed at implementing this law's provisions. Important legislative acts are to

be adopted within the framework of the basic law to enhance and define more precisely its individual articles and provisions. Among those acts that have already been submitted to the State Duma are the draft laws:

- on employee inventions, utility models, and industrial designs; and
- on secret inventions.

In 1997 a law on innovation activities and a governmental decree on the state accreditation for scientific organisations will be drafted. The current regulation On Contracts for the Creation (Transfer) of Scientific and Technological Products will be amended to conform to the newly adopted Civil Code of the Russian Federation. The above-mentioned legislation will be an important supplement to the laws and normative acts currently in force in the Russian Federation (“The Patent Law of the Russian Federation”, the law “On Copyright and Related Rights”, etc.) which strengthen a number of legal rules related to inventing. The preparation of such legal measures, however, does not settle the problems. At present the legal rules regulating property rights in the Russian Federation are extremely inadequate, and it is necessary to make wide use of international experience.

In this connection the exceptional importance of this International Workshop should be stressed. Its subject matter embraces many aspects of scientific and technological activities, patenting, management of intellectual property as well as securing and protection of rights.

It is important to emphasise that the program of the International Workshop includes summary reports of prominent Russian and international experts of the OECD Member countries and that experts and practical workers of Russian patent agencies were invited.

Especially interesting for the Workshop participants may be the problems which can be settled in the immediate future. These problems include:

- The problem of sharing exclusive intellectual property rights between scientific workers and legal entities -- the organisations that were commissioned to conduct projects financed from the state budget. In this instance the emphasis may be placed on an unresolved, new problem, i.e. sharing of exclusive rights in projects financed via state budgetary funds. Competitive financing through a system of grants (for instance, through the Fund of Fundamental Research of Russia) has become an important part of state financial support for Russian scientists.
- A need to oversee those aspects of international agreements -- agreements on support rendered to scientists by international scientific funds, etc. -- which concern intellectual property rights. It is obvious that the legal basis governing this sphere in the Russian Federation is insufficient. Especially critical is the question of intellectual property that was created before an international agreement or a contract was put into effect and may be used in carrying out the projects stipulated under the agreement or the contract. The problems of a proper evaluation of the contract’s price, while taking into account a resolution of this difficulty, remain on the agenda.

Of course, the above-mentioned problems are not the only ones requiring a lively exchange of views and of accumulated experience.

The programme of the International Workshop includes discussions on many other problems which are important for development of generally accepted norms and rules of intellectual property protection in Russia that are in accordance with international standards. We can hope that a wide exchange of views will be useful and fruitful.

DRAFT ANNOTATED AGENDA

First day: 22 October 1996

Opening Session (*) (a.m.)	Opening Remarks	
First Session (a.m.)	Topic A:	Government-funded research and patenting
Second Session (a.m. and p.m.)	Topic B:	Legal framework for intellectual property developed through contract research

Second day: 23 October 1996

Third Session (a.m.)	Topic C:	Managing intellectual property developed at universities or research centres
Fourth Session (p.m.)	Topic D:	Enforcement of intellectual property rights
Closing Session	Concluding Remarks	

(*) Some flexibility in the allocation of time may be required throughout the Workshop.

Opening remarks

Following a request by the Russian government, this Workshop is organised by the Centre for Co-operation with the Economies in Transition (CCET) in collaboration with the Directorate for Science, Technology and Industry (DSTI). It is partially funded by a voluntary contribution from the Canadian government and is being organised with the assistance of the Russian State Committee for Science and Technology and ROSPATENT. The Workshop will bring together experts on intellectual property issues and government officials from the Russian Federation, several New Independent States of the former Soviet Union (NIS), and OECD Member countries. Representatives of other international organisations and the business community are also expected to attend the Workshop.

The overall objective of the Workshop is to examine a number of difficult issues on intellectual property rights as they relate to government-funded research in the Russian Federation. The workshop will focus on these issues from the perspective of the federal legislative framework and from the perspective of

the organisational framework of state science centres and educational institutions. During the course of the discussions it is expected that participants can reach certain conclusions and/or recommendations concerning those issues.

Topic A: Government-funded research and patenting

Various background papers present a general overview of R&D funding and patent activity in the OECD area and Russia. Particular attention is given to an analytic description of the recent organisational reforms in the Russian scientific research sector. This session should help develop an understanding of how the transition period is affecting the Russian science establishment, providing a background for discussing intellectual property issues. It should also allow for a brief exchange of views on the role of the state in supporting science. (See below discussion paper for Topic A -- Government-Funded Research and Patenting: An Overview).

Topic B: Legal framework for intellectual property developed through contract research

Background material outlines how universities and national laboratories in the OECD area and Russia are organised for managing their intellectual property. A survey of the current legal framework in the Russian Federation, including current legislation and possible problems linked with its implementation, will also be presented. (See below document for Topic B -- Legal Framework for Intellectual Property Developed through Contract Research)

This session centres primarily on discussing intellectual property rights provisions for contract research (state-funded and privately-funded) done at OECD area universities and state laboratories with those currently being used at Russian research institutes. It covers such topics as: title, ownership of data, obligations of employees (employee agreements), delineation of contracted work (from past work, from other ongoing research), conflict of interest, subcontracts, joint research with other institutions, non-exclusive license to federal government, disclosure, publication restrictions and secrecy agreements, national security provisions, foreign applications, patent prosecution and maintenance, and utilisation requirements: assignment, royalty distribution, reports.

In addition to examining the individual topics outlined above, the discussion might also investigate how different legal sources (federal, regional or institutional) are most relevant to resolving the above issues. Discussion by participants might centre on how the principles work in practice.

Background documentation (available on <http://www.oecd.org/sge/ccet>):

Rüdiger Zellentin, "Filing for International Patent Protection"

Paul A. Labbett, "Delineation of Contracted Work (From Past Work, from other Ongoing Research)"

Paul Rabette, "Disclosure, Publication Restrictions and Secrecy Agreements"

Topic C: Managing intellectual property developed at universities or research centres

The objectives of the third session are to share the experience of OECD area university and national laboratory technology transfer managers in protecting and commercialising intellectual property. It

will cover such topics as: managing a technology transfer office, organising invention disclosure, maintaining good relations with inventors, using outside patent specialists, doing a pre-filing patentability and commercial evaluation, marketing the technology, licensing (royalties, pricing, finding comparables, standstills, and options), and incubators. (See below document for Topic C -- Managing intellectual property developed at universities or research centres.)

Discussion should focus on the current Russian organisational situation, procedures and problems. Possible suggestions on how to restructure institutional work could emerge. In addition, the discussion might focus on the implications of any currently planned legal initiatives for technology licensing and explore the feasibility of pairing “brother” or partner organisations, e.g., Russian and OECD universities, whereby they could help each other in evaluating the potential for commercialising intellectual property in each other’s markets.

Background documentation (available on <http://www.oecd.org/sge/ccet>):

Adrian Wheldon, "Business Development at the Central Laboratory of the Research Councils"

Stefan Gärtner, "Conducting Prefiling and Commercial Evaluations: Introductory Talk"

Carl B. Wootten, "Licensing Negotiations"

Topic D: Enforcement of intellectual property rights

Session 4 discusses the importance of and mechanisms for enforcing intellectual property rights. The importance of enforcement is linked to its economic rationale that protection stimulates research, technological innovation and raises welfare. In doing so, it strikes a proper balance between conferring exclusive rights and fostering competition. Viewed from three different perspectives, that of the firm, the national economy and international trade, IPR enforcement proves to be an important element in supporting economic growth. A firm requires IPR enforcement to obtain innovation rents, a return on its investments made in R&D, and to be protected from potential imitators who, not having made the investments, could be lower cost producers. The national economy benefits, for creative work is induced, new ideas are disseminated rapidly, investment is promoted, and consumers receive better goods and services. The globalisation of the world economy has increasingly projected the national economic benefits to an international level. With competition increasingly occurring at an international level, proper international IPR enforcement is required for firms to receive the needed return on R&D investments.

Session 4 seeks to provide a forum for sharing the experience of OECD area technology managers (universities, national laboratories, and business) on what enforcement mechanisms are most important for technology producers. Participants can discuss the current efforts being made to establish enforcement mechanisms in Russia and how they might be improved.

Some questions for discussion might be:

- How might the general economic rationale for enforcing intellectual property rights (see Hartmut Fest, "The Economic Rationale of the Protection of Intellectual Property Rights and their Enforcement") not be applicable to Russia during its transition period? What might be a different rationale for the transition period?

- What mechanisms exist for informing the public on legal and administrative decisions relating to patent enforcement issues? Are the merits of cases summarised in writing and made available to others so that they may understand the bases of decisions? How do OECD area and current Russian practices differ?
- What kind of problems exist in defining the relative competencies of administrative and judicial bodies for intellectual property rights matters? Are all administrative decisions subject to judicial review? If not, which are and which are not? How are lower court rulings subject to higher judicial review?
- What might be the greatest obstacles facing Russian institutes seeking legal enforcement of their intellectual property rights?
- How easy is it to get a preliminary injunction to stop patent infringement during the conduct of the infringement proceedings? Are there other types of provisional measures available?
- How are damages for reimbursing the patentee provided for? What other remedies are available? In which cases are criminal procedures possible?
- What types of border measures are available for preventing the passage of infringing goods? How are these implemented in practice (possible problems with current free trade arrangements, etc.)?

Background documentation (available on <http://www.oecd.org/sge/ccet>):

Alexander A. Christoforoff, "Enforcement of Intellectual Property Rights in Russia: Current Status, Problems and Prospects "

Concluding remarks

The main findings and conclusions of the Workshop's discussion will be summarised. Possible recommendations will be summarised, including the identification of possible areas of follow-up technical assistance.

DISCUSSION PAPER FOR TOPIC A: GOVERNMENT-FUNDED RESEARCH AND PATENTING -- AN OVERVIEW

Research and development at OECD area universities and public research organisations

Recent trends in funding

The business enterprise sector funds almost three-fifths of the research and development (R&D) done in the OECD area and employs almost two-thirds of the area's researchers. Government funding for R&D has recently decreased, in some cases reflecting reduced defence-related expenditures or general budgetary pressures. The higher education sector in the OECD area generally receives about 15 to 20 per cent of total gross domestic expenditures on R&D (see John A. Martens, "OECD area trends: R&D expenditure and patent activity at government research organisations and universities").

While the business enterprise sector performs some research for the government, almost 85 per cent of the research performed by business is self-funded. The relative importance of the business enterprise sector as a performer of R&D has been increasing over the past decade.

Patenting

Patenting by OECD area universities and public research organisations is generally viewed as an activity tangential to their main goals: education and the performance of research for the public good. In fact, serious debates have surrounded the propriety of universities protecting and commercialising intellectual property developed by their staff. The opponents of university patenting often cited the threat to the tradition of open publication and the danger that patenting would undermine academic claims to objectivity and disinterestedness. The proponents have argued that patents help ensure the proper use of university developments and provide financial benefits to the university community and the larger public. While public research organisations also protect their intellectual rights, they do not view it as the ultimate goal of their work (see Daryl S. Grzybicki and Judson R. Hightower, "Treatment of Intellectual Property by United States Government Laboratories"). Protection is largely sought to defend the government from having to pay royalties to another owner and to promote the broader use of the research results.

The OECD area has an active interchange of patents, with the North American, European and Asian regions reporting over 30 000 outside applications annually. This interchange reflects the judgement of OECD area businesses that securing patent protection, because it is enforceable, represents an important business strategy to obtaining a sufficient return on their investments (see Hartmut Fest, "The Economic Rationale of the Protection of Intellectual Property Rights and their Enforcement").

Research and development in the Russian Federation

Recent trends

Political and economic reforms in Russia have created the basis for the development of market institutions. If these institutions are able to take root further, a growing share of Russian research and development should become guided by market signals (see Leonid M. Gokhberg and L.E. Mendeli, "Profile of Research and Development in Russia"). Nevertheless, the current outlook is that "budgetary funds will remain the most important source of financing R&D in Russia". Although most (almost 70 per cent) expenditures for R&D work now take place in institutes categorised as belonging to the business enterprise sector, much of the R&D performed at these institutes appears to be linked to some kind of state funding. In 1995 the state budget still accounted for about half of Russia's gross domestic expenditure on R&D. The growing share of basic research, mostly funded by the state, at the business enterprise sector also appears to reflect this continued link.

Considerable economic disruption has accompanied the reform process, severely affecting the Russian research establishment. The overall level of government funding for research and development, when adjusted for inflation, has drastically declined, with 1995 outlays about only a quarter of those made in 1990. At the same time wages for many researchers have declined, both in real terms and relative to wages in other professions. This wage deterioration has reduced the prestige of scientific research and the attractiveness of choosing a scientific career among the young.

There have been a number of efforts, both from the state and from individuals, to ease the disruption caused by the current economic changes, namely:

- A network of State Research Centres (SRC) was founded. The institutes chosen were viewed to have "unique experimental equipment, highly qualified personnel, and internationally recognised scientific results". The SRC programmes are linked to priority objectives of S&T development that are established by the State Committee for Science and Technology together with other appropriate ministries (departments). These selected institutes received a variety of economic support measures, from priority allocations of budgetary funds to tax benefits.
- A special assessment was levied on production enterprises and is used to support R&D programmes.
- An independent Russian Foundation for Basic Research was established. It administers grants on a competitive basis. This organisation provides, for the first time, scientists with access to funds for independent projects, including those done independently of their institutes.
- Individual researchers have sought outside employment or funding. One recent survey revealed that during the 1992-1993 period, about 80 per cent of the Russian Academy's scientists were working with private firms. About half of them were doing so permanently. In addition, many researchers have sought foreign employment. Some have received foreign funding.

The higher-educational sector's research establishment appears especially hard hit by economic changes and now accounts for only about 5 per cent of total Russian R&D expenditures. The collapse of industrial production, with the corresponding decline in investment, has severely reduced the funds they have received through contracts with industry. Competition for funding with institutes from the Academy of Sciences and the military-industrial complex is proving difficult.

Patenting and licensing

The shift from the past system of author's certificates to the current patent system has greatly reduced the annual number of invention applications. While some of this reduced volume probably reflects economic dislocations, much of it reflects the new imposition of fees and some of it, perhaps, doubts surrounding the ability to enforce legally one's patent rights. Nevertheless, a growing domestic Russian market for technology appears to be taking root, with over 1 000 license agreements being reported to the Russian Patent Office in 1994.

Some questions for discussion might be:

- How might outside funding of university or national laboratory research conflict with an institution's goals? What impact is outside funding having on the character of Russian educational and public research establishments? How might it compromise objectivity?
- Is there general agreement that "budgetary funds will remain the most important source of financing R&D in Russia"? What might be some of the implications for Russian research?
- How great a role might commercialising R&D be expected to play in Russian educational and public laboratory research budgets?

DISCUSSION PAPER FOR TOPIC B: LEGAL FRAMEWORK FOR INTELLECTUAL PROPERTY DEVELOPED THROUGH CONTRACT RESEARCH

The current Russian legal framework

Supportive government regulations are essential to provide a framework for the ownership and commercialisation of intellectual property. These regulations should cover intellectual property from government, academic and industrial organisations. For high technology developments to be of commercial value, enforceable, consistent and obtainable protection must be available, whether it be through the patenting, copyright, industrial design or chip topography processes.

The Russian Federation's economic reforms are requiring significant changes in the organisation and management of its research and development establishment. A new federal legal framework, with a market-oriented Civil Code and intellectual property legislation that makes private ownership accessible to all, now exists as a basis from which to carry out many of these changes. This framework will govern the intellectual property developed by Russian institutes under contract commitments (see Y. O. Lebedev, "Legal Basis of Intellectual Property Arising During Research Performed as Contract Obligations: The Current Situation in Russia" for a listing of the basic laws).

The impact of the intellectual property reforms on individual research institutes varies, largely reflecting differences in the proximity of their work to areas of commercial application. Nevertheless, even some of the more theoretical institutes are being affected by intellectual property issues, as personal economic difficulties push some of their employees to explore more commercially-relevant work. The increasingly tight budgetary situation facing institutes may also lead institutional work programmes to favour more the areas of possible commercial importance or to seek additional funding, thus raising their interests in how to protect their intellectual property interests.

The transition to a market-oriented economy has confronted research institutes with the need to reform how they manage their intellectual property research and has required institutional changes. Proper administrative policies and procedures within the scientific research institutions and educational facilities are needed to support the development and transfer of technology. The institutional policy will determine ownership of the intellectual property that results from research activities and will provide incentives for the researcher and the various sectors within the institution to encourage and participate in industrial research contracts.

While these changes are underway, their broad acceptance appears to be developing slowly. As was stated in the document of Y. O. Lebedev "... commonly-used business customs transferred on the territory of the Russian Federation mostly found no demand ...".

The recent experience of concluding R&D contracts and agreements in the new legal environment has encountered a number of common pitfalls (see Yuriy O. Lebedev, "Legal Basis of Intellectual Property Arising During Research Performed as Contract Obligations: The Current Situation in Russia"). There remains a tendency on the part of some enterprises of "requisitioning" the results obtained by scientific and

technical organisations. Nevertheless, the accumulation of institutional experience and strengthening local-level policies will be important in providing continued incentives for the research programs, for the researchers themselves and for the harmonious functioning of the institution.

- How might the current federal legal framework be improved so as to promote the further development of a technology market in Russia?
- How well have scientific research institutes made the necessary institutional changes to adapt to the new federal legal framework? What are the major problems?
- What are the principle reasons for the lack of demand for commonly-used business traditions relating to intellectual property rights at Russian research institutes? What is the outlook for an increased demand?
- Is the problem of enterprise “requisitioning” of technologies decreasing? What needs to be done to counter this tendency?

Particular intellectual property right issues

Many government and educational research organisations in the OECD area have accumulated considerable experience in concluding contracts for research and development. Intellectual property rights protection issues can be some of the more difficult aspects of these contracts. Among the most important issues in such contracts are:

- title, ownership of data, obligations of employees (employee agreements), conflict of interest;
- delineation of contracted work (from past work, from other ongoing research);
- subcontracts, joint research with other institutions;
- disclosure, publication restrictions and secrecy agreements, national security provision; and
- foreign applications, patent prosecution and maintenance, and utilisation requirements: assignment, royalty distribution, reports.

These are dealt with in more detail below.

Title, ownership of data, obligations of employees (employee agreements), conflict of interest

Issues surrounding the ownership of the invention and the obligations of employees are among the most contentious and require careful administrative organisation. The following presents a brief discussion of several important aspects drawing on the experience in several OECD countries.

Title

At the research institution level, it was just 16 years ago that the United States Government enacted the Bayh Dole Act, which allows universities and research institutions receiving public funds for research activities to own the resulting inventions. This Act legislated a uniform policy on ownership of intellectual property in the United States. Private research institutions have always been able to own the intellectual property coming out of their institutions. In most cases, there is strict review of manuscripts and presentations to determine if novel, commercially-valuable technologies are contained within and should be protected. At most American companies, the employee automatically assigns all rights and title to any intellectual property discovered while in that employ to the employer.

In contrast, in Canada the ownership of intellectual property is decided at the university or research institution level. For example, within the Province of British Columbia, the three research intensive universities each have a different policy on this matter. In situations where a researcher has joint appointments in several institutions, the ownership of any intellectual property becomes a matter of some debate. Within the downtown Toronto area, where there are 510 research institutions that each have different intellectual property policies, this situation is exacerbated. In many regions or localities, affiliation agreements between the research institutions may be negotiated. These will either provide a blanket solution to handle all situations or will prescribe a process for resolution. In many cases, the blanket solution calls for a sharing of ownership and any resultant revenue or royalty stream.

It is also common practice in Canada for an employee to automatically assign all rights and title to any intellectual property discovered to the employer. In the few private research institutions in Canada, such as The Pulp and Paper Research Institute of Canada (PAPRICAN), the intellectual property is owned by the institution.

An anomaly in this regard arises in the case of true collaborations, where the ownership of research deliverables will directly relate to the individuals who carried out the discovery or innovation. Hence, an invention or discovery may be wholly owned by the institution and its researchers; it may be wholly owned by the non-institutional sponsor or it may be jointly owned. While this may be governed by the institutional intellectual property policy, negotiations often will deal extensively with ownership and “grant of right to use” issues.

In the case of close collaboration between industry and institutional researchers, where the company has provided a prior technology, any discussion about resultant intellectual property royalty flow to the institution will have to rely on the definition of the prior technology, the desired enhancements, and the contributions that each party put into the creation of the enhancements that was delineated in the work plan. Usually the ownership of those enhancements will be a subject of great debate. Often the enhancement is specific to and relies on the prior technology and the institution will grant ownership to the company in exchange for a licensing agreement. Where the enhancement has broader implications, the discussion may revolve around the complicated issue of cross-licensing agreements.

Ownership of research data

The ownership of research data remains a contentious and loosely-defined area at most universities. While many universities assume that they own the research data of their employees, they have appeared reluctant to articulate these rights broadly. The issue appears relatively more straightforward at federal laboratories. Linked to questions about ownership are the questions of what data should be retained, for how long, by whom, how may it be removed, etc. Quite frequently research contracts will have definite stipulations about data ownership and about how data are to be safeguarded. Data ownership questions become especially important when an employee leaves an institute or when questions of professional misconduct are raised.

Employee agreements

While national legislation often outlines the rights of employee inventors, most institutions insist that employees sign a separate invention assignment agreement and they inform their employees in writing of any changes to the institution's patent policy. Many outside sources of funding also insist that such separate written agreements be in place. This practice helps protect the institution's interests when confronted with such common cases as an inventor who insists on ownership because the invention:

- was his or her idea;
- lies outside of the field of research for which the institute has hired him or her;
- was conceived outside of employment, perhaps at home, or
- was conceived while he or she was visiting the institution, not employed by it.

The actual content of such agreements varies widely among institutions, but they generally outline or refer to such topics as: compliance with the institute's and outside sources' intellectual property policies, definition of the institution's resources, documentation requirements, conflict of interest provisions, etc.

Conflict of interest policies

Conflict of interest arises in situations where the researcher or institution has competing obligations for either time, resources, or intellectual property. As well, a moral conflict of interest may arise where a researcher's personal interests may lead him to be biased or not able to complete his obligations to the institution. Some examples of conflicts of interest that may arise in the context of a research agreement include:

1. consulting agreements with an industry sponsor;
2. clinical trial performance which include shares in the company or personal income;
3. ownership or participation in a start-up company;
4. performing similar research projects on different industrial sources of funds.

- What kind of problems are being encountered or are likely to be encountered in the introduction of individual signed employee agreements for intellectual property rights? How are refusals to sign best handled?
- Who owns the research data from research conducted by institute employees? What procedures are in place for data storage?
- Is there an institutional review process for conflict of interest? If there is, what kind of guidelines are in effect?
- Under what circumstances might an institute want to transfer title to an invention to the employee-inventor?
- How do institutes inventory their intellectual property?

Delineation of contracted work (from past work, from other ongoing research)

The quality and integrity of an institute's Background Intellectual Property, IPR that arose during prior research, underpins its attractiveness to potential research sponsors (See Paul A. Labbett, "Delineation of Contracted Work [From Past Work, from other Ongoing Research]"). Having IPR that are badly protected or assigned exclusively to other (possible rival) organisations, giving entire areas of expertise exclusively to other companies, earning a reputation of poor confidentiality or premature disclosure, or having a lack of clarity surround the ownership of intellectual property developed at the institute are all signs of bad management and undermine an institute's ability to attract sponsors. Institutes need to be aware that the value of Background IPR to them is not always a financial one, but that it is nonetheless a vital commodity for them in the research market.

A key point in a collaborative agreement is guaranteeing the sponsor/collaborator a free right to use any Background for the duration of the research project itself, providing that use is also for the purposes of the research project. When defining the scope of the research/collaboration, the relevant Background needs to be declared as part of an institute's contribution, permitting its use for the project (under a royalty-free, non-exclusive license) and for later use of the Foreground Intellectual Property. Nondisclosure agreements are an essential part of managing the access to Background. Subsequent commercial use of Background is generally on 'normal commercial terms', although in other cases its true worth may be scientific rather than something which can be charged for. The terms for exploiting the foreground should refer to the Background, especially when the latter is commercially protected.

- What type of Background IPR problems are facing Russian institutes when accepting outside funding for research? How do the problems differ when the funding is from foreign partners?
- Are there other experiences from participants similar to the automobile-related research mentioned in the final paragraph of the document by Paul A. Labbett, "Delineation of Contracted Work (From Past Work, from other Ongoing Research)"? How might such problems best be avoided?
- Is the Russian experience that, an institution which has adopted a good code of practice to handle its IPR generally has few problems related to Background, unless they are caused by the unreasonable demands of research sponsors?
- Has the shift from an author's certificate system to a patent system created any special Background IPR problems for research institutes?

Subcontracts, joint research with other institutions

The motivation for co-operative research can vary considerably gaining access to special knowledge, mutual networking among scientists, or the development of commercially important results. Nevertheless, to protect the interests of the institute and its employees, such co-operative research should be formalised by an agreement that, among other things, spells out how intellectual property issues are to be handled.

There are various types of research contracts ranging from granting funds to an institution and demanding relatively few deliverables to seeking heavily-defined commitments (often with industry-sponsored research agreements). There can also be interactive commitments that result from research collaboration. Other types may govern the use of laboratory space and equipment, the provision of consulting by the researchers, the provision of services, etc.

The types of legal agreements that govern these arrangements vary to support the level of complexity and the breadth of obligations that each party undertakes.

Industrial research agreements

Technical innovation in industrialised economies is increasingly becoming R&D intensive, and industry is consequently interested in tapping outside sources of knowledge, including national laboratories and universities. At the same time researchers outside of industry find the interaction with industrial sponsors intellectually stimulating, and they welcome additional sources of funding.

Industrial research agreements are relatively specific: the sponsor has a particular problem for which he requires a solution. The industrial sponsor launches a search to find the appropriate institution with the necessary expertise and infrastructure to solve his problem. Within the institution, such requests come to the researcher himself, or to the technology transfer office. Once appropriate capabilities have been identified, an agreement will be negotiated which must include or consider the following terms:

- a resume of the past relations and everything that happened between the parties prior to the signature of the contract;
- what each party brings to the contract prior to the start of the collaboration;
- the goals of the collaboration;
- research protocol as defined by the sponsor, including the stages of research, their length, the division of the tasks, a clearly defined timetable for deliverables and mutual financial obligations;
- the place of any third parties in relation to one or the other of the parties to the contract;
- confidentiality clauses designed to protect the sponsors' proprietary information and intellectual property;
- a policy for intellectual property, including a clear definition of the ownership of intellectual property enhancements resulting from the research;
- stipulation of the sponsors' access to such enhancements, negotiated prior to the commencement of research, as well as the licensing conditions that would follow the contract;
- overhead charges, which are levied as a percentage of direct costs. (In Canada, the average overhead rate is 38 per cent on direct costs. In the United States, the overhead rate ranges from 38 per cent to 100 per cent or higher on direct costs.), and
- termination clauses protecting the interest of all parties.

Collaborative research agreements

Deliverables and obligations for collaborative research agreements differ somewhat from those of industrial research contracts. Collaborative research agreements represent the coming together of ideas, technologies and creative power. Thus, the respective responsibilities, inputs and outputs of each party need to be defined in the work plan. The ownership of any resultant intellectual property, the rights to use such intellectual property, the ownership of any enhancements or derivations, etc. also needs to be negotiated and described in the agreement.

Research agreements among non-profit institutions generally seek to exchange know-how, avoid duplications in research programmes, develop a critical mass of knowledge that can stimulate innovation. They often increase the attractiveness of a programme to outside public or private funding and may ultimately lead to patentable results.

It is essential that collaborative research and development projects address the following points:

- The research project needs to be defined jointly by the sponsor and the university and its researcher.
- Ownership of inventions, software, biological know-how and trade secrets may rest with the university, or be jointly owned with the sponsor.
- The sponsor will require a right to utilise the research results in its commercial enterprise. Traditionally in North America, these rights have taken the form of a nonexclusive royalty-free license, or an exclusive royalty-bearing license.
- Publication may be temporarily restricted and the sponsors' confidential information may be protected to the best of the university/institutions ability.
- Overhead costs above and beyond the actual project costs need to be identified at an early stage and collected. In Canada, the average overhead rate of 38 cent of direct costs is added to contracts. In the United States, the overhead rate ranges from 38 per cent to 100 per cent or higher of direct costs.
- Confidentiality clauses will endeavour to protect the sponsors' intellectual property and proprietary information to the best abilities of the institution.
- Termination clauses protecting the interest of all parties are essential.

In the United States and Canada, research institutions have traditionally received government funds for general building, maintenance and administration. Over time, these government funds have not increased with the increase in research funding at the institutions. The federal granting programs usually do not allow as an eligible expense allocations towards general administration expenses. Over time, the provision of insurance to mitigate liability has also increased the cost of doing research.

As a means to raise sufficient funds to cover the operation of institutions, an overhead or expense for indirect costs is levied on industrial contracts and collaborations. While performing research activities the institutions rely on specialised talent, equipment or resources that the company does not otherwise have access to; thus the overhead charges are accepted. In most cases, the research program is also cost effective.

Most institutions have their own policy on overhead rates, and within a given geographic region, the rates may vary considerably. Usually, overhead rates are not negotiable within that institution, however rates may vary depending on the nature of the interaction. Service contracts, equipment rentals, research contracts, and clinical trials all may have different overhead rates associated with them.

A good format of the agreement can be found in the attached "Simplified and Standardised Model Agreements for University-Industry Co-operative Research", produced by the Industrial Research Institute, National Academy Press, Washington, D.C. Once the terms of the agreement have been negotiated with the sponsor, this model agreement provides a widely acceptable legal framework.

Signing the deal is just the start. Any good research agreement involves maintenance of the relationship through continual reporting, dialogue and information exchange. Most of the agreements that have "gone sour" result from lack of communication between the parties. It is essential that the researchers

and the administration maintain continual contact with the sponsor. To do otherwise invariably leads to misunderstandings and problems of interpretation of the agreement.

Some suggested questions for discussion include:

- What differences are there, if any, between contract research terms at Russian institutions and those presented above?
- What issues cause the greatest problems in concluding R&D contracts in Russia today?
- Research and educational facilities receive funds from a variety of sources e.g., State Committee for Science and Technology, Ministry of Education, industrial organisations, foreigners, etc. Does the treatment of intellectual property rights vary significantly among the different sources of funding? Do these sources demand that their financial support warrants at least a royalty free license? What factors might argue for or against the granting of a nonexclusive royalty free license?
- How are research consulting contracts handled at Russian institutions? What are the mechanisms and guidelines regarding infrastructure and personnel that oversee such activity?
- Is there a review process for conflict of interest? If there is, what kind of guidelines are in effect?
- How long does it take to process contracts? Is a mechanism in place for a timely delivery of the executed agreements?
- What are the unique effects of early termination with regard to intellectual property ownership?

Disclosure, publication restrictions and secrecy agreements, national security provisions

Soliciting the disclosures of inventions from research staff is a major task of an institute's technology transfer organisation. The process should be kept as simple as possible and carefully nurture continual communication with the inventor. Researchers should be encouraged to request pre-disclosure meetings to discuss the advisability of filling out a formal disclosure form. While each institute will design its own disclosure form to suit its needs, much of the required information is standard. (See University of Alberta Confidential Invention Questionnaire and Assignment for a sample disclosure form.)

Industrial research contracts invariably include clauses that deal with both confidentiality and publication of results. The common practice in North America at universities, is not to perform secret research. The universities will accept confidential material in written form and marked "confidential", and will use their best efforts to maintain it so. The universities will usually impose limited time restrictions on publications to allow for review of the material by the sponsor, and the filing of patents or other types of intellectual property protection. At most institutions, the maximum time that a thesis may be delayed is six months, and the publication delays which have been negotiated in the research agreement can vary from 90 days to one year. Conflicts can arise when the parties disagree on whether the publication of research results compromises proprietary information. These needs must be addressed and resolved for a successful continuing interaction to occur.

Both in Canada and the United States, there are government research facilities and private research institutions that operate outside the bounds of standard university policy, have considerably more flexibility in restricting publication and maintaining confidentiality. State research institutions can maintain a system of national security controls over the public release of research data. In the case of private research institutions and industrial research, publications will be delayed till adequate patent protection has been filed. As a means of announcing their technological developments and to encourage scientific advancement, most researchers, regardless of location or employer, will be strongly motivated to publish as quickly as possible.

- How is the soliciting of invention disclosures organised at Russian institutions? What are the most problematical aspects of the disclosure process?
- What are the principle problems surrounding the issue of confidentiality at Russian research institutions?
- What procedures are used to determine if a contract with a foreign partner is subject to Russian export control review?
- What kind of time limits appear reasonable for reviewing the possible intellectual property content of publications?

Foreign applications, patent prosecution and maintenance, and utilisation requirements: assignment, royalty distribution, reports

The filing of foreign patent applications requires a developed strategy that requires a thorough analysis of the market for the invention (including an assessment of possible competitors and their location, other issues related to market access such as start-up costs, the demand for the invention, the size of the market, etc.) and of the invention itself (the ease with which it may be copied or reverse-engineered, its probable market life span, etc.). In addition, the strategy must consider the legislative differences among countries or regions and the related cost and tax implications (see Rüdiger Zellentin, "Filing for International Patent Protection").

The costs of foreign filings can be considerable and can be reduced through a number of alternatives. The choice of the best approach draws heavily on the market and technical analysis, for decisions of where and how to file will depend on the particular characteristics of each invention and its market. Filing through the Patent Co-operation Treaty (PCT) does not necessarily save costs, but actually has additional charges. Nevertheless, it provides an attractive method for delaying all of the associated costs with foreign filings (national fees, required translations and local attorneys fees), for it extends the deadline for making the individual national applications. This extra time is often useful in judging the probable success of the invention and the reasonableness in making certain national filings. A subsequent reasoned decision not to seek broad international coverage or to choose other alternatives to protection could, therefore, result in considerable savings.

The PCT procedure also permits conducting a preliminary international examination at other patent offices. The countries in transition benefit from a reduced fee at the European Patent Office (EPO) (instead of an average DM 3 292, the cost is DM 823). A preliminary international examination at the EPO permits written correspondence with the examiners, so the examination can be used in national filings within Europe, thus saving costs.

Once foreign protection is obtained, considerable costs arise in paying the annual maintenance fees. There might also be requirements to work the patent.

- How are strategies for foreign filing developed at Russian institutes? What are the most difficult elements in developing a strategy?
- How are the applications and prosecution of patents financed in Russian research institutions? Is there a government agency or financing available for this activity?
- What are some of the most common problems encountered by Russian institutes in filing for foreign protection?

DISCUSSION PAPER FOR TOPIC C: MANAGING INTELLECTUAL PROPERTY DEVELOPED AT UNIVERSITIES OR RESEARCH CENTRES

by Dr. James W. Murray and Ms. Helen Becker, University of Alberta

Introduction

New technology and products have long been valued by commercial enterprise as means to attract investment and economic rewards. The ability of universities in North America to be more active participants in reaping these returns was limited prior to the early 1980's, when the enactment of the Bayh-Dole Act in the United States gave the right to own publicly funded research results. Since that time, there has been an exponential growth in the awareness, management and profits arising out of the intellectual property from universities. In North America in 1994, the products of university research accounted for \$24 billion in sales, which returned \$422 million in royalties to the originating universities. [Association of University Technology Members (AUTM) 1994 Licensing Survey.]

The impressive results achieved by AUTM member universities from the United States and Canada demonstrate the valuable contribution that technology transfer can bring to a country, its institutions and its researchers. As has been pointed out by Gering and Schmied (1993), European universities slowly began to set up intellectual property programs similar to the models created by US universities, which are further advanced in the field and generate a substantial contribution to the US economy. Their main conclusion of a comparison between France, Great Britain, Germany and the United States was that European universities should be able to be as successful as US institutions, in terms of university patent exploitation, even within their existing frameworks.

There are various components required to bring valuable technology to the commercial arena, not the least of which is the development of the state-of-the-art technology. However, most of the technology transfer models are not normally transferable from one region to another. This paper attempts to identify the principal components required to develop a successful program anywhere in the world.

Managing a technology transfer office

A successful technology transfer office requires a small core of experienced people with the following characteristics:

- an understanding, compassion and appreciation for the researchers and their research efforts;
- knowledgeable in the main research and development programs of their institutions;
- knowledgeable in the intellectual property policies of their institutions;

- knowledgeable of industry sectors;
- familiarity with both national and international patent law;
- skilled negotiators;
- an understanding of the entrepreneurial process;
- and sufficient support and administrative personnel to process technology in a timely manner and ensure the efficient utilisation of resources.

Functions of a technology transfer office

The functions of a technology transfer office are comprised of seven key management activities:

1. Intellectual property protection (see discussion in Topic B).
2. Technology identification (see discussion in Topic B).
3. Technology assessment.
4. Prototype development to add value to technologies.
5. Marketing of technologies.
6. Industry interaction in the technology evaluation process.
7. Spin-off company development.

Universities have their own intellectual property policies, which usually mandate the universities to obtain patents for inventions produced by their researchers. It has been observed, however, that universities generally are not ideally situated to market or apply technical knowledge in a commercial way on their own.

The actual filing of patent applications and patent prosecution is normally done in North America by using outside patent specialists who have particular scientific and legal expertise in the technical area. Relatively few North American technology transfer offices employ their own “in-house” patent agents due to the extremely wide range of technologies that come out of their institutions.

Suggested issues for discussion:

- How does one determine the staffing level, mission and responsibilities of the technology transfer offices at Russian universities or national research institutes?
- How does one control or manage external patent counsel to ensure quality product and cost control?
- Is there any association of universities or research institutions for the sharing of information, training and expertise in the area of technology transfer in Russia? What could be the contribution of such an association or institute?

Technology identification

A major part of a technology transfer office's responsibility is to work toward the identification of technologies with commercial potential. The universities/research institutions' ability to interact with their researchers will bring more invention disclosures and more effective management and development of existing technology opportunities. Increased communication between industry and researchers will also lead to increased collaborative or contract research, which will strengthen both the institutions' capabilities and provide valuable resources for research and economic development.

Technologies which have been identified by either the researcher or the technology transfer office are documented and reported on forms similar to the Report of Invention form attached, which is used at the University of Alberta. These forms serve as a basis for preliminary evaluation of the technology. In addition, they are the basis of the entire technology filing or tracking system within the institution, as well as the patent application and prosecution file (see discussion on disclosure in topic B.)

Technology assessment process

Assessment is a screening mechanism which involves due diligence and evaluation of identified new technologies including both *technical* and *commercial* analyses.

Variations of the following form are used for the evaluation of technologies at several research intensive universities in North America, including the University of Alberta.

Technology Evaluation Protocol

INVENTION DISCLOSURE NUMBER/TITLE: _____

BACKGROUND TESTS:	NO LOW	YES HIGH	RATING 1-5
1. Patent search completed and clean	_____	_____	_____
2. Literature search completed and clean	_____	_____	_____
3. Invention remains confidential	_____	_____	_____
4. No publications pending	_____	_____	_____
5. No prior claims to the technology	_____	_____	_____
6. Technology protectable by patents	_____	_____	_____
TECHNOLOGY TESTS:			
1. Technology basis of a new industry or company (major breakthrough)	_____	_____	_____
2. Technology state of the art	_____	_____	_____
3. Easy to demonstrate technology	_____	_____	_____
4. Identifiable & significant benefits	_____	_____	_____
5. Functioning prototype	_____	_____	_____
6. Addition to existing U of A patents	_____	_____	_____
7. Long product cycle	_____	_____	_____
MARKET TESTS:			
1. Fill identifiable & marketable need	_____	_____	_____
2. Prospective license identified (*)	_____	_____	_____
3. Believable but indeterminate large upside potential	_____	_____	_____
4. Absence of direct competitive products	_____	_____	_____
5. Definable niche market	_____	_____	_____
6. Market accessible (no dominant technology)	_____	_____	_____
7. Technology has low dissonance	_____	_____	_____
COMMERCIAL TESTS:			
1. Result of industry-funded research	_____	_____	_____
2. Prospective licensee identified (*)	_____	_____	_____
3. Improvements/cost reduction > 20 per cent	_____	_____	_____
4. Low financial risk	_____	_____	_____
5. Technology basis for a spin-off company	_____	_____	_____
6. Sustainable competitive advantage	_____	_____	_____
7. Conforms to relevant standards	_____	_____	_____
MANAGEMENT TESTS:			
1. Inventor technology champion	_____	_____	_____
2. Inventor has realistic expectations	_____	_____	_____
3. Inventor team player	_____	_____	_____

What is the biggest concern/problem?

What is the upside opportunity?

Critical information missing?

Estimated costs: Patenting \$

Time:

Estimated return to U of \$

Time span (yrs):

*Prospective Licensee:

Recommendation: Return to Inventor: Return for Further Research Patent Application/Licensing Other:

This assessment form serves to quantify risks in each phase of development and to pass judgement on whether or not to continue pursuing the development (and hence funding) of a particular technology. It should be noted that even this type of quantification method relies substantially on intuition and personal judgement, on the part of both the researcher and the technology transfer officer.

This early stage due diligence and preliminary evaluation is the least expensive way to identify viable technologies and encourage private sector investment in those technologies. Early stage due diligence has another important implication: it will eliminate nonviable projects before higher levels of investment are undertaken by either the researcher or the institution. At MIT, up to 50 per cent of the inventions are declined at this early stage. In these cases, the invention is usually returned to the inventor for further research or for independent development.

Intellectual property protection (patent and copyright) is a key factor in attracting industrial partners for further development. The institution's technology transfer office and related networking will increase its ability to effectively protect innovations as the cornerstone of further co-ordinated marketing and development. In addition, the institution's networking can bundle technology which will allow for stronger, cross-linked patent strategies, giving broader protection and competitive advantage. The assessment activities of technology transfer offices would:

- respond to and identify initiatives from researchers and industry;
- evaluate technologies (technically and commercially), and perform patent analyses;
- evaluate the developmental risk inherent in an individual technology;
- file and prosecute patent applications to achieve the broadest possible protection; and
- enhance early-stage prototype development and help focus research activity to support marketable products.

Suggested issues for discussion:

How do Russian research institutions identify technologies of potential value?

What tracking system is used to follow the disclosure and patent prosecution process?

What are the major problems encountered by Russian institutes in doing profiling and commercial evaluation? What are the principal methods and sources of information available?

How might OECD area and Russian university and public research organisations be able to assist each other in questions relating to each other's markets?

Are the principals outlined above similar to the considerations made at Russian research institutions to evaluate technology for their potential value?

Is such a quantitative approach viewed positively by the researchers and technology transfer officers? What parts of the above evaluation protocol appear to be most problematical?

What kind of balance would you propose between this quantitative assessment approach and the "gut feel" intuitive approach that many technology transfer officers use?

Is there an institutional policy that allows the technology transfer officer to be wrong and not suffer penalties?

Is there a provision for turning back the technology to the researcher? Are there potential residual flow-backs to the institution in these cases?

Prototype development to add value to technologies

In the OECD area there is frequently a significant gap between funding of basic research and the point or stage where an new invention is sufficiently tangible to attract commercial partners. Often more research results are required before a commercial partner is willing to invest in product development. These results usually fall outside the realm of basic research, as they have a commercial or applied rather than an academic focus. For example, in North America technology transfer offices in general find that 50 per cent of the inventions are rejected on the basis of prior disclosure, limited market potential, and prior art.

In Canada, at the University of Alberta there is an active Prototype Development Initiative which aims to convert more of these early stage inventions into commercially viable products. At the present time, there are some 20 different technologies from all disciplines across the campus being moved to the next stage in the development process. In 1995/96, this program helped to catalyse the formation of seven new spin-off companies, primarily in the biomedical/biotechnology sectors. These companies currently employ 106 people.

A prototype development program can add significant value to early stage inventions by carrying out the following functions:

- scale up of bench-type experiments (in conjunction with companies or agencies at existing facilities) to allow for the further evaluation of commercial potential;
- develop prototypes and supporting documentation of research inventions in order to demonstrate properly to potential licensees the viability of such inventions;
- develop documentation, conduct commercial feasibility studies, and develop robust interfaces for software programs;
- develop strategic corporate partnerships to support further development either as a spin off company or as licensable technological developments.

Suggested issues for discussion:

- | |
|--|
| <ul style="list-style-type: none">– In view of the fact that there are a number of large research institutions, do they work co-operatively with the universities to build prototypes, add value to the technologies and play an active role in inter-institutional technology transfer?– Who pays for the building of prototypes in this environment?– What role does industry or the financial community play in this endeavour? |
|--|

Marketing of technologies

To market research expertise effectively, one must have a good understanding of the diversity and capabilities of the research community and augment the outreach by the researchers themselves. It has been the experience of many North American institutions that the researchers themselves, given the proper incentive and support, are one of the more effective sources to market their expertise. The role of the institution is to support and facilitate these initiatives and encourage the researchers to network with representatives from government and industry. Contract agreements are readily facilitated by personal contact between interested researchers. Again, this stresses the importance of the researcher being supportive of interactions with industry.

One important way the institution can support and encourage the bringing together of such parties is to assist in publicising the research expertise and know-how. One new and relatively inexpensive way of widespread dissemination and publication of information is through the use of the World Wide Web (Internet). An example of the Government of Canada's efforts to support information is the "schoolnet" website (http://schoolnet.carleton.ca/Trans_Forum/english.html or through <http://ctn.nrc.ca>) that links to the web pages of most of the research institutions in Canada. From this central web page, with information concerning dissemination on the Internet, access can be gained to the "Trans Forum" web page where institutional policies, research expertise, available technologies and contacts can be found.

In building relationships with industry it is essential that each institution have dedicated technology commercialisation personnel skilled at facilitating interactions with industry, other institutions or government agencies. Ideally, a partnership is built between the technology transfer personnel and the researchers. This ensures that proper contractual arrangements are made which respect the policies and procedures of the respective organisations. This is particularly important when one recognises that "front line" marketing efforts are often made by the researcher.

In building these industrial relationships, it is essential that the institution and its researchers recognise the fundamental concerns of industry. These can be summarised into three basic points:

1. always deliver on commitments (especially delivery of the final report) which have been made in the contracts;
2. ensure that the project is completed on time and on budget; and
3. maintain open communication between all parties.

The goal is to create long-standing, productive university-industry relationships, so that the clients developed will be repeat customers over the long term. Any sustaining relationship is built on trust between the parties. As part of this process, to ensure the establishment and maintenance of trust, representations and commitments must be realistic, reasonable and achievable. These are the essential principals that go into the development of the work plan of any contractual arrangement and are important to future marketing efforts.

Working together, universities and research institutions can gain substantial economies of scale centralising the technology transfer process. For example, in Canada there is an initiative to centralise the technology transfer function for the Maritime Region, as well as an initiative in southern Ontario originating from the Innovations Foundation of Toronto. Great economic benefit can be obtained by communally evaluating the market position of technologies. Another factor that supports this type of communal activity

is the ability to add value through the bundling of technology. As well, significant advantages can be realised by collectively promoting groups of similar technologies.

The communal marketing of technologies could include:

- marketing (pricing, positioning, and promoting) of available technologies and the negotiation of licensing agreements and research contracts;
- professionally packaging and bundling technologies (where appropriate) through the pre-commercial stage and introducing them to the industrial and financial communities;
- facilitating potential spin-off companies by providing access to resources within the broader community; and
- seeking complementary technologies through strategic partnerships.

Suggested issues for discussion:

- How might the individual technology transfer offices pool their resources? Would resource pooling be appropriate along technology/discipline or geographical lines?
- How do various research institutions market their expertise to industry/government clients? What methods appear most successful?
- Are there good examples of collaborative marketing or bundling of technologies between institutions?
- Are there state or federal agencies who assist in this process?
- Are there industry organisations or associations that play a role in this function?

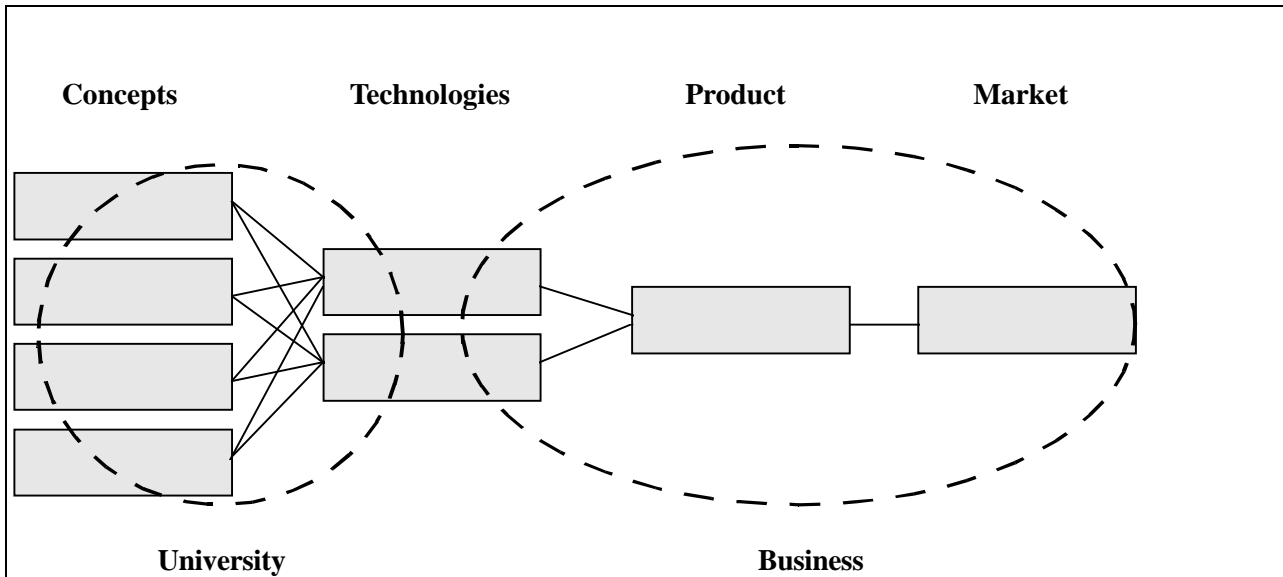
Industry interaction in the technology evaluation process

As the aim is to transfer technology to industry for commercialisation, it is important that industry plays as direct a role as possible in the research and development process. In the case of a sponsored research contract or collaboration, the sponsor has some “grant of rights” to the technology, and therefore is the obvious licensee and hence commercialiser of the technology. This is known as “technology pull”. An important reference regarding intellectual property rights in industry-sponsored university research is “A Guide to Alternatives for Research Agreements”, Industrial Research Institute, National Academy Press, Washington, DC., August 1993.

The key issue is how to obtain industry involvement in the technology evaluation process where market need may not yet have been identified, and where there is no obvious industry interest. This process is referred to as “technology push”. In these cases, industry’s direct involvement comes later in the technology transfer and commercialisation timeline. Depending on the stage of development of the technology and the market need, industry can be convinced, through the due diligence and assessment process, that certain technologies are worthy of investment. In order to address this need, one of the

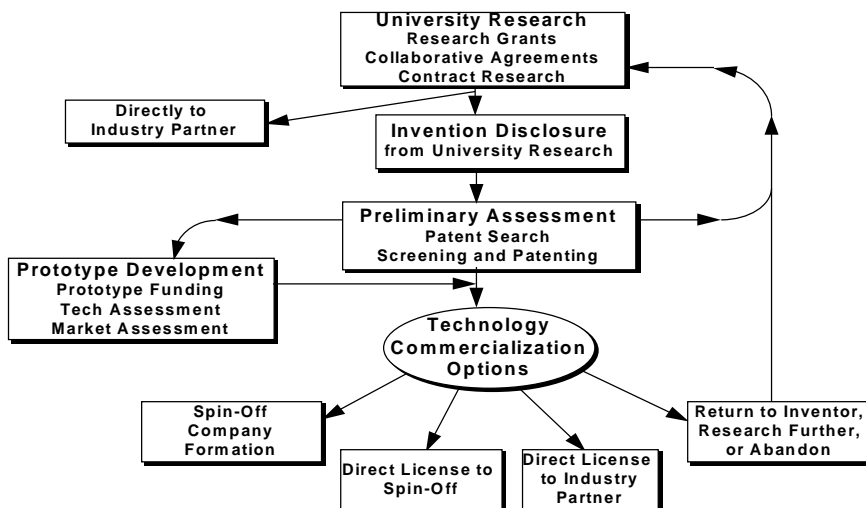
principal mandates of the technology transfer office is to “bundle and package” inventions and technologies so that they appeal to industry. The concept of technology bundling is shown next.

Technology Bundling



Technology Push

Technology Development & Intellectual Property Transfer



Spin-off company development

Where inventions have multiple applications, a spin-off company is often the best vehicle for development. A commitment of significant resources is required however, to assess new ventures, package them to attract both investors and entrepreneurs (which means both technical and business presentations), and structure a business arrangement. One of the advantages can be that the location of the spin off company is closely linked to the research institution, and thereby secures the full benefit of commercialisation, including the jobs, resources and infrastructure for the local or regional economy.

Small and medium-sized enterprises (SME's) are the engine of growth in the new economy in North America. This fact correlates well with the global trend that sees world GDP in technology-based goods rising to over 30 per cent by the year 2000. Is the Russian Federation in the position to create SME's to take advantage of this enormous growth potential?

Some questions worth considering are:

What are the major barriers (legal, economic, etc.) confronting the development of spin off companies originating out of Russian research institutions?

Is there any state or federal support that assists in this process?

Is there any interaction between the Business schools and the technology transfer offices, especially in the formation of spin off companies?

Is it possible for Russian institutions to participate in spin off companies through equity or royalty positions?

Licensing of technology

The standard practice in North America is for universities and research institutions not to sell their technologies, but to license them, either exclusively or non-exclusively, to an industrial partner(s). This procedure develops a win/win situation for both the research provider and the research user. The return to the institution normally takes the form of a royalty on the sale of products with an upfront licensing fee, and may in part include reimbursement of the institution's patent costs.

Most institutional technologies are licensable provided:

- There is intellectual property protection.
- Prototypes have been built or proof of concept has been established.
- Documentation is available and manuals are available.
- Software is user friendly and relatively bug free.

A critical decision in the licensing strategy is to negotiate either an exclusive or nonexclusive royalty-bearing license. This decision will rest on the nature of the future product(s). If there is only one use for a technology, and especially if the field is highly competitive or has high barriers to entry, an

exclusive license will be demanded. If the technology lends itself to several uses or products, or the product manufacturers are diffuse, a nonexclusive license would maximise the returns to the institution.

Another critical decision is whether to invest the time, effort and technology in the development of a spin-off company. In certain cases, a spin off company will be the only means by which a niche market technology will be developed. On the other hand, it would be a waste of valuable multi-use technology to isolate it in a small, and usually under-funded technology start up.

Standard terms and conditions of licenses are readily available through the training facilities offered by associations such as the Association of University Technology Managers (AUTM) and the Licensing Executive Society (LES). AUTM has developed a Technology Transfer Training Manual which includes standard agreement forms for most situations encountered.

The ability to operate a successful technology transfer office is contingent on a number of factors, from government regulations through to institutional policy, and industrial receptiveness. But even with the most progressive incentives and policies, the process is entirely dependent on the actual researcher's co-operation and participation.

- What are the main factors to consider in deciding whether to seek an exclusive or nonexclusive royalty bearing license?
- What areas in licensing present the most problems to Russian institutes?
- What are the principal barriers to licensing in Russia and how do they differ from licensing activities abroad?

THE LEGAL BASIS OF INTELLECTUAL PROPERTY ARISING DURING RESEARCH PERFORMED AS CONTRACT OBLIGATIONS: THE CURRENT SITUATION IN RUSSIA

by Mr. Y. O. Lebedev, Russian Federation

Introduction

In the Russian Federation, it is civil legislation that determines the legal status of participants in economic relations, their property rights, other material rights and their exclusive rights to the result of intellectual activity (intellectual property). It is also civil legislation that regulates contractual and other commitments, as well as other property and personal non-property relations linked to them on the basis of equality, free will and property independence of the participants. It should be also mentioned that the citizens, legal persons, public authorities of the Russian Federation, subjects of the Russian Federation, and local municipal administrations are viewed as participants in civil relations. In addition, the rules set up by civil legislation apply to relations involving foreign citizens, persons without citizenship and foreign legal persons, unless otherwise provided for by the federal laws.

This paper analyses intellectual property emerging from research, test and design, and technological (scientific and technological) work realised under contract, with intellectual property being understood as the exclusive rights over the following objects:

- scientific works, including computer software and databases;
- selection achievements including the products (material) of breeding;
- integrated circuit technologies;
- inventions, utility models and industrial designs (intellectual property objects);
- other results of scientific and technical activities, including information, protected by law.

The results of scientific research, product design and their engineering documentation as well as technologies that result from scientific-technical work contain, as a rule, the above objects of intellectual property.

Special features of contractual obligations that arise during the implementation of scientific and technical work

Before analysing the legal framework regulating the emergence, protection and realisation of intellectual property, it is important to point out the main particularities of contractual relations in scientific and technical work.

Contractual obligations for the implementation of scientific and technical work are characterised by the fact that they are realised in the domain of intellectual activities. The particularity of such activities consists in the possibility of acquiring property rights and other material rights enabling a subject to exercise the rights to possess, use and dispose of the material objects containing the results of intellectual activities. At the same time, exclusive rights can be obtained on the contents of results of intellectual activities under which the subject of the above rights exercises priority and author's rights as well as the exclusive right to use the results. The above relationship of property and non-property rights is often not taken into consideration when concluding contracts for performing scientific and technical work, which leads to establishing a kind of generalised right and consequently either to discriminatory terms or disputes.

Another particularity of such obligations is a type of contract relation for performing scientific and technical work. One of them, in particular, often referred to as a contract, is characterised by "client-executor" relations, under which the client orders a certain scientific and technical work and the executor performs that work against payment and transfers its results to the client. Another one, often referred to as an agreement, has the form of an agreement on joint scientific and technical activities consisting in the implementation of certain scientific and technical work through which the participants of such activities make joint contributions in view of a set goal.

The above-mentioned difference in the type of contractual obligations may have importance when acquiring and commercialising both property and exclusive rights on the results of scientific and technical work.

Legislative provisions regulating contract obligations for scientific and technical work

Contract relations for performing scientific and technical work were designed by law in 1991 only in the Fundamentals of Civil Legislation of the USSR and the Republics. Before that date ministerial acts were applied which just determined the rules for concluding economic agreements and placing orders to perform such work. With relations being established in this way, intellectual property in fact belonged to the state. The latter meant that all Soviet states, co-operative and social organisations -- proceeding from the interests of the state and their own interests -- were entitled to use, without any special authorisation, objects of intellectual property created with the financial or other material assistance of the state.

The basic laws of the Russian Federation currently regulating the intellectual property emerging as a consequence of contract commitments are:

- Civil Code;
- authors' and related rights;
- state defence orders;
- on the conversion of defence industry;
- cattle breeding;
- supplies of products for federal state needs;

- legal protection of computer software and data bases;
- legal protection of integrated circuit topologies;
- selection achievements; and
- patent law.

Contract relations while performing scientific and technical work are comprehensively described in the Civil Code of the Russian Federation which came into force on March 1, 1996. Those relations are regulated by the provisions of chapters 4, 6, 8, 16, 22, 25, 27, 29, 30, 37-39, 54 and 55.

Let us first consider the provisions of chapter 38, “Performance of Scientific Research, Test and Design, and Technological Work”. The essence of the considered contract relations consists in the executor’s obligation to carry out scientific research according to the client’s technical specifications, to conceive and produce a sample of the new product, including its engineering documentation, or to work out a new technology; whereas the client is obliged to accept and to pay for the work done. As has been stated above, this type of contractual relation is often referred to as a contract.

The Code specifies that contractual terms should conform to the laws or other legal acts on intellectual property. In particular the executor must guarantee to the customer the transfer of the results obtained without violating any other persons’ exclusive rights. With the same goal the executor is obliged to agree with the client on the need to use any third party’s protected intellectual property and on the need to acquire from them the relevant rights.

Those norms are related above all to the particularities of Russia’s legislation concerning the identification of the owner of intellectual property which stems from fulfilling one’s official duties or official work. Under Russian legislation the exclusive rights to the use of the objects of intellectual property -- and in some cases the property rights to them -- belong to the person with whom the author is employed (the employer), unless it is otherwise stated in a contract between them. In this context the client ordering the scientific and technical work should be sure that the executor, being the employer, has no additional commitments with its employees that could hamper or make impossible the transfer to the client of the results of work and the respective rights to them.

The Code grants to both the customer and executor the right to use the results of the work, including those results that can be legally protected, within the limits and on the terms and conditions stipulated in the contract. In this respect it is established that if those limits and terms are not contractually fixed, it is presumed that the client is authorised to use the result of works transferred to him by the executor, and the latter has the right to use for his own needs the results of works he obtained. Consequently, there is in fact a juridical construction, according to which the client has the right to use the results transferred to him by the executor within limits that could be narrowed by the contract’s terms, and the executor -- within limits that could be broadened by the same terms.

It should be noted that the above-mentioned features of contracts for performing scientific and technical work are fully applicable to public federal contracts, including defence. In such contracts -- in accordance with chapter 37 “Contract” and the federal laws “On State Defence Order” and “On Supplies of Products for Federal State Needs” -- state customers can be federal executive authorities, federal state-owned enterprises or government institutions and the executors can be juridical persons or individuals. Thus, in accordance with the Decision of the Government of the Russian Federation “On Supplies of Products for Federal State Needs” of June 26, 1995, No 594, state contracts need only regulate

the procedural relations between the state customers and the executor, as well as the terms for patenting the objects of intellectual property created while executing the state contract.

An earlier Russian Government Decree (“On the Procedure for Applying Certain Provisions of the Former Soviet Union’s Legislation to Inventions and Industrial Designs on the Territory of the Russian Federation” of August 14, 1993, No 822) stipulated that when concluding a state contract for the delivery of goods for state needs that included products using inventions which are patented by other companies or persons, including foreign patent holders, the state customer should ensure the acquisition of the appropriate licenses. In doing so, they should allocate the necessary financial means. This act did not in any way regulate similar relations between state customers and executors as regards using the objects of intellectual property belonging to them. Moreover, the Federal Law “On the Conversion of Defence Industry in the Russian Federation” authorises converting state enterprises to transfer independently (exchange and sell) technologies, licenses, know-how, scientific and technical information that were used in the pre-conversion period for producing weapons and military equipment. The above-mentioned features confirm once more the existence of a sufficiently large spectrum of possibilities for establishing legal relations between the participants in scientific and technical works in the framework of state contracts.

Another type of contractual relationship, envisaged by the Code’s chapter 55 “A Simple Partnership”, can be used to carry out scientific and technical work. The essence of this relationship consists in the commitment of two or more persons to join their shares and to act in common without creating a legal person to reach for instance scientific and technical goals. As has been stated above, this type of contract is often referred to as an agreement on joint activities.

Essential is the provision that recognises as shares in joint activities everything that is contributed in the common venture, including: money, other property, professional and other knowledge, skills and know-how, as well as business reputation and business relations. Besides, it is stipulated that if the value of contributions and the way of distributing profits gained by common activities are not specified by the agreement, it is presumed that the shares and, consequently, division of profits are considered as equal. Furthermore, agreements aiming to eliminate some of the participants in joint activities from a distribution of profits are considered null and void. This type of contractual obligation envisages that parties to the agreement acquire joint rights both to the objects contributed in a joint business and to the objects that arise from the process of joint activity (including intellectual property objects). Consequently, it is assumed that such rights should be realised by common consent. The listed factors, and above all the ability to contribute objects of intellectual property as shares, make this form of contractual obligations particularly attractive to the subjects of scientific and technical activities.

It should be said that the Civil Code singles out a separate type of agreement, mentioned in chapter 39 “Remunerated Services”. This type of agreement envisages the executor’s obligation to carry out certain work or activities (to render services) according to the client’s specifications and on the basis of remuneration. It is determined that such services can be of consultative, informative or training nature, but they cannot relate to services rendered in the course of scientific and technical work under a contract. Consequently, when implementing contract commitments to render remunerated services, no intellectual property relations can arise between the participants. This important circumstance should be considered, as in practice the results of the scientific and technical works liable to legal protection are often transferred as consultative, informative or training services.

Legal provisions regulating the contractual obligations for using the results of scientific and technical work

The legal provisions regulating contractual obligations for using the results of scientific and technical work are only outlined in this report. This stems from the fact that, as will be shown below, the practical establishment of contractual obligations to perform scientific and technical work very often does not create a legal basis for commercialising either the results obtained under the contract or the executors' past results from scientific work that they contributed in the current work; this is especially important for results that can be legally protected.

The legal acts regulating contractual obligations for the use of the results of scientific and technical activity are the same as listed above. The basic objectives of such contract commitments are to:

- transfer all exclusive rights to the use of the object of intellectual property; for example, an author's contract would contain terms for the full ceding of all property rights for computer software, databases or topology, or patents;
- transfer a limited part of the exclusive rights; for example, a contract to transfer property rights for computer software, databases or topology, or a license agreement to use the patented objects, etc.

The agreements treated in chapter 54 "Commercial Concession" of the Civil Code should also be mentioned in any discussion of the new types of contractual obligations that can relate to the use of the results of scientific and technical work. In accordance with commercial concession contracts, one of the parties (the title holder) undertakes to grant to the other party (the user) on a remunerated basis, for either a specified or unspecified term, the right to use in his business activities a package of exclusive rights. This package may specifically include the right to protected commercial information, including technical documentation, and to other objects of exclusive rights including those protected under patent legislation. A special feature of a commercial concession contract is the compulsory presence in the transfer package of exclusive rights that are equivalent to the results of the individual's intellectual activities (company name, registered trade mark, mark of service, etc.).

Notwithstanding the availability of the above-mentioned developed legislation for contractual obligations related to using intellectual property objects, very little of the envisaged forms of legal relations takes place in practice. This situation is reflected in the following: the number of license agreements and patent concession agreements registered over the past three years represent only 5 per cent of the patents in force in the Russian Federation as of the beginning of 1996.

Thus, the current legislation fixes a whole system of contractual relations that can be actively used, both for performing scientific and technical work and for using their results (in business as well). Clearly only the involvement of such relations with the system of the intellectual property protection will ensure in practice an equal and mutually advantageous use of the potential from science and technology in the new economic relations that are emerging in the Russian Federation.

The practical realisation of contractual relations in performing scientific and technical work

The implementation of contract relations for performing scientific and technical work and consequently for intellectual property is closely related to the political, economic and social events taking place in the Russian Federation. A market economy and a state based on law are emerging. This process

is strongly influenced by the absence of guaranteed state support for scientific and technical organisations as well as a lack of demand for innovation from the national industrial enterprises, which is caused by the drop in industrial production.

Because of the above-mentioned situation, Russian scientific and technical companies have mostly developed contract relations with foreign institutions, including governmental ones, over the past years. In many cases it is the analysis of those relations which provides a rich material to estimate the current situation in Russia in the area of contracted scientific and technical work and the related protection and use of intellectual property objects.

The prevailing forms of co-operation between Russian and foreign organisations are relations established through contracts for performing scientific and technical work. As a rule, the customers are foreign organisations and the executors, Russian scientific and technical institutions. Agreements on joint scientific and technical activities are much more rare. Questions on the protection and use of intellectual property objects, both those created under contract and those previously created and used during co-operation, are regulated or should be regulated directly through relevant contracts and agreements signed by Russian and foreign organisations, which fully respond to the existing economic relations between the countries. The considerable similarity of legislation in the Russian Federation and in developed industrial countries now helps this matter. Moreover, the Russian Federation's participation in the World Intellectual Property Organisation enables Russian and foreign contracting parties to have an exact and common understanding of the notion of "intellectual property" according to the documents of the above organisation.

An analysis of the practice of concluding and implementing such agreements and contracts enables an identification of the following common mistakes (which may lead to discriminatory relations and consequently to contentious and destabilising situations in scientific and technical co-operation between Russian and foreign organisations):

- non-consideration of previously-created intellectual property or the use of intellectual property not covered by relevant legal protection;
- while allocating intellectual property, the form of scientific and technical co-operation, the contributions made by the parties (including intellectual property) doing the work under contract, and the parties' intention to participate in marketing the new intellectual property, are not taken into account;
- inexact definition of the potential owners of the exclusive rights to the results and of the type and scope of the rights to the intellectual property on Russian territory and in other states;
- lack of identification of confidential business and proprietary information relating to the work, as well as the terms and conditions for its transfer, exchange and publication;
- failure to provide for the remuneration of authors and inventors;
- failure to set the priority dates when filing patent applications for created industrial property or failure to respect the rules established in Russian and foreign patent legislation;
- disregard of the eventual need to submit the scientific and technical results to export control, a regime existing in many countries;

- use of one language, usually English, in contracts and agreements;
- failure to foresee mechanisms for dispute settlement, which may arise during performance of the work.

The above deficiencies in the contract relations between Russian and foreign organisations in many respects contradict the generally accepted business customs established in developed market relations. Moreover these deficiencies are multiplied when used in contracts between Russian organisations. This situation is aggravated by the following factors.

- Lack of official accounting for intellectual property objects (industrial property above all) in scientific and technical organisations, as well as a lack of agreements with their staff to regulate the origin of intellectual property.
- The existence of the previous practice of administrative requisition of the results obtained by scientific and technical institutions for the sake of so-called “implementation in the interests of industry” at industrial enterprises instead of using legal-civil (contractual) mechanisms. These mechanisms are designed to integrate the economic rewards of developed market economies into the scientific and technical domain.
- Lack of clear legal frameworks for scientific and technical work which may be the object of state secrets, or subject to export control.

Of course, such a situation naturally preoccupies both the government of the Russian Federation and scientific and technical circles. In this context the Russian government has formulated and is currently implementing measures aimed at creating the protection and civilised use of intellectual property objects. Among such measures are the following priority ones:

- conducting training and continued education for managerial, scientific, and technical personnel on the creation, protection, use, export and import of results of scientific and technical activity;
- securing legal regulation of consulting-intermediary services on questions about the transfer of the results of scientific and technical activities;
- establishing an ordered framework for transferring to the civilian area the results obtained during scientific and technical work from public defence orders;
- strengthening and developing the regional and industry-specific systems for scientific and technical patent information, the systems for preparing and issuing scientific publications, as well as the system of registering and recording scientific and technical work.

According to the Russian Government’s Decree “On Establishing an Inter-Ministerial Commission for Protection of Intellectual Property Objects” dated March 7, 1995, No 228, a relevant commission has been set up to co-ordinate the activities of all public authorities to ensure the implementation of Russian legislation on the protection of intellectual property objects and commitments fixed by the international agreements signed by the Russian Federation. The commission also seeks to prevent unfair competition and to create a civilised market for intellectual property objects. Under the Decree of the President of the Russian Federation “On Measures of Development of Justice

Administration in the Russian Federation” dated May 2, 1996, No 642 it is the Ministry of Justice which is in charge of the state policy on legal protection of intellectual property.

Conclusion

The rapid development of Russian legislation governing civil relations, including contract obligations and exclusive rights to the results of intellectual activity, has resulted in a situation where the commonly-used business customs transferred on the territory of the Russian Federation have mostly found no demand. Hopes that the rules applied in Western society would be immediately accepted by the Russian people, who had been isolated for decades from the civilised world, did not come true. Neither have the hopes that a considerable worsening in the Russian economic situation would rapidly make its citizens act to achieve their interests and abilities through legal means.

Russia and its people have a long way to go yet to accept and adapt to a new set of conditions determined predominantly by economic factors. This has special importance for innovative activities, which determine the progress of society. In this respect, the creation of concrete mechanisms and methodological support for the realisation of civil law relations in the scientific and technical area is fundamental for the innovation process and a top priority. It is evident that solving the numerous problems identified above will lay the basis for developing scientific and technical activity in the Russian Federation in the future.

**THE CURRENT LEGAL AND ORGANISATIONAL CONTEXT FOR INTELLECTUAL
PROPERTY AT A STATE SCIENTIFIC CENTRE: "ALL RUSSIA SCIENTIFIC RESEARCH
INSTITUTE OF INORGANIC MATERIALS (ARSRIIM)"**

*by Vladimir A. Forstman
Head of Patent and Licensing Department, ARSRIIM*

The main technological focus of ARSRIIM

ARSRIIM is the leading Russian institute in the field of materials for atomic energy. The main directions of ARSRIIM's activities are:

- the design of materials and processes for nuclear reactor core components (fuel rod, assemblies, etc.) in power, transport and research reactors;
- the development of processes and equipment for spent nuclear fuel reprocessing as well as for the reprocessing and safe disposal of radioactive waste; and
- the creation of new, advanced materials and the development of manufacturing technology for their use in different branches of industry, with special emphasis given to superconducting materials.

Research and development at the institute is conducted according to federal goals set out in the programs of the Ministry for Atomic Energy and Industry and the Ministry for Science and Technical Policy. Conversion activities are being developed according to the priority directions for industry set by Russia's government. The main direction of conversion projects relate to the design of different materials, alloys, compounds and improved manufacturing technologies, for example:

- alloys on the base of refractory metals (Nb, Ta, V, Re, W) for thermoemission transducers, fusion reactors, etc.;
- superconducting composition materials for nuclear-physics facilities ;
- high energy magnetic materials for manufacturing magnets;
- isotope sources for use in space and medicine; and
- regenerable membrane filters, etc.

Functioning of ARSRIIM

The institute currently employs about two thousand people, almost half of which have a higher education (four hundred have Master's and Doctor's degrees). Staff reductions over the last ten years have equalled about two thousand, with about one thousand members being discharged at the pensionable age and others taking up other work, generally with private and commercial organisations. However, more recently some highly qualified scientists have returned and some young specialists from educational institutes have joined the institute. The average monthly staff salary is 1 million rubles (approximately 200 \$ USA). Most staff members supplement their incomes by participating in International Research and Technical Centre research projects and in the research projects of other organisations.

Management at ARSRIIM is carried out by its director and deputy directors, who oversee the institute's main scientific programmes mentioned above. These scientific programmes are performed by ten departments managed by a director-manager. Each of these departments has experimental facilities for materials and design testing. ARSRIIM also has a central design bureau and an experimental-test facility. It maintains close relations with leading enterprises, technological institutes and design firms in Russia's atomic industry.

ARSRIIM receives financial support from the following four sources:

- state budget grants from the Ministry for Science and Technical Policy;
- state budget grants from the Ministry for Atomic Energy and Industry;
- direct agreements with domestic organisations and enterprises to carry out research and development; and
- contracts with foreign firms and international organisations.

There is currently an acute shortage of research and development funding, largely reflecting insufficient federal financial support for programmes in nuclear technologies. Consequently, ARSRIIM needs to change and expand its research projects and to commercialise its materials and developments, targeting different branches of the Russian national economy and international technology markets.

ARSRIIM, as an institute, is related to the Ministry for Atomic Energy and, as a State Scientific Centre, to the Ministry for Science and Technical Policy. It also has a special interaction with the government of Moscow and ecological organisations in connection with safety requirements for working with radioactive materials.

Technology transfer and patenting

A special sub-unit, the Department of Intellectual Property (DIP), was formed in the Economic and Financial Subdivision of ARSRIIM to conduct work on protecting the institute's intellectual property and aiding technology transfer. The principal activities of DIP are:

- soliciting disclosures and protecting inventions and other types of intellectual property;
- developing patenting and patent maintenance plans;

- developing a patent and licensing policy;
- examining the intellectual property aspects of research and development contracts;
- monitoring of the use of intellectual property;
- drafting license agreements;
- estimating the value of intellectual property and license objects; and
- carrying out patentability searches and searches for infringement.

DIP has a staff of 15 members, who are graduate specialists in the fields of technical, economic, patent and technology transfer problems. It has four groups:

- property right protection and prosecution;
- patent searching;
- patent documentation collection; and
- technology transfer and intellectual property economics.

The head of DIP is a registered patent attorney of Russia and a Master of technical sciences. Whenever foreign contracts are reviewed or license agreements with foreign firms are made, DIP interacts with ARSRIIM's Department of International Contracts.

Current rules on intellectual property

Inventions

When doing research under contract for a domestic sponsor, ARSRIIM has a policy of keeping the rights to any acquired foreign patents for any resulting inventions produced by its employees. The institute also grants Russian research sponsors the option to select an exclusive royalty-bearing license or to acquire the property right by paying a royalty to the institute. The joint patenting of inventions in Russia is often stipulated when conducting joint development work with industrial branch enterprises that are national monopolies. Under this latter situation ARSRIIM insists on partial payments from the profits related to the commercial realisation of an invention.

In practice ARSRIIM concludes the framework agreement with enterprises about joint invention rights distribution principles. The specification of the amount of payment (as percentage of sales) is stated in a separate agreement in cases involving the commercialisation of joint inventions.

ARSRIIM's policy for inventions made under research and development contracts with foreign firms consists of granting the property rights to the firm on the territory of its home country, while the institute retains ownership on Russian territory. Within the framework of such research and development agreements, ARSRIIM seeks to stipulate that the transfer of patent rights to the sponsoring firm for third countries be under specified commercial terms. The institute insists on this approach when a considerable amount of its own pre-existing research results were used in performing the contracted research for the agreement.

While negotiating each contract, ARSRIIM tries (as a general rule) to find mutually beneficial solutions in respect to intellectual property rights, taking into consideration the influence of the main factors -- for example, the type of project funding, funding shares of any other sponsors, federal organisations, usage of pre-existing information in contracted works, etc. In our opinion, only through such an approach will serious and prolonged relationships in the field of nuclear technology be successfully established.

Problems connected with determining invention ownership also arise during the conversion of USSR authors' certificates on joint inventions of institutes and enterprises into Russian patents. Under Russian legislation the "state's right" to these inventions may be transferred by applicants or authors into private property within 20 years from the date of priority and free of charge. ARSRIIM has a potential portfolio of about 2000 such inventions. The main issue arising within the agreements to convert authors' certificates on joint inventions into Russian patents, consists in ARSRIIM's insistence on being paid part of the profit from using the inventions. As a rule, enterprises disagree with this view. Since conversion may be legally realised by the common consent of the applicants (or applicants and authors), impositions often arise and exclusive intellectual property rights are not commercialised.

Research data from work done at the institute

ARSRIIM protects unpatented research results, which are of practical and scientific value, as confidential information. At present, DIP is developing a system for registering technical know-how with the goal of making a fuller inventory and improving the commercial efficiency of their use during the transfer of research and development results. Problems relating to the commercial use of know-how are extremely pressing for ARSRIIM: there are a great number of previously unpublished inventions, and considerable sums of money would be required for their foreign patenting.

Obligations of employees

Under the Patent Law of Russia the rights of inventions created by staff members in the course of their official duties belong to the employer (i.e., ARSRIIM). Each staff member concludes a standard agreement with the administration. According to this agreement the employees are obliged to inform the DIP about any new invention (patentable or unpatentable) and to maintain a regimen of confidentiality. When filing patent applications the administration concludes additional agreements with inventors on the payment of awards in the event of commercial utilisation.

Delimitation of contracted work

Most of ARSRIIM's research and development work is now conducted using outside financial resources. Each agreement -- foreign contracts with external funding and domestically funded contracts -- passes through an official registration system. These official papers are kept by ARSRIIM for 5 years, so we can always establish the research themes which have been conducted by each department. As a rule, ARSRIIM's departments conduct research for several agreements simultaneously and often in similar scientific fields. Consequently it can be difficult to determine within the scope of exactly which contract an invention was made. In this case it is necessary to examine in detail the scope of financial support and the customer's requirements in respect of the patent protection of research results. Therefore, excessively hard customer's terms on the scope of rights of intellectual property created within the contracts do not facilitate the real ownership transfer to him.

Conflicts of interest between ARSRIIM and its staff members

Conflicts of interest appear in the following forms:

- employee dissatisfaction with the financial reward for their creative activities at ARSRIIM;
- employee unwillingness to be concerned with the legal protection of research and development results and to disclose new results;
- transfers abroad of research and development results without respect to existing intellectual property rights and without paying awards to the inventors or authors;
- disclosure of know-how during negotiations with foreign firms or at the time of a staff member's journey abroad; and
- promotion of an individual employee's interest through favouring a particular sponsor, at the expense of the interests of ARSRIIM.

The financial problems which form the basis of conflicts can be:

- the low level of a qualified scientist's salary; and
- the poor remuneration and recognition of a scientist's intellectual activity and the lack of adequate funding for protecting research results in ARSRIIM's name.

Under present conditions, the attention of highly qualified scientists is diverted from research activities to seeking financial support, customers and jobs with quick returns. The creation of significant inventions within the framework of such jobs is very improbable. To reduce these problems, there is a system of payments to inventors whose inventions are used in the developments of ARSRIIM or during the acquisition of outside research requests that are based on ARSRIIM inventions. A special fund has been established for this purpose. A system for concluding agreements with inventors as well as procedures for paying rewards to inventors has been established (in the case of successful patent grants and use of inventions). Many payments have been executed according to this procedure.

Subcontracts and joint research

While engaged in research and development, ARSRIIM often concludes agreements with other research organisations, particularly with those doing radiochemical testing of new technologies and materials made at ARSRIIM. Conserving the property rights of ARSRIIM is usually foreseen within the framework of such agreements.

Disclosing objects for possible patenting

There are formal procedures for prompting employees to disclose their patentable invention.

Disclosing an invention at ARSRIIM may occur in two ways. First, when the inventors take the initiative and disclose their idea to the head of scientific work and to patent experts under their agreement with the institute. DIP's experts then carry out a preliminary examination of the purported invention, examining its novelty and patentability. If the preliminary search is positive, the experts ask for additional technical data and potential applications for the invention. After drafting the invention's specifications, the application papers are discussed at the council of experts and sent to the patent office. The main factor favouring inventions disclosed by this procedure undoubtedly relates to the creative and financial interests of scientists and researchers in getting intellectual property protection in ARSRIIM's name. Therefore, while formulating an application, ARSRIIM and the group of inventors also conclude an agreement on the royalties to be paid in case of successful commercialisation. Secondly, all materials and information, which are turned over under contracted works, are examined for any relevant know-how and inventions. Materials and information may be sent to a sponsor only after receiving the signature of the chief of DIP.

When soliciting the disclosure of possible subjects for protection, DIP takes action to prevent premature publication and transferring. To this end, DIP staff members work together with the inventors in preparing the patent application papers or in performing the registry procedure for new information deemed to be a commercial secret (know-how) of ARSRIIM. However, the significance of this control procedure must not be overestimated. The best means for ensuring the disclosure of inventions remains addressing the financial interests of inventors in obtaining patent protection.

Sponsors usually insist on the necessity of disclosing information about purported inventions when concluding research and development agreements. ARSRIIM is interested in transferring the development results together with the right to use the intellectual property, for the commercialisation of most of the materials and technologies developed at ARSRIIM is only possible at atomic industry enterprises that are natural monopolies. Therefore, the institute has concluded framework agreements with leading enterprises in the atomic industry in which such disclosure is foreseen along with joint patenting and rules on distributing profits.

Restriction of publication and national security provision

A system of controls at ARSRIIM is established according to the Russian State Secret Law. All official papers are reviewed for the existence of information that should be kept a national secret. When necessary, a special unit of ARSRIIM can detain papers (to edit the materials) and hence postpone publications. Material secrecy (or non-secrecy) is established within one month.

Foreign applications

ARSRIIM seeks to file international applications according to PCT-procedures for the most promising inventions. At the same time efforts are made to search for potential licensees and cede the patent rights to them before beginning the national stage of examination. Such an approach reflects a lack of money for foreign patenting and the impracticalities of policing patent use abroad.

Over the past several years ARSRIIM's contract work with foreign firms, leaders in the field of nuclear technology, has significantly increased. This work has even led to several joint inventions. The distribution of rights for these inventions was stipulated by the relevant conditions in the agreements. However, problems have arisen as the Russian Patent Law requires filing applications first in Russia, and

this requirement may conflict with contract conditions on the distribution of intellectual property rights. ARSRIIM believes that filing international applications is a correct and acceptable procedure for patenting such inventions in Russia, as the issue of distributing potential intellectual property rights between participants is usually solved according to the contract and Russian legislation.

Patent prosecution and maintenance

Patent prosecution and the correspondence pertaining to applications and fee payments are done by DIP's property rights protection group. For inventions with unclear commercial value, this group seeks additional data from branch laboratories and branch enterprises. It then analyses the expediency of maintenance and makes the relevant decisions.

Managing the use of intellectual property

In practice the issues surrounding intellectual property usage are determined by the research and development contracts, joint activities, agreements, frame-agreements for joint inventions and license agreements for inventions. In agreements with Russian licensees, the royalty base and royalty rates may be affected by the following conditions:

- part-financing of the intellectual property by the licensee (and sometimes the use of the licensee's production base and staff members);
- problems associated with the fact that enterprise royalties to the research institute is a novelty for Russia;
- enterprises' shortage of money; and
- the fact that a considerable part of ARSRIIM's costs is covered by the state budget.

Given the current economic situation and taking into account the current level of the domestic license market in Russia, ARSRIIM's royalty receipts from Russian licensees amount more to a way of financially stimulating employee interest in inventive activity than a significant contribution to ARSRIIM's budget.

The approaches taken to define lump sums and royalty rates under license agreements with foreign firms are based on international practices. Moreover, we use a standardised royalty as a base. The determination of the payment amounts during the transfer of know-how is of great significance for the institute, for ARSRIIM has only few foreign patents and a considerable number of USSR author's certificates remain unpublished.

The use of ARSRIIM's intellectual property is fairly easily monitored because the institute's staff members participate in the commercialisation of technology developed at the enterprise. The definition of the commercial conditions for intellectual property usage is a difficult issue, for the other parties do not want (in most cases) to base payments on profits, particularly when joint intellectual property is used. If the intellectual property rights so belong solely to ARSRIIM, payments are distributed between ARSRIIM, the authors of the invention and the persons assisting the creation and use of the inventions. Payments are made according to the stipulations found in the agreement between the authors and ARSRIIM. Part of the author's payment, as well as individual shares for each author, are defined under the agreement. If the intellectual property rights belong to ARSRIIM and other persons jointly, then an additional agreement for the distribution of license fees is concluded between them, and each licensor

makes payments to authors according to this agreement. A rule on cash awards to persons assisting in the creation and use of inventions has been established by an internal regulation of ARSRIIM and approved by the director.

Business development

General approach to technology sales

Within the last five years ARSRIIM has undertaken collaboration with several leading foreign firms, carrying out contract research and development. At present ARSRIIM has more than thirty contracts for research and development with firms from: the United States, France, Great Britain, Japan, Germany, Canada, and South Korea. Financial support from contract research and development is a noticeable share of the institute's budget and is tending to grow.

Most of these contracts have two stages. ARSRIIM specialists summarise research they have made, describing the resulting data. Foreign specialists then study this summary and define the themes they find most interesting. The parties subsequently conclude contracts for further work on the chosen topics or for the transfer of more detailed information and materials. Such an approach makes it possible to define the commercial potential of ARSRIIM's developments and inventions and to identify the most promising fields for long-term collaboration. Department directors are significantly involved in concluding contracts, specifically at the time of negotiation abroad.

Determining the commercial importance of an invention starts at the moment an inventor contacts DIP to disclose an invention. Such determinations are based on the collection of information from laboratories and also on the expert's forecast. The forecast is developed further and then the expedience of patent maintenance is determined. Unfortunately the institute's specialists on technology transfer seldom participate at the early stages of negotiations with foreign firms, especially when they are held abroad. This exclusion often prevents the creation of mutually beneficial contracts that could provide for the possibility of long-term collaboration. It seems to me that representatives of foreign firms, to avoid possible later complications, should be careful that Russian intellectual property specialists be included early on in negotiations.

Factors complicating business with foreign firms

ARSRIIM is interested in establishing long-term collaboration with foreign firms, especially to sell finished technologies and to conclude research and development contracts. ARSRIIM's recent experience confirms that such collaboration is realistic. However, numerous factors are complicating the conclusion of contracts and the achievement of these goals. For instance, most of ARSRIIM's intellectual property exists as unpublished USSR authors' certificates. These inventions are currently safeguarded as the institute's know-how. At present there are no legal obstacles to publishing or converting most of these inventions into Russian patents. However, getting comprehensive foreign protection is too expensive and makes in many cases such publishing undesirable. As a result, when the institute negotiates a contract and the transfer of research results to a sponsor, the issue frequently arises of how to price the transfer of ARSRIIM know-how in the contract. ARSRIIM believes that if it must transfer unprotected know-how as part of the contract for research, it needs considerable compensation; while the research sponsor wants only to pay for the related research that draws on the know-how.

Another significant complication during contract negotiation centres on the rights to any intellectual property created in the course of the research. Sometimes customers' claims cover even the property rights in Russia. Such demands are very disadvantageous to the institute, for they effectively

block the possibility of collaborating with other firms in similar areas. A more acceptable approach would limit the assignment of intellectual property rights to the customer's home country only. Moreover, the option of electing exclusive or non-exclusive licenses with right of use in territories outside of Russia could be granted, too. In our opinion such an approach would stimulate the employee's research efforts and his willingness to insert any accumulated knowledge into the research results. In addition, it would result in favouring collaboration with firms willing to accept such conditions.

Finding business partners

ARSRIIM uses participation in international meetings and conferences on nuclear technology and international exhibitions as opportunities for finding potential licensees and/or sponsors of research and development. Presently the institute is preparing an advertisement with information on new materials and developments created in the framework of the conversion of military programmes. This information is being placed into databases on technology transfer. Such databases include: Klenner Intellectual Property Management (USA); "International databases of Technologies and Business resources" (Florida, USA and Ottawa, Canada); "World Bank of Licensable Technology"; Information-Commercial System "Atom" (Russia); and "International Business Opportunities Service" (Germany). ARSRIIM also uses direct mailings.

Disclosure of technical information

ARSRIIM's experience in collaborating with foreign firms shows that negotiation and conclusion of a favourable contract often depend to a great extent on the scope of information revealed during preliminary negotiations. The two-stage mode of contract fulfilment (see above) seems to be the most acceptable for both parties, especially in the early stages of collaboration. Such an approach creates the possibility for a more accurate definition of the subject matter of the projects and for the evaluation of the scope of information transferred during each negotiation stage. It also appears to reduce risks for both parties. Before revealing information in the course of negotiations, parties often enter into separate confidentiality agreements because the most significant achievements of ARSRIIM have not been protected by foreign patents. Unfortunately, the necessary preparations for negotiations with foreign firms frequently aren't made and the scope and legal conditions for the transfer of information aren't determined. We inadequately use the possibility of option agreements for disclosing commercially valuable information.

Major problems

For information searches (as to novelty, patentability, utility, validity etc.) DIP staff members use the information collections at ARSRIIM and at the Russian State Patent Library. There are no problems in accessing patent information documents. However, access to foreign scientific publications has recently become difficult, subscriptions to foreign publications having been cut at most libraries because of a lack of money. Information and financial resources for performing market research have been reduced too. There are no problems for patenting and maintaining patent protection in Russia, for the costs are relatively low.

Foreign patenting is rare because of a lack of money. Patenting abroad is done for only the most promising inventions and/or in case foreign firms appear interested in acquiring a particular new technology. Insufficient financial rewards for inventors and scientists complicates the relationship with authors of employee inventions and the patenting of such inventions in ARSRIIM's name (for example, poor rewards exacerbates the prevalence of conflict-of-interest situations). Under present conditions these

problems are further complicated by the exodus of staff members, with specific subject areas being heavily affected.

The rights of inventions made before, or stemming from, contracted research

The Soviet legacy

In the Soviet Union, the state completely owned all inventions, as it financed all scientific research and development. Soviet citizens could theoretically apply for patents, but in practice only foreigners did. Individuals and enterprise-applicants were given an authors' certificate, which simply certified the fact of the invention's creation and the right of the inventors to a bonus. These authors' certificates did not provide for any exclusive rights to the inventions. Any state enterprise could use any of these inventions within the USSR. The application process had a system of procedures which subdivided the inventions into four categories during examination: "secret", "for official use", "technology", "ordinary". Only "ordinary" inventions were published in the *Official Bulletin*. Inventions disclosing to a certain extent technologies as well as inventions of possible great value were classified as: "for official use" and "technology". Access to such inventions was allowed by special permission only. Most inventions from the military- industrial complex (including ARSRIIM's) were unpublished.

The following changes have occurred since the Patent Law of Russia and the Law for State secrecy have been put into effect:

1. The main provisions of the Russian patent legislation have been harmonised with legislation in the developed countries of the West. Patents for new applications are granted to physical and juridical persons.
2. The restrictions on the publication of non-secret inventions has been abolished, and the secrecy field of invention has been narrowed.
3. A free-of-charge conversion of authors' certificates on non-secret inventions into patents assigned to the applicants and/or inventors was initiated. (An inventor can convert an author's certificate into a patent only with the institute's permission.) Transfer may be made within 20 years from priority date. Thus, the dual standard in respect to intellectual property rights for national and commercial sectors has been dismantled. Russia has chosen to favour private property for intellectual achievements and has also created the possibility of a free transfer of rights to inventions which previously belonged to the state. In my opinion, deep legislative market reforms have been put in place for the field of intellectual property rights. At present inventions exist on Russian territory in the following legal forms:
 - patented inventions, acquired according to patent application;
 - patented inventions, acquired according to the procedure for converting USSR authors' certificates into private property;
 - published inventions, for which the exclusive rights remain unclaimed;
 - unpublished inventions based on authors' certificates, for which exclusive rights are unclaimed by the applicants or author's (information about them is confidential as before);
 - secret inventions.

It is necessary to note that Russian patents for inventions of the third and fourth groups may be acquired any time within 20 years of the priority date. Patents for inventions of the fifth group may be granted only if the secrecy is removed through an established order.

Presently an unprecedented potential for commercialising Russian intellectual achievements exists. These achievements may be easily converted, free of charge, into the intellectual property of individual persons. ARSRIIM has a portfolio of such achievements containing about 2 000 inventions. There can be no doubt that this potential will aid the development of the intellectual property market during Russia's economic transformation.

Foreign contracts

The problem of delimiting the intellectual rights between sponsors and clients, in accordance with Russian legislation, is determined by contract terms and is not burdened by any special requirements of federal agencies. When transferring rights in Russia, this principle is realised not just for intellectual property created under contract but also for that intellectual property for which the executor already had the rights or for which he might receive the rights during the process of privatising "state" intellectual property (i.e. the conversion of a USSR author's certificate).

The difference in managing intellectual property rights in foreign contracts stems from the fact that the sponsor may be given rights both for the intellectual property created under the contract and for that part of intellectual property which was previously possessed by the executor and which currently exists as unpublished inventions based on authors' certificates. In its experience in developing contracts for conducting R&D work, ARSRIIM makes an effort to separate clearly the new results and the already existing information that is ARSRIIM's intellectual property. Depending on the specific circumstances, the conditions for disclosing information and transferring the rights to intellectual property are stipulated either directly in the contract or in a separate agreement on the transfer of know-how.

PROFILE OF RESEARCH AND DEVELOPMENT IN RUSSIA

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Introduction

Many economic, social, institutional, and political factors have helped form -- often with contradictory effects on development trends -- the present structure of the Russian R&D sector.

Political and economic reforms have created the basis for a market economy. The Russian economy is gradually acquiring essentially new characteristics that are primarily connected with the abolition of the state's monopoly over property. By the beginning of 1995, 85 per cent of industrial enterprises were private and they accounted for 79 per cent and 72 per cent, respectively, of total industrial output and employment. At the same time, all economic sectors underwent strengthened commercialisation, including those which remained as state property and are state run.

There was an acute economic crisis with a resulting decline in output and investment and a high inflation rate. In 1991-95, GDP decreased by 38 per cent, while capital investment dropped by 73 per cent.

Investment in unprofitable sectors and the necessity of supporting social programs have made the situation even more complicated. It has resulted in an increased burden on the federal budget and made it impossible to maintain government appropriations for R&D at previous levels. At the same time, the low solvency of enterprises, a contraction of the internal market for capital goods, and intense competition from imported goods should be noted. These factors have helped reduce the opportunities for long-term investment and have drastically decreased industrial demand for R&D and innovation.

The above-mentioned trends have considerably reduced the scale of R&D potential and were accompanied by a decline in the prestige of R&D work -- actual pay is especially low when compared with that of the business enterprise sector. Public opinion surveys show that the prestige of scientific activity is particularly low among persons with higher education, especially among those forty and younger or with higher incomes. Moreover, approximately 67 per cent of all respondents (80 per cent of those with higher education) think that the role of S&T in Russia is decreasing (Centre for Science Research and Statistics, 1996).

The collapse of the USSR disrupted organised international S&T and innovation links. Russia's R&D and higher education establishment was the source of progress in many fields in the other New Independent States, and the break-up of the USSR has complicated their further development. Access for citizens of other republics to the elite universities and technical colleges in Russia has been reduced. At the same time, many advanced basic research institutes, industrial R&D units and special research

facilities of unique importance (such as the space launching site in Baikonur and the Crimean and Armenian observatories) are now located outside the Russian territory.

The USSR Academy of Sciences as a single administrative structure has ceased to exist; inter-republic research programmes are discontinued; R&D contracts between institutes and enterprises in different republics are cancelled. As a result, the R&D potential of New Independent States in some research areas do not respond to the needs of their national economies.

Political and institutional changes have helped decentralise decision-making and move from a directly centralised economic management to one of regulation. Centralised orders for R&D are being gradually replaced by a market system of demand formation. Paralleling the decreased state role is a rising role of industrial associations, enterprises, and local authorities.

At the same time, there remains a certain inertia in R&D organisation, an intention to preserve institutional structures that functioned for decades according to the peculiarities of an administrative-command economy. Relative to R&D, it primarily concerns the artificial division of “big” science, including the academy sector and the defence industry which enjoyed numerous privileges of political and economic nature, from other less privileged sectors – civilian industry, higher education and enterprise R&D sectors -- marked by a considerably poorer provision of financial, material and technical resources. The fundamental structural imbalance in R&D potential is linked to this isolation of R&D from higher education and industrial enterprises, as well as to the domination of independent research institutions (institutes, design bureaux, etc.) and their departmental subordination, which established administrative barriers to research co-operation across scientific fields and to creating and disseminating innovations. These problems continue to retard the development of the country’s R&D potential and its transformation into the requirements of a market economy.

The unstable political situation is also negatively affecting the elaboration and accomplishment of reforms, including those for S&T policy. Subjective factors also play a significant role: nearness to state authorities, the commitment of particular science administrators to reforms, their personal positions, an understanding of how to adapt to the changing economic, social, and political conditions.

Russian R&D is increasingly becoming integrated into the international community. Russia has become increasingly open to international economic and S&T co-operation. Russian scientists are participating in international projects and employed abroad on contracts. The creation of foreign-related companies, their subsidiaries and joint ventures in Russia are a way for the country to enter international technology markets. A stabilisation of the economic and political situation and a strengthening of legislative guarantees for foreign investments will contribute to further intensification of international S&T links.

The above-mentioned factors in many respects predetermine the present organisational structure and development trends of Russia’s R&D. This paper examines this structure and these trends by using statistical publications provided by the Centre for Science Research and Statistics, the materials of the international monograph prepared by staff members of the State Committee on Science and Technology and the CSRS (Gacs, Gokhberg and Peck, 1996). The technical notes at the end of this paper contain definitions of the most important concepts and indicators, as well as necessary statistics.

The organisational structure of Russian R&D

The principal elements

Independent R&D institutions and organisations in higher educational institutions, industrial enterprises, and other sectors of the economy are the principal elements of Russian R&D. According to statistical data, 4 059 Russian R&D institutions existed at the beginning of 1996 (see table 3). Since 1990, their total number has decreased by almost 13 per cent, reflecting reductions in the industrial R&D sector, principally for the project and design organisations performing R&D.

The main form of Russian R&D organisation remains research institutes which are separated from higher education institutions and enterprises. Independent research and design organisations account for 70 per cent of all R&D institutions (in 1990 – 58 per cent); whereas the shares for higher educational institutions and industrial enterprises (which dominate R&D in developed market economies) do not exceed 10 per cent and 8 per cent respectively. Independent research institutes account for a similarly high and growing share of total R&D employment, 70 per cent in 1994 compared to 55 per cent in 1990.

R&D according to sectors

In accordance with the classification scheme adopted by OECD Member countries, four main sectors are defined for Russia's R&D establishment: government, business enterprise, higher education, and non-profit private.

- *Government.* The increase in the number of government R&D institutions (see table 4) stems from the emergence of some new institutes in the state administered system (research institutes of federal ministries and departments *et al.*) and the establishment of new or the division of existing academy institutes. While the overall number of Russian R&D institutions dropped over the 1990-94 period, the number of academy institutes grew from 535 in 1990 to 787 in 1995, of which in the Russian Academy of Sciences (RAS) – from 297 to 429 (see table 5). As a result, the RAS now accounts for 11 per cent of all Russian R&D institutions, a 5 percentage point increase over 1990. Institutes of the RAS, many of which continue to be major basic research centres of world-wide importance, are now incorporated in 18 branch departments, 3 regional departments, and 5 independent research centres. The government sector also includes R&D institutions subordinated to regional and local authorities. Their population has recently decreased, numbering 196 and 9 respectively at the beginning of 1996. They account for about 5 per cent of total Russian R&D institutions.
- *Business.* The business enterprise sector's market-oriented R&D institutions, including the R&D units of industrial enterprises, consisted of 2 345 organisations at the start of 1996, and they primarily specialised in applied R&D. Changes in the business enterprise sector's R&D focus reflect sectoral trends in industrial production and the privatisation process that has conditioned changes in the R&D institutions' property. Many industrial R&D institutions were removed from direct administrative subordination to ministries and departments and incorporated into industrial associations, concerns, and financial and industrial groups. Privatisation has mostly affected the R&D institutions in civilian industry.

On the whole, by the beginning of 1996, 832 R&D institutions were in joint (combined) ownership of the government and other Russian legal entities, 198 were private property, and 24 were in

joint ownership with foreign participation (see table 6). They employ almost a quarter of Russia's R&D personnel. Most privatised institutions are found in the business sector; nevertheless, in our estimate, about 56 per cent of the business R&D institutions remain state property.

Industrial enterprises traditionally play a small part in the national R&D effort. With access to generally insignificant resources and being unevenly developed, this so-called factory R&D is oriented, as a rule, exclusively to developing applied technologies or solving problems for specific enterprises, including the adaptation of outside R&D results to specific production problems. The gradual stabilisation of production in a number of industrial sectors and, consequently, a stabilisation of their financial situation during 1994-95 helped for the first time to increase the number of industrial enterprises performing R&D to 49 in 1995.

- *Higher education.* The isolation of R&D from higher education, which is occurring as the financial conditions of universities and colleges deteriorate, has led to a considerably reduced scale of R&D. The number of higher educational institutions performing R&D decreased during 1990-95 from 453 to 408. Thus, by the beginning of 1996, R&D was performed by only 54 per cent of all Russian higher educational institutions. A continuation of this trend may result in irreversible consequences for R&D as such and for training specialists.
- *Non-profit, private.* The formation of a private, non-profit R&D sector is a new phenomenon in Russia. The number of such R&D institutions remains insignificant (in 1995, 10); however, increased research activities by voluntary associations, professional scientific societies, and charity foundations will contribute to expansion of this sector's R&D performance. In 1991-95, more than 60 new voluntary academies of sciences were established, many of them already have regional departments. Approximately 50 scientific societies and academies are incorporated in the Union of Scientific Societies.

State Research Centres (SRCs)

The formation of a network of State Research Centres (SRC) is a new, important component of Russia's current S&T policy. A Russian Federation Government decree grants this status to particular research institutes, enterprises, and higher education institutions which have unique experimental equipment, highly qualified personnel, and internationally recognised scientific results. Such institutions are considered as R&D entities of federal importance and receive special support for their activities. Giving an institution the status of SRC does not change its organisational and legal status. An SRC's activities are performed in accordance with programmes meeting the priority objectives of S&T development that were approved by related ministries (departments) in agreement with the Russian Federation's State Committee on Science and Technology. The State Committee also provides goal-oriented financing for SRCs through plans for basic and strategic research and the programmes for applied R&D that it approves. In addition to receiving priority allocations of budgetary funds for financing research programmes and developing their experimental bases, SRCs are granted tax privileges and reduced rates for electricity, heat, water, and communications services, etc. SRCs are also exempted from VAT on materials, equipment, purchased articles, and services of other organisations that are necessary for accomplishing the programmes financed from the federal budget, as well as from custom duties on imports, etc.

By the beginning of 1996, there were 61 State Research Centres, employing 108.5 thousand people or about 10 per cent of Russia's total R&D employment. The SRCs include large research institutions with leading positions in priority S&T fields (nuclear physics, power generation, chemistry

and advanced materials, aircraft, machinery, medicine, biology and biotechnology, informatics, instrument-making, optics, electronics, robotics, etc. (see tables 1.5 and 1.6). Among the SRCs are 23 research centres of atomic and defence industries, 7 institutes of the RAS, and 2 research units of higher education institutions. In the near future it is planned to begin revising the list of SRCs, taking into account their results.

An overview of R&D in the Russian Federation

The recent situation in Russian R&D is reflected in the drastic fall of R&D input and output recorded by the main indicators.

Trends in overall R&D expenditures

During 1990-95, R&D expenditure in Russia, at current prices, grew from 13 billion rubles to 12.1 trillion rubles (see table 9). This nominal increase did not compensate for the negative effects of growing inflation. The deterioration of the financial situation, a growth of budget deficits that limited any increases in funds for R&D, difficulties in finding additional funds in ministries and departments, and the reduction in industrial demand for R&D resulted in a 4.4-fold decrease in R&D expenditure at constant prices during 1990-95. Expenditures in 1995 were about 23 per cent of those in 1990. We estimate, with regard to the ruble purchasing power parity, that Russian R&D expenditures in 1994 totalled approximately \$6 billion, ranking Russia immediately behind the G7 countries.

The trends in R&D expenditure significantly trailed the change of the main macro-economic indicators. As a result, the share of GERD in GDP fell from 2.03 per cent to 0.73 per cent. Finally, if in 1991 Russia's expenditures about equalled the OECD average, it later fell to equal such countries with relatively minor R&D potentials as Iceland, Ireland, Spain, and New Zealand. Such comparisons are a troubling indicator of Russia's low level of R&D financing.

The country's changed political and economic situation was accompanied by a transformation of the goal orientation of R&D. A reduction in defence-related programmes and the conversion of the defence industry has led to decreased defence-related R&D, from 43 per cent of total expenditures in 1991 to 26 per cent by the beginning of 1995 (see table 10). Russian defence R&D's share of total expenditures now about equals that of other nuclear powers: the United States, the United Kingdom, and France. Among the civilian orientations of R&D, the research efforts aimed at the general advancement of knowledge (12 per cent of the total R&D expenditure in Russia in 1994) and at the improvement of the economic efficiency and technological level of industry (9 per cent) occupy major places. Strategic national goals, such as health protection and the generation and rational use of energy, receive relatively low levels of funding (about 3 per cent). Environmental protection enjoys even less attention (less than 2 per cent of total R&D expenditure).

An analysis of R&D expenditure by field shows a disproportion in the disciplinary structure of science because of its strong technocratic orientation. For years, at the expense of many fields of knowledge, engineering was emphasised. It has accounted for almost three-quarters of total R&D expenditure and maintained this share over the last decade.

The shares of medical, agricultural, social sciences, and humanities are within the range of 3-4 per cent. Only the share of natural sciences, due to a certain governmental support of basic research,

increased over these years, accounting for almost 18 per cent of R&D expenditures by the beginning of 1996.

R&D expenditures according to sectors

The transition to a market economy gradually changed the character of R&D institutions' activities, forcing them to adjust to new situations and survive under difficult financial conditions. Such changes fundamentally affect the trends in particular R&D sectors.

- *The business enterprise sector.* Russian R&D is dominated by the business enterprise sector; its share of R&D expenditure, gradually rising, has reached almost 69 per cent (see figure 1). Many industrial research institutes have preserved their established links with enterprises, including within the new institutional entities which have replaced industrial ministries. The services rendered to enterprises are mostly aimed to meet short-term needs; therefore, development expenditures, as a share of total research and development at industrial R&D institutions, has somewhat increased (from 64 per cent to 66 per cent in 1990-94). Applied research, especially long-term, has not found an industrial demand, nor received sufficient budgetary support. Therefore, its share in the overall R&D effort of industrial R&D institutions decreased from 33 per cent in 1990 to 29 per cent in 1994, and at enterprises it decreased, respectively, from 18 per cent to 9 per cent. Deteriorating financial situations have forced large industrial research institutes, including those of the defence industry, to seek additional funding. They have somewhat increased the scale of basic research, thus competing with academy institutes. Consequently, the share of basic research at industrial R&D institutions reached 4.5 per cent by the beginning of 1995 (2.7 per cent in 1990).

A further redistribution of the work (zakaz) portfolio of R&D units at industrial enterprises has favoured development projects (to 91 per cent in 1994 in comparison with 80 per cent in 1990). These projects are intended, as a rule, for internal use and financed from enterprise resources. They have also contributed to an increase in the enterprises' share of the national R&D effort. The business enterprise sector, which incorporates industrial R&D institutions and enterprises, accounted for more than two-thirds of total Russian R&D expenditure at the beginning of 1996.

- *The government sector.* The decreased government share of total R&D expenditures (from 28 per cent in 1994 to 26 per cent in 1995) stems from measures to rationalise the system of federal executive bodies and a resulting relative reduction of the value of works in subordinated R&D institutions. At the same time, this share is more than twice that of the average for OECD Member countries (OECD, 1995), largely reflecting the role of academy institutes in Russian R&D performance.
- *The Russian Academy of Sciences.* R&D expenditures at the Russian Academy of Sciences grew, at current prices, at rates above those in other Russian R&D sectors. As a result, the RAS increased somewhat its share of total Russian R&D expenditure: from 8 per cent in 1990 to 13 per cent in 1995. Thus, RAS institutes on the average appear relatively more prosperous than R&D units in industry and higher educational institutions.

This continued federal budget support for the Academy, with basic research as its principal objective, has given Academy institutes an increasing share of the total funds spent on R&D. A relative increase in the share of applied research during 1990-94, when indications of a strengthening commercialisation of academy science were still visible, was replaced by a

drastic decrease in 1995: 1995 applied research accounted for only 16 per cent of total R&D, and development, 9 per cent. In 1990, these shares were, 27 per cent and 12 per cent, respectively (see table 12). This change testifies to many academy institutes' weak competitiveness, relative to industrial R&D institutions, in performing development work that is oriented to the needs of specific enterprises. The RAS' share of basic research continues to rise, reaching in 1995 already 75 per cent (in 1990 – 62 per cent).

With fewer clients able to pay for applied studies, not only has the RAS' share of the total value of R&D risen by almost 5 percentage points over 1990-95, but there was also an increase in the share of basic research in the country as a whole, reaching almost 16 per cent. The current share of basic research share in total R&D expenditure brings Russia closer to the levels found in leading industrial countries: 13 per cent in the United Kingdom and Japan, 14 per cent in the United States, 19 per cent in Germany, and 23 per cent in France (National Science Board, 1991). At the same time, one should not forget that this increase in the value of basic research is only relative, for according to the absolute figures for 1990-94, it fell by 68 per cent. Thus, if measured in 1990 prices, its value in the RAS in 1994 was equal to only 279.8 million rubles (32 per cent of the 1990 level).

- *Higher education.* The higher education sector's contribution to R&D is dropping precipitously. Its share of R&D expenditures at the beginning of 1996 came close to 5 per cent. Most of the reductions came in the reduced value of contracts for applied R&D with enterprises, thus increasing the dependence of the higher education R&D sector on budgetary support. Basic research now comprises the largest share of research and development done at higher education facilities. It increased twofold for 1990-94, reaching 44 per cent by the beginning of 1995. With a continuing outflow of highly qualified personnel, higher education institutions find it increasingly difficult to compete with the academy institutes in basic research and with industrial research institutes in applied research and development. Thus, higher education institutions are increasingly losing their standing, and their share of R&D expenditures in Russia is, on the average, 3-4 times lower than that in the OECD Member countries.

Trends in employment

The changed activities of R&D institutions belonging to different sectors help explain recent, and at first sight paradoxical, employment trends in R&D. While R&D expenditure in 1990-95 decreased by 76 per cent, the R&D employment for the same period dropped by 45 per cent (see figure 3).

- *Changes according to type of employee.* R&D personnel reductions vary across the different employee categories. In 1989-91, the reductions mostly affected technicians, support and other auxiliary staff. Attempts were made to preserve the research collectives as the key element of R&D human resources and to reduce overhead expenses. Nevertheless, these reductions inevitably affected the working conditions and efficiency of researchers, who often were forced to combine research work with performance of technical functions and maintenance work on instruments and equipment. In 1993-95, the number of technicians stabilised at the level of 10 per cent of the total R&D employment, and the number of support and other auxiliary personnel – at 41-42 per cent (see table 13). At some institutes there were major decreases in the number of researchers, testifying to the gradual transformation of institutes into purely business entities, with proper scientific activity fading away.

- *The exodus to business.* Reduced employment in R&D is directly connected with general labour market trends. A main factor was the outflow of R&D specialists, above all the highly qualified ones, to the business sphere. This sphere's new opportunities easily enabled highly qualified scientists to find quite well-paid jobs with good advancement outlooks; as a result, many managers of banks, joint ventures, and other large business entities have advanced scientific degrees. However, specialists with lower qualifications, faced with employment difficulties, often return to lower-paid jobs in budget-supported institutions, thus replenishing the supporting and other auxiliary staff.
- *Variations among age groups.* Against the background of an absolute reduction in total R&D employment, the share of researchers with advanced degrees rose in 1989-95 from 7 per cent to 11 per cent. There was an absolute rise of the number of doctors of science (by 24 per cent in 1989-95) and a greater exodus of younger people, mostly with a first degree in science or no advanced degrees. Almost 60 per cent of the researchers leaving academy institutes in 1991-93 were less than 40 years old. Younger personnel, as a rule, are less bound by age limitations and official positions and noted for being highly mobile. The decrease in the share of persons without advanced degrees in the total number of researchers likely reflects this fact.
- *Variations among sectors.* The reductions of R&D personnel have differed among sectors. The higher education sector's smaller share of total R&D employment stems from a reduction in personnel at higher educational R&D facilities and from the part-time participation of teaching staff in R&D. With smaller budgets, higher educational institutions are paying research considerably less than, for example, teaching, thus making R&D less attractive. As a result, the personnel in the higher education sector, measured both in the actual head-counts and in full-time equivalents, continues to decrease (see table 14). This sector's share of total R&D employment now remains under 10 per cent. Staff reductions have affected the government sector relatively less than the other sectors, largely due to the situation at RAS institutes (see table 15). Employment during 1989-95 only decreased by one-quarter; whereas, on the average for Russia it fell by 52 per cent.
- *An analysis of personal motivations in employment.* The relatively satisfactory employment statistics for the RAS reflects the personal motivations observed in the research community under the present situation. According to data from sample surveys made by the Centre for Science Research and Statistics, most researchers intended to remain in science because it is viewed as a commitment for life and they have already achieved certain scientific results. Almost 60 per cent of all researchers plan to continue their scientific careers, e.g. in the Academy - 70 per cent. Only 3 per cent of respondents declared a definite intention to change occupations. Almost 72 per cent of those interviewed have no interest in any other activities; 34 per cent hope for an improvement of the R&D situation and consider the current difficulties as temporary. Only 10 per cent of scholars are unwilling to change their occupation because of the pre-retirement age, and 11 per cent say that it is difficult for them by force of habit.
- *The incidence of outside employment.* A key factor behind such preferences is probably the moonlighting of researchers in the business sphere. Facing frequent arrears in salary payments, part-time work, and forced leaves, often uncompensated, many researchers in academy and industrial institutes are just nominally on the payroll and actually engaged in quite different activities. According to estimates of the Centre for Science Research and Statistics, a high share of scientists employed at the Academy are permanently working with

private firms: over the period from 1992-93, it grew from 35 to 45 per cent and, when counting people partially employed in business entities, it approaches 80 per cent. The degree of engagement in activities allowing Academy researchers to make immediate use of their professional credentials, namely in industrial R&D or teaching at higher education institutions, is about twice as small. The quantitative measurements of employment trends at the RAS appear more favourable than those for the average Russian R&D institution. In particular, if one looks at the sector "Science and Scientific Services" as a whole, the RAS' personnel outflows are almost average: 21.1 per cent of total employment against 28.8 per cent for the national economy in 1994. However, the inflows of new staff have for a number of years been among the lowest; as a result, the balance of outflow and inflow in 1994 made up 13 per cent of employment in the sector (in the national economy – 8.7 per cent). Meanwhile in the Academy the relative outflow indicators are 1.5 times lower, and the balance of outflow and inflow of staff, being twice lower, continues to decrease.

- *Problems in pay levels.* The personnel loss in the R&D sector relates largely to the low level of pay. Almost 71 per cent of scholars who left their jobs gave low pay as the decisive motivating factor.

Already by 1991-92 rapidly developing inflation and a deteriorating consumer market occurred without an efficient mechanism for social protection. Salaries in R&D institutions became almost worthless. Since then, the level of salaries in R&D has remained 75 per cent under the national average (see table 16). The finance sector pays almost twice as much; private businesses, almost 5 to 10 times as much. Moreover, the system of remuneration that has been established in the Academy, as well as in other R&D sectors, does not attract young researchers. Thus, the salaries of researchers younger than 30 years equal only 73 per cent of the average; for 30-34 years, 84 per cent of the average; and for researchers older than 60, it exceeds the average by almost 40 per cent. Therefore, the outflow of persons in the more socially active ages becomes in a sense regular, and the measures undertaken to counter it are obviously insufficient.

Low salaries in domestic R&D have contributed to a decline in the prestige of research work and its attractiveness for higher education graduates and post-graduates. As a result, many strong and competitive professionals leave R&D for business activities or are forced to moonlight in fields outside their scientific specialisation, leaving the R&D establishment without new blood.

- *The growing imbalances in age structure.* The pay situation creates a less than optimal age structure for R&D personnel. The share of researchers younger than 40 in the institutes of the Academy of Sciences decreased from 42 per cent in 1992 to 37 per cent in 1994, and the share of persons older than 60 rose for the same period from 8 to 11 per cent. Approximately 44 per cent of doctors of science in the RAS are of retirement age (in 1992 – 40 per cent). According to data from the RAS Presidium, at the beginning of 1993 the average age of Academicians ranged between 63 (Department of Economics) and 72 years (Department of the Problems of World Economy and International Relations), and the average age for RAS corresponding members ranged from 60 (Department of Mathematics) to 69 years (Department of Literature and Language). Even in such dynamic scientific fields as, for example, nuclear physics, informatics, and biology the average age of Academicians reaches 68-69 years.
- *Employment abroad.* The international migration of Russian scientists, either emigrating or working abroad under contract, has also affected the dynamics of human resources in Russian R&D. According to a CSRS estimate, the number of emigrants is less than

0.5 per cent of the total outflow of personnel from R&D (see table 17). However, despite its relatively moderate scale, emigration sometimes includes highly qualified and talented specialists and can have serious qualitative consequences for many advanced scientific schools and promising research fields.

According to surveys conducted by the Centre for Science Research and Statistics in collaboration with the Personnel Department of the RAS, 508 scientists left the country for permanent residence abroad in 1991-92; and 196 scientists, in 1994. Thus, international migration decreased from 0.8 per cent to 0.2 per cent of the total number of RAS researchers.

Russia's participation in international R&D links has contributed to a large-scale departure of scientists for work under contract. If in 1991-92 1 701 researchers of the RAS were sent on long-term study missions (2.8 per cent of the total), in 1993 there were 2 638 (3.1 per cent). Among the latter group 55 per cent were younger than 40 years, 19 per cent were doctors of science and 51 per cent candidates of science. Interestingly, those researchers not having advanced degrees mostly went for a term of three to six months; whereas, those who were relatively young and had advanced degrees went for longer terms.

Most RAS researchers working abroad came from the following departments: General Physics and Astronomy (19 per cent), Physico-Chemical Biology (18 per cent), Siberian (15 per cent), and General and Technical Chemistry (10 per cent). In certain departments the departure of scientists for contract work reached substantial levels. Thus, in the Department of Mathematics more than 20 per cent of scientists are working abroad, including 27 per cent of doctors of science and 16 per cent of candidates of science; in the Department of Physico-Chemical Biology the respective figures were 9, 15, and 16 per cent; in the Department of Nuclear Physics, 6, 7, and 11 per cent. All this testifies to a high competitiveness of Russian scientists, but at the same time inevitably inspires some anxiety about the prospects of further development of these departments in Russia if the contracts receive continual prolongation.

Changes in patent and licensing activity

Declining indicators for human resources and financing mirrors a further decline in the efficiency of the activities of R&D institutions. Gradual decreases in the indicators characterising it, that were displayed as far back as the late 1970s – early 1980s (Centre for Science Research and Statistics, 1993), later assumed a more acute character. In 1991, 52 200 author certificates for inventions were granted in Russia, but after the transition to the patent system, which replaced them, the main portion of patent activity was connected with the exchange of author certificates and, e.g. in 1995, only 25 800 patents were intended for the protection of new inventions (see table 18).

Decreased patent activity came partly from the high costs of patenting and insufficient patent guarantees against infringement. In addition, there was an inability of industry to pay for inventions, including covering the high cost of acquiring patent protection. A survey of innovation by industrial enterprises showed that when the technology market is underdeveloped, there is a preference for patent-free licenses. Such licenses accounted for about one-third of the R&D contracts concluded by innovating enterprises during 1992-1994. During the same period, know-how transfers and engineering and consulting services accounted for 18 and 23 per cent of the total. It is caused by wide accessibility of patent-free licenses for enterprises and their relative cheapness. The acquisition of patent licenses and rights to patents accounted for only a modest share during the same period, 6 per cent and 10 per cent respectively. Most enterprises appear to orient their innovative activity primarily to insignificant improvements of products and technologies not protected by patents.

The recent increase in license activity relates mostly to a doubling of the annual number of non-exclusive license contracts, while the share of agreements transferring patent rights remained under 20 per cent of the total (see table 19).

Russian R&D institutions participate relatively little in international technology markets. Russia's share in the total number of patents granted by the European and the US Patent Offices is less than 0.1 per cent (European Commission, 1994). The export of technologies in 1994 amounted to \$294.5 million, considerably less than that of the leading industrial countries. Most transfers are related to unprotected intellectual property, generally held to be commercially less valuable. Engineering services accounted for the largest share (91 per cent) of technology exports and the transfer of R&D results about 8 per cent (see table 20). Besides facing tough competition in world markets, a lack of funds to maintain patents and to advertise paralyzes Russian R&D institutions.

Imports of technologies (which is the amount of disembodied technology transfers involving licenses, know-how, S&T services, etc.) in 1994 were estimated at \$46 million, a drop of 12 per cent over 1993. This reduction stemmed largely from a curtailment of license purchase (by 40 per cent). Industrial property protected by patents and considered as commercial secrets still dominates imports. The share of licenses in the total value of technology imports reached 57 per cent in 1994.

A lack of more detailed statistics does not permit a comprehensive estimate of the receipts and payments for technologies traded in the domestic and international markets; nevertheless, available data show a low level of innovative activity, not only in the quantitative but in the qualitative respect as well.

Budgetary financing of R&D

Overall trends -- amounts and sources

Trends in the development of Russian R&D are directly related to changes in the sources of financing. Prior to 1994, financing for the Russian R&D sector was extremely centralised, with state budgetary funds accounting for about 93 per cent of total R&D expenditures (including budget funds transferred by customers on contracts).

By 1994, the sources for R&D financing began to change. In 1992 non-budgetary funds for financing sectoral and intersectoral R&D were established by assessing enterprises 1.5 per cent of their sales. These funds soon became a significant source of financing, accounting for 6 to 7 per cent of total R&D expenditure during 1994-95 (see figure 5).

The state budget funds allocated for R&D in 1995, expressed in constant prices, equalled only about one-fifth of the 1991 level (see figure 6). Budgetary declines outpaced the capabilities of R&D institutions to adapt to market principles. Moreover, non-payment of the budgeted funds became chronic, peaking in 1994 when R&D institutions failed to receive 44.7 per cent of the funds stipulated in the budget (in 1995 – 29.9 per cent).

One should note that R&D expenditures have traditionally been a modest part of total government budget expenditures: in 1970-90 the share in the ex-USSR ranged between 3.4-4.8 per cent. In 1994 it decreased in Russia to 2.8 per cent (see figure 7), a low for the last quarter of the century. Thus, the R&D sector became a victim of government attempts to reduce the budget deficit.

Direct budgetary funding's share of total R&D financing fell in 1995 to 47.2 per cent (or, if including funds for government sector institutions, 60.5 per cent) and that of the business enterprise sector increased to 17.4 per cent. The latter rise stems not from greater enterprise expenditures (the unfavourable macro-economic situation actually kept them down) but from a growing pace of drastic reductions in budgetary spending.

A variety of sources for R&D financing is gradually replacing the centralised system. In particular, for the period 1994-95, the share of foreign sources increased almost 2.5 times, making up about 5 per cent by the beginning of 1996. About 76 per cent of these funds went to R&D institutions in the business enterprise sector.

- *Trends at the Russian Academy of Sciences.* The sources of financing research at the Russian Academy of Sciences differ significantly from those used elsewhere in Russia. The RAS is self-governed and legally independent of the government, but as with analogous research institutions in leading industrial countries (e.g. the Max-Planck-Gesellschaft in Germany), the RAS is almost entirely financed from state budget sources. With reductions in contract work, direct budget allocations accounted for 81 per cent of the total value of RAS R&D efforts. Moreover, when taking into account that most outside customers are ministries and departments or government sector institutions, state budget funds represent almost 87 per cent of total R&D, while the orders financed by enterprises amount to little more than 5 per cent. In 1994-95, the RAS witnessed a relatively small increase in R&D financing from non-budgetary funds and from abroad. These sources accounted for 2.2 per cent and 4.9 per cent respectively.
- *Trends at higher educational institutions.* Higher educational institutions receive about 62 per cent of their total R&D outlays from the budget and from government sector institutions (see figure 8). Contracts from enterprises and other organisations of the business sector are relatively important (almost 20 per cent of funds in 1995), as are those supported by non-budgetary funds (8 per cent). The importance of these sources of R&D financing for higher educational institutions is rising. Nevertheless, a shortage of funds for their primary activities is forcing higher educational institutions to cut R&D financed from general university funds, and the latter's share of total R&D expenditure in the higher educational sector decreased to 5 per cent at the beginning of 1996.

A continuing federal government role

Analysis shows that, in spite of the trends of recent years, budgetary funds will remain the most important source of financing R&D in Russia. Almost all state funding comes from the federal budget, while the regional budgets contribute very little.

Categories of federally-funded civilian research

The budget for civilian R&D is co-ordinated by the State Committee on Science and Technology of the Russian Federation and distributed according to the following categories:

- *Funds for the so-called basic financing of R&D institutions.* These funds are distributed by ministries and departments to subordinate R&D institutions relating to their staff size, their needs for maintaining buildings and equipment and their requirements for other necessary expenditures. Recently a large part of these funds is being distributed for specific goal-oriented federal R&D programmes. However, many were routine distributions,

reflecting the primary activities of corresponding ministries and departments. Among the most important of them are the Programme for Civil Aviation Development and the Federal Space Programme, which account for almost one-fifth of budget appropriations for civilian R&D.

The 1995 state budget funding for the basic financing of R&D institutions equalled 4.2 trillion rubles (about 80 per cent of the total). The effort to compensate for inflationary increases in the cost of living required cuts in material and other related expenditures. Thus, funds budgeted for salaries grew relatively more than other expenditures, totalling (together with social fees) on average about 43 per cent in 1994. Continuing price increases for equipment and materials, heat and electric power, communal services, leasing and protection of premises, (rising 3-5 times just in the early months of 1995), forced institutes to cancel purchases of instruments, needed reagents, and S&T information. An especially difficult situation has emerged in the capital-intensive research fields and in many of the advanced research units with expensive equipment and up-to-date premises. Some institutes are carrying debts to power-supplying and communal services that equal their annual budgets.

- *Grants of goal-oriented budget funds, distributed on tender basis* (the Russian Foundation for Basic Research, Russian Humanities Foundation, Foundation for Promotion of Small Enterprises in S&T).
- *Financing of R&D according to priority objectives.* Such funds are goal-oriented and distributed (usually on a tender basis) by the State Committee on Science and Technology directly (i.e. bypassing ministries and departments) to R&D institutions for specific research projects.

The structure of the civilian R&D budget

- *By socio-economic objective.* Table 21 presents the structure of the civilian R&D budget in Russia by the socio-economic objective of research and development. Industrial development, unlike in the leading industrial nations, remains one of the most capital-intensive orientations of the budgetary financing for civilian R&D. Approximately 43 per cent of these outlays go to R&D in aviation, missile and space equipment, and other means of transportation. Other outlays are for improving the economic efficiency and technological level of industry (22 per cent), electronics and communications equipment (17 per cent), and software development (9 per cent).

Basic research for the general advancement of knowledge and primarily represented by natural sciences represents the second highest amount of civilian budget funds (18 per cent of the total value). Among other major objectives of civilian R&D are: civilian space (10 per cent), health protection (9 per cent), social development (8 per cent), and agriculture (about 7 per cent).

- *By branch institute.* R&D institutions of the defence complex received the largest share (almost two-fifths) of funds from the 1995 civilian R&D budget, while academy and higher education institutions received about one-third, (25 per cent for the RAS and 8 per cent for higher education)(see figure 9). Resources for basic financing are distributed by the RAS Presidium and account for most of their funding. The distribution is performed quite routinely by 18 directions. Their composition reflects the existing structure of branch departments of the RAS. The most prominent of them are research in general physics and

astronomy (21.4 per cent of the value of RAS basic financing in 1994) general and technical chemistry (12.2 per cent), advanced information technologies (8.9 per cent), and physico-chemical foundations of biology and biotechnology (8.2 per cent). Nuclear physics, Earth research, and projects of the general biological and ecological profiles account for approximately 6.5-7 per cent of the Academy's basic financing, while the shares of other objectives are comparably small, ranging from 0.6 per cent (modern problems of mathematics) to 3.9 per cent (large-scale processes in the environment).

The Russian Foundation for Basic Research

Resources from the Russian Foundation for Basic Research, established in 1991, are used as subsidies (grants) and distributed on a competitive grant basis to fund: scientific projects conceived on the initiative of small groups (up to 10 persons) or individual researchers, the development of research facilities and information systems for performing basic research, publishing, the arrangement of scientific conferences in Russia or the participation of scientists in international events abroad, projects creating centres for the joint use of unique instruments and equipment, and the organisation of expeditions. The Foundation's resources are relatively modest: initially, in 1992, they made up about 3 per cent of budget appropriations for civilian R&D. In 1993, the Foundation's share fell to 2.1 per cent. An instruction of the Russian Federation Government fixed its funding at 4 per cent of the civil R&D budget as of 1994. Nevertheless, in 1994 the Foundation failed to receive 99.6 billion rubles of its government funds, or almost half of the planned sum. (A shortfall in line with the general level of budgetary shortfalls elsewhere in the economy.)

Although the Foundation's financial power is relatively modest, its activities attract considerable interest from research teams. For the first time many scientists have access to funds for independent projects, including those done independently of their institutes. This independence is especially important for some narrowly-specialised fields of theoretical research, both in natural sciences and humanities, which find no support in the framework of government priorities. In 1994, the Foundation received 1.5 thousand applications, and the average amount of an individual grant was estimated at 20 million rubles. Scientists affiliated with educational institutions and industrial research institutes have recently increased their shares of such grants. The shares of RAS among the applications submitted and grants approved was equal to two-thirds in 1993 – respectively, about 70 per cent and 65 per cent, but in 1994 they decreased to 55 per cent and 59 per cent.

A new important initiative was the introduction of a programme of emergency support for leading scientists in 1995. It was enlarged to include regular tenders for support to leading scientists and scientific schools in 1996. The Russian Foundation for Basic Research was to be allocated an additional 100 billion rubles in 1996 for these purposes. At the end of 1994, a Russian Humanities Foundation was established to operate on the same principles.

The Foundation for promoting small enterprises

A Foundation for Promoting Small Enterprises in S&T was created in 1994. It aims to support specific developments, innovation projects, as well as innovation infrastructure facilities. Initially the value of the Foundation's resources was fixed at an amount of 0.5 per cent of federal budget allocations for civil R&D; since 1996 this share has been increased to 1 per cent. The selection of projects for financing is made on a tender basis and the resources are granted, as a rule, on a repayable basis.

The government programme of R&D priorities

The financing of R&D by priority objectives is performed in the framework of governmental S&T programmes, programmes for the development of state research centres, etc. (see table 22). In 1995, 810.1 billion rubles were allocated for such projects, or about 15.5 per cent of the civilian R&D budget. According to the 1996 budget, this share should increase to 19 per cent.

- *State Research Centres.* A large portion of these resources (321.1 billion rubles in 1995 or about 40 per cent of total funds for priority objectives) went to state research centres and constitute, according to data of the State Committee on Science and Technology, about 40-70 per cent of their total financing. More than half of these funds for the SRCs go to basic research (55 per cent in 1994), and about one-third to applied projects that aim to find ways of using the theoretical results. The rest of the funds (about 11 per cent) is used for specific projects of a very practical nature. However, as experience shows, the main problem facing the accomplishment of SRC programmes is their under-funding. During 1993-95 the centres failed to receive 34-36 per cent of the planned yearly allocations.

Government S&T programmes are intended to cover large-scale, future-oriented S&T problems having a high importance for the development of science, economy, and the social sphere. For their financing in 1995, 162.4 billion rubles were allocated, or nearly 20 per cent of allocations on priority objectives.

- *Priority fields.* There are presently 41 government S&T programmes connected with the development of priority fields. Among them are programmes to create highly effective production processes for the agro-industrial complex, environmentally safe and resource-saving technologies in power engineering, chemistry, and metallurgy; new materials; technologies and equipment for construction, transportation, etc. A number of large-scale programmes are aimed at the development of research in high-energy physics, nuclear physics, regulated thermonuclear fusion, high-temperature superconductivity; exploration of space, the World Ocean; research in genetics; the creation of technologies, machines and industries for the future, advanced information technologies, advanced methods of bio-engineering. Government S&T programmes also envisage creating new pharmaceuticals, the development of medicine and health services, and solving social problems.

It should be emphasised that the most heavily funded of these programmes, while largely coinciding with the main priorities defined already under the budgetary financing for R&D in the ex-USSR, differ from the latter in that their share of funding is considerably smaller (nearly 10 times). With such a dispersal of resources among different programmes, it is impossible to ensure real (adjusted for inflation) funding increases for their accomplishment. Thus, in a nominal calculation, funding for projects on high-temperature superconductivity during 1992-95 increased only 10.1 times; that on creation of future technologies, machinery and industries, 13 times; advanced information technologies, 14.5 times, etc. In the forthcoming period it is planned to review the list of governmental S&T programmes, and those selected for further financing from the federal budget will be granted a higher federal status.

In spite of the imperfections inherent in setting priorities, forming programmes, launching tenders and examining results, the support of priority objectives for S&T development contributes to a gradual concentration of limited budgetary resources on key goals needed for the nation's S&T and socio-economic development. The distribution of budget appropriations by

priority objectives and through a system of grants provided by goal-oriented funds brings about elements of competition in the activities of research teams, contributes to the formation of a new structure of scientific potential and radically different mechanisms of for conducting R&D that conform to the realities of market economy.

Technical Notes And Statistical Data

This section contains definitions of the main terms, classifications and indicators used in domestic R&D statistics to meet the requirements of international statistical standards.

Research and development (R&D) comprise work aimed at acquisition of new scientific knowledge and the determination of ways for its practical use. They include basic research, applied research and development in all fields of science: natural, technical, medical, agricultural, social sciences, and humanities.

The statistical data embrace **R&D institutions**, i.e., organisations (institutions, enterprises) performing R&D as their primary activity or containing units performing R&D as their primary activity, irrespective of their affiliation with a particular sector of economy, the organisational and legal form, and the form of property. In the practice of statistical surveying of R&D performance, a reporting unit in all cases is an organisation (institution, enterprise) having its independent budget and the rights of a legal entity. If R&D performance is the main activity of a reporting organisation, it is simultaneously a reporting unit and a unit under survey. Otherwise, reporting units are the incorporated specialised units whose main function consists in performing R&D. In accordance with the recommendations of the Frascati Manual, domestic statistics stipulate a classification of R&D institutions by sector of performance and type of institution, grouped according to organisational characteristics, nature and the specialisation of projects performed, etc.

Sectors of R&D performance are the sectors of the economy incorporating a considerable number of organisations performing R&D and characterised by the homogeneity of their principal functions and services rendered, the sources of financing, and the legal status. Such an approach to structuring R&D institutions is recommended by the Frascati Manual with the objective of identifying the sectors of economy where R&D are performed, and is based on grouping public needs satisfied by it. Special attention is paid to the compatibility with the classification adopted in the National Accounts System, which allows comparing R&D indicators with other statistical data.

Domestic studies of science for decades used an unchangeable classification based on the departmental subordination of R&D institutions, including the academy, higher education, industrial R&D, and enterprise sectors. The transition to the National Accounts System, the adaptation of international standards in R&D and innovation statistics, the need to take into account trends in Russian R&D under the present conditions and in the future have required a review of the sectoral classification for implementation in statistical surveying of R&D performance. The list of R&D sectors and the types of R&D institutions belonging to them are reflected in tables 1 and 2 below.

Statistical analysis of R&D financing is based on estimation of **intramural expenditure** on these purposes performed within R&D institutions during the year under survey, irrespective of the source of financing. They comprise both current and capital expenditures. Depreciation of fixed assets, according to international standards, is excluded from current expenditure since their sum with capital investment would entail a double counting of expenditures. Intramural R&D expenditure is distributed by

field of science and technology, source of funding, and socio-economic objective. Current intramural R&D expenditure is also grouped by type of activity (basic research, applied research, development).

R&D personnel is accounted as the total employment of independent institutions and respective units of higher education institutions, industrial enterprises, etc., performing R&D. By occupation, the R&D personnel is subdivided into four categories: researchers, technicians, supporting, and other auxiliary staff.

Researchers are professionals engaged in R&D and immediately performing creation of new knowledge, products, processes, methods, and systems, as well as in the management of these activities. Researchers usually are higher education graduates. This category also includes the administrative personnel immediately supervising the research process (heads of R&D institutions and units performing R&D).

Technicians take part in R&D, performing technical functions, as a rule, under the supervision of researchers (exploitation and maintenance of scientific instruments, laboratory equipment, computers; preparation of materials, drafts; conducting experiments, tests and analyses, etc.). In most cases, technicians have got special secondary (vocational) education and (or) necessary professional experience and knowledge.

Supporting staff includes staff members performing supporting functions connected with R&D: employees of planning and financial units, patent services, units for S&T information, S&T libraries; workers engaged in assembling, adjustment, maintenance and repairs of scientific equipment and instruments; workers of pilot (experimental) production units; laboratory assistants without higher or special secondary education.

Other personnel includes staff members engaged in services as well as performing general functions connected with the activities of a R&D institution as a whole (employees of accounting departments, personnel departments, units for material and technical provision, secretarial and clerical staff, etc.).

In order to determine the scale of employment in R&D in compliance with the international standards, parallel to the actual number of persons performing R&D, statistics also take account of the number of those employed in R&D who have other jobs or contracts. On this basis, the total employment in R&D is calculated in the full-time equivalent with the account of actual time spent on these purposes.

Table 1. Sectors of R&D performance

Sectors	Coverage
Government sector	<ul style="list-style-type: none"> - Institutions subordinated to ministries and departments and serving the government and ensuring satisfaction of social needs in general (government administration, defence, public order, health care, culture, recreation, social security, etc.), including federal and local bodies. - Non-profit institutions completely or primarily financed and controlled by the government, except those included in the higher education sector. These institutions in the first place serve the government and are not aimed at obtaining profit; mostly they are involved in research connected with social and administrative functions.
Business enterprise sector	<ul style="list-style-type: none"> - All organisations and enterprises whose primary activity is related to output of products or services for sale (different from services by the higher education sector), including those owned by the government. - Private non-profit organisations mainly serving the above-mentioned organisations.
Higher education sector	<ul style="list-style-type: none"> - Universities and other higher education institutions irrespective of financing sources or legal status. - Research institutes, experimental stations, and clinics directly controlled or governed by higher education institutions, or associated with them. - Organisations directly serving higher education (in the system of the higher education).
Private non-profit sector	<ul style="list-style-type: none"> - Private organisations not aimed at obtaining profit (professional societies, unions, associations; voluntary and charity organisations, foundations); except the foundations financed more than half by the government, which belong to the government sector. - Private individual organisations.

Table 2. **Classification of R&D institutions by sector of performance and type of institution**

Sector of R&D performance	Type of institution
Government sector	Institutions of federal (central) ministries and departments (including the Russian Academy of Sciences and the branch academies) Institutions of administrative bodies of national republics, territories, regions, Moscow, and St. Petersburg Institutions of local (municipal) administrative bodies
Business enterprise sector	Industrial (branch) research institutes, Design, design project, and technological organisations, Project and prospecting organisations, Industrial enterprises, Experimental bases, Other
Higher education sector	Universities and other higher education institutions; Research institutes (centres) subordinated to higher education institutions and (or) a governmental agency in charge of higher education; Design and design projecting organisations subordinated to higher education institutions and (or) a governmental agency in charge of higher education. Clinics, hospitals, and other medical establishments attached to higher education institutions; Pilot (experimental) enterprises subordinated to higher education institutions; Other
Private non-profit sector	Voluntary scientific and professional societies and associations; Voluntary organisations; Charity foundations; Other

Table 3. **R&D institutions by type**

	1990	1991	1992	1993	1994	1995
Total	4646	4564	4555	4269	3968	4059
Research institutes	1762	1831	2077	2150	2166	2284
Design organisations	937	930	865	709	545	548
Construction projecting and exploration organisations	593	559	495	395	297	207
Experimental enterprises	28	15	29	17	19	
Higher education institutions	453	450	446	456	424	408
Industrial enterprises	449	400	340	299	276	325
Others	424	379	303	243	241	287

Source: Centre for Science Research and Statistics.

Table 4. **R&D institutions by sector of performance**

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
1994	3968	1150	2300	511	7
1995	4059	1193	2345	511	10

Source: Centre for Science Research and Statistics.

Table 5. Academy R&D institutions

	1990	1991	1992	1993	1994	1995
Total	535	586	729	746	764	787
Russian Academy of Sciences	297	321	369	396	409	429
Russian Academy of Agricultural Sciences	188	170	296	291	295	292
Russian Academy of Medical Sciences	50	52	64	59	60	66

Source: Centre for Science Research and Statistics.

Table 6. R&D institutions by type of property

	1993	1994	1995
Total	4269	3968	4059
Russian property	4267	3968	4034
Public property	3597	2999	2979
of which:			
federal	3385	2801	2783
provincial	212	198	196
Municipal property	21	10	9
Property of voluntary associations	8	13	16
Private property	116	150	198
Joint property (without foreign participation)	525	796	832
Foreign and joint property (with both Russian and foreign participation)	2	–	26

Source: Centre for Science Research and Statistics.

Table 7. State research centres of the Russian Federation

	1993	1994	1995 ¹
State research centres (SRC)	42	61	62
Budget funds for SRC programmes, million rubles:	57919.6	202302.1	339000
basic research and upstream studies	–	118034.5	209163
applied research and development	–	84267.6	129837
R&D personnel	92361	96904	108533

¹ Plan.

Source: Centre for Science Research and Statistics.

Table 8. State research centres by field of science and technology

Field of science and technology	Number of SRCs
Nuclear physics and atomic power engineering	10
Chemistry and new materials	10
Ship-building, navigation, and hydrophysics	6
Informatics and instrument-making	5
Optical electronics, laser systems, robot technology, special chemistry	5
Aviation	4
Biotechnology	4
Machine-building	4
Medical and biological problems	3
Oceanology, meteorology, water-provision and hydrotechnology	3
Mining and metallurgy	3
Agro industrial complex	2
Construction	1
Astronomy	1
Total	61

Source: Centre for Science Research and Statistics.

Table 9. Gross domestic expenditures on R&D (GERD)

	1990	1991	1992	1993	1994	1995
Gross domestic expenditures on R&D, million rubles:						
at current prices	13007.8	19991.3	140590.7	1317199.5	5146102.0	12149458.6
at constant 1989 prices	10839.8	7290.2	3224.5	3055.0	2929.9	2445.7
As a per cent of gross domestic product	2.03	1.43	0.74	0.77	0.82	0.73

Source: Centre for Science Research and Statistics.

Table 10. **Gross domestic expenditures on R&D by socio-economic objective and field of S&T: 1994 (million rubles)**

	Total	Natural sciences	Engineering	Medical sciences	Agricultural sciences	Social sciences	Humanities
Gross domestic expenditures on R&D	5146102.0	941720.1	3705407.5	153199.8	184398.1	109673.3	51703.2
Socio-economic objective:							
Economic development	2524713.8	257752.8	2037911.4	6129.2	174863.5	46395.2	1661.7
Social development	285404.2	70133.2	57587.9	125863.4	2897.9	21176.1	7745.7
General advancement of research	641264.8	408794.7	124645.5	20490.3	4799.2	40328.5	42206.6
Exploration and exploitation of the Earth and atmosphere	157558.8	138013.8	17327.1	–	1837.5	291.3	89.1
Civil space	214726.3	17252.5	197186.3	91.2	–	196.3	–
Defence	1322434.1	49773.1	1270749.3	625.7	–	1285.9	0.1

Source: Centre for Science Research and Statistics.

Table 11. **Intramural current expenditures on R&D by type of activity and sector, 1994 (million rubles)**

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Intramural current expenditures on R&D	4996915.6	1371944.5	3323635.8	300913.1	422.2
Basic research	842030.3	560065.4	149218.6	132712.2	34.1
Applied research	1021911.1	314528.2	599407.7	107588.9	386.3
Development	3132974.2	497350.9	2575009.5	60612.0	1.8

Table 12. **Intramural current expenditures on R&D at the Academy institutions by type of activity**
(million rubles)

	Total	Basic research	Applied research	Development
Russian Academy of Sciences				
1990	1438.2	884.5	384.2	169.4
1991	1914.6	1148.6	596.6	169.4
1992	14201.7	9001.3	4221.1	979.3
1993	118004.5	69251.4	42045.9	6707.1
1994	544881.1	409547.3	87931.9	47401.9
Russian Academy of Agricultural Sciences				
1990	240.6	43.6	155.1	41.9
1991	402.9	53.1	302.1	47.7
1992	3616.3	856.8	2210.9	548.6
1993	28093.3	6800.1	17380.3	3912.9
1994	123363.4	34894.8	63986.1	24482.5
Russian Academy of Medical Sciences				
1990	111.2	47.2	63.0	0.9
1991	177.7	77.3	98.8	1.6
1992	1638.9	529.7	1098.5	10.7
1993	13593.5	5877.7	6658.0	1057.8
1994	58005.7	39144.5	15585.2	3276.0

Source: Centre for Science Research and Statistics.

Table 13. **Percentage distribution of R&D personnel by occupation**

	Total	Researchers	Of whom		Technicians	Supporting and other auxiliary staff
			Doctors of science	Candidates of science		
1989	100	50.5	0.7	6.3	12.2	37.3
1990	100	51.1	0.8	6.5	12.1	36.8
1991	100	52.3	1.0	7.0	12.0	35.7
1992	100	52.5	1.1	7.3	11.8	35.7
1993	100	49.0	1.4	8.0	10.2	40.8
1994	100	47.5	1.6	8.8	10.4	42.1
1995	100	48.9	1.8	9.2	9.6	41.6

Source: Centre for Science Research and Statistics.

Table 14. **R&D personnel in full-time equivalent by sector of performance (thousands)**

	1994	1995
Total	1264.1	1210.6
Government sector	315.4	306.2
Business enterprise sector	815.3	787.6
Higher education sector	133.2	116.4
Private non-profit sector	0.3	0.3

Source: Centre for Science Research and Statistics.

Table 15. **R&D Personnel at the academy institutions**

	1989	1990	1991	1992	1993	1994	1995
Total	152.5	137.7	134.7	128.5	121.4	112.4	114.9
Researchers	83.8	78.5	80.0	77.6	74.2	57.1	67.4
Of whom with scientific degrees:							
Doctors of science	5.8	6.4	6.9	7.5	7.9	7.9	8.6
Candidates of science	25.8	27.1	27.8	27.9	27.4	26.3	27.1
Technicians	9.7	8.9	8.5	7.6	6.7	11.4	9.8
Supporting staff	34.8	37.8	33.1	30.2	26.1	21.9	21.7
Others	24.2	12.5	13.1	13.1	14.4	14.9	16.0

Source: Centre for Science Research and Statistics.

Table 16. **Average monthly salaries in the sector "Science and scientific services"**

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Average monthly salary, rubles	209.9	215.9	224.9	256.6	314.3	351.9	515.0	3859.0	39645	171720	364881
As a per cent of salary: in the national economy	104.2	103.8	104.1	109.1	121.5	118.6	94.0	64.4	67.6	77.9	75.4
in industry	96.3	96.6	97.7	102.5	114.2	113.2	85.0	54.6	63.2	76.0	65.4
in construction	84.8	84.2	83.0	83.7	92.9	93.6	74.1	47.9	50.8	60.6	55.3

Source: Centre for Science Research and Statistics.

Table 17. **Number of employees of the sector "Science and Scientific Services" who emigrated from Russia (thousands)**

1989	1989	1990	1991	1992	1993	1994	1995
0.14	0.95	2.1	1.8	2.1	2.3	2.1	2.2

Source: Centre for Science Research and Statistics.

Table 18. **Patent applications and patents granted**

	1992	1993	1994	1995
Patent applications	45694	32469	25833	20757
Of which from:				
resident applicants	33866	28496	21179	16629
non-resident applicants	11828	3973	4654	4128
Patent applications according to the Patent Co-operation Treaty	7895	11224	15572	9728
Of which from:				
resident applicants	48	52	26	18
non-resident applicants ¹	7847	11172	15526	9710
Protective documents granted ²	82458	27757	40263	71015
Patents granted in exchange for author certificates	-	14543	19682	45382
Patents granted	10787	13214	20581	25633
Of which to:				
resident applicants	7646	8938	16054	20861
non-resident applicants	3141	4276	4527	4772
Patents valid	22779	44321	60321	75640
Patents Granted according to the Patent Co-operation Treaty	199	345	1022	334

1. Including the ex-USSR countries.

2. Data for 1992 cover both author certificates and patents, data since 1993 – only patents because of discontinued author certificates issuing.

Source: Russian Patent Office.

Table 19. **Licensing contracts and patent transfer agreements**

	1992	1993	1994
Total	629	756	1135
Patent transfer agreements	98	97	214
Exclusive licenses	98	80	101
Non-exclusive licenses	433	579	820

Source: Russian Patent Office.

Table 20. **Technology exports and imports (%)**

	Exports		Imports	
	1993	1994	1993	1994
Total	100.0	100.0	100.0	100.0
Of which:				
R&D	5.0	7.7	2.0	5.7
Engineering services	94.5	91.0	46.0	18.0
Licenses	0.02	0.3	26.0	57.0
Know-how	0.4	0.9	26.0	19.3

Source: Innovations in Industry Sectors/ CSRS. Moscow, 1996, p. 23.

Table 21. Percentage distribution of the federal budget appropriations on civil R&D by major socio-economic objective and field of S&T¹

	Total	Natural sciences	Engineering	Medical sciences	Agricultural sciences	Social sciences	Humanities
Intramural current expenditures on R&D	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Development of agriculture	6.60	0.60	2.30	—	97.60	0.10	—
Production and rational use of energy	0.70	0.20	1.10	—	—	0.10	—
Industry	40.60	3.70	62.00	0.10	0.20	8.10	—
Construction	0.40	0.01	0.70	—	0.40	0.02	0.50
Transport	1.50	—	2.10	—	—	4.60	—
Communications	0.20	0.05	0.20	—	—	—	—
Infrastructure, urban and rural planning	0.10	0.01	0.10	—	1.10	0.30	—
Services	0.10	—	0.10	—	—	1.20	—
Environment protection	1.70	1.60	1.60	1.00	0.30	6.60	0.10
Health	9.00	0.60	2.80	90.50	—	2.00	—
Social development	8.30	0.30	8.60	0.10	—	53.80	63.80
General advancement of research	18.20	81.80	2.10	6.70	0.40	23.30	35.60
Exploration of the Earth and atmosphere	2.20	11.10	0.20	—	—	—	—
Civil space	10.30	0.03	16.00	1.50	0.01	—	—
Defence	0.10	0.04	0.20	0.10	—	0.05	—

¹ CSRS est., as of 1 January 1994.

Source: Centre for Science Research and Statistics.

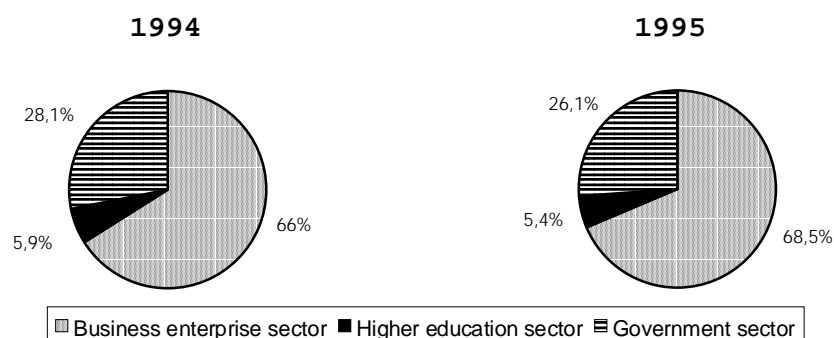
Table 22. **Federal budget appropriations on civil R&D**
(million rubles)

	1992	1993	1994	1995
Total	103158.3	848865.6	2791482.1	5228616.6
Ministries and departments ¹	73393.3	726611.4	2418129.6	4418106.1
Priority objectives of the Ministry of Science and Technological Policy	29765.2	122254.2	373352.5	810060.5
Including:				
Programmes of State Research Centres Development	–	57919.6	202302.1	321051.0
Government S&T programmes	7544.5	23279.1	64154.6	162363.0
Funds for regional centres and programmes	–	4172.8	6706.1	13869.7
International programmes and projects	1086.2	6569.3	20496.4	40124.0
Major programmes and projects for the national economy	8581.5	17916.8	28435.9	44944.2
Programme of S&T Innovative Infrastructure Development (technoparks, technopoli, business incubators)	–	1744.8	1620.0	4456.6
Maintenance of unique research facilities	–	–	17934.0	41613.0

¹ Including goal-oriented budget funds.

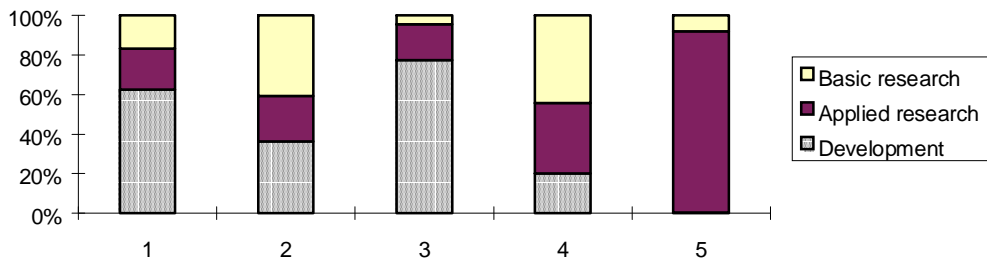
Source: State Committee on Science and Technology of the Russian Federation.

Figure 1. **Percentage distribution of gross domestic expenditures on R&D by sector of performance**



Source: Centre for Science Research and Statistics.

Figure 2. Intramural current expenditures on R&D by type of activity and sector, 1994 (%)



Per cent

1 - Total

2 - Government sector

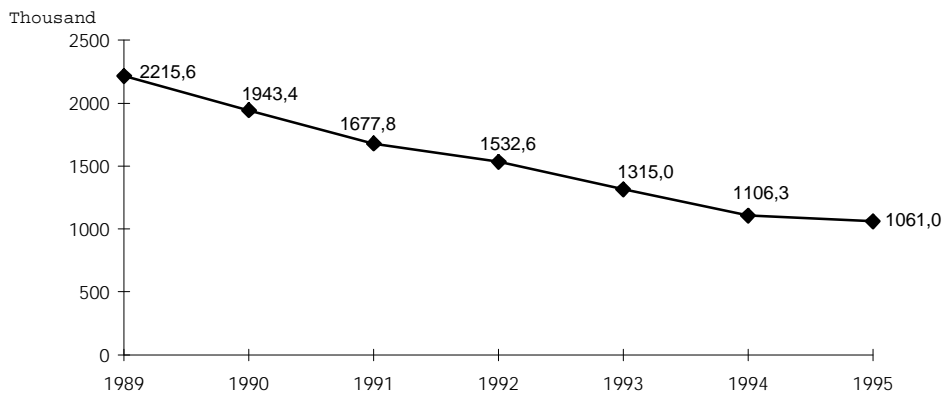
3 - Business enterprise sector

4 - Higher education sector

5 - Private non-profit sector

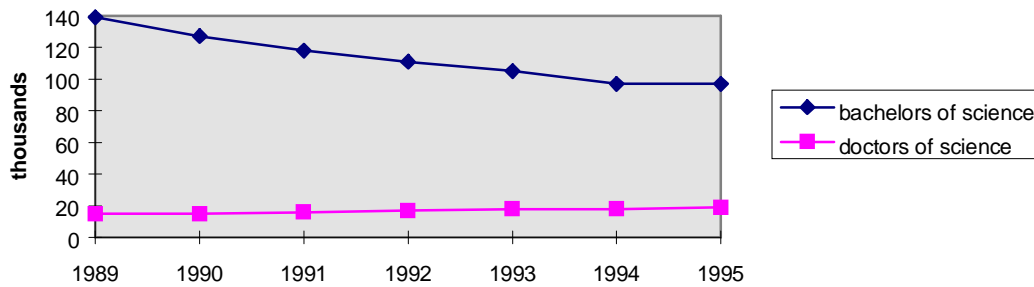
Source: Centre for Science Research and Statistics.

Figure 3. R&D personnel



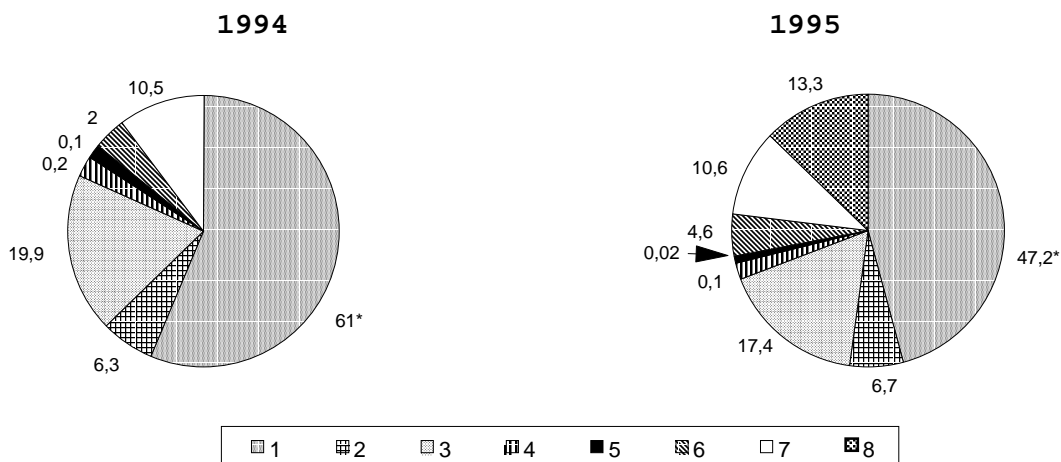
Source: Centre for Science Research and Statistics.

Figure 4. Researchers with scientific degrees



Source: Centre for Science Research and Statistics.

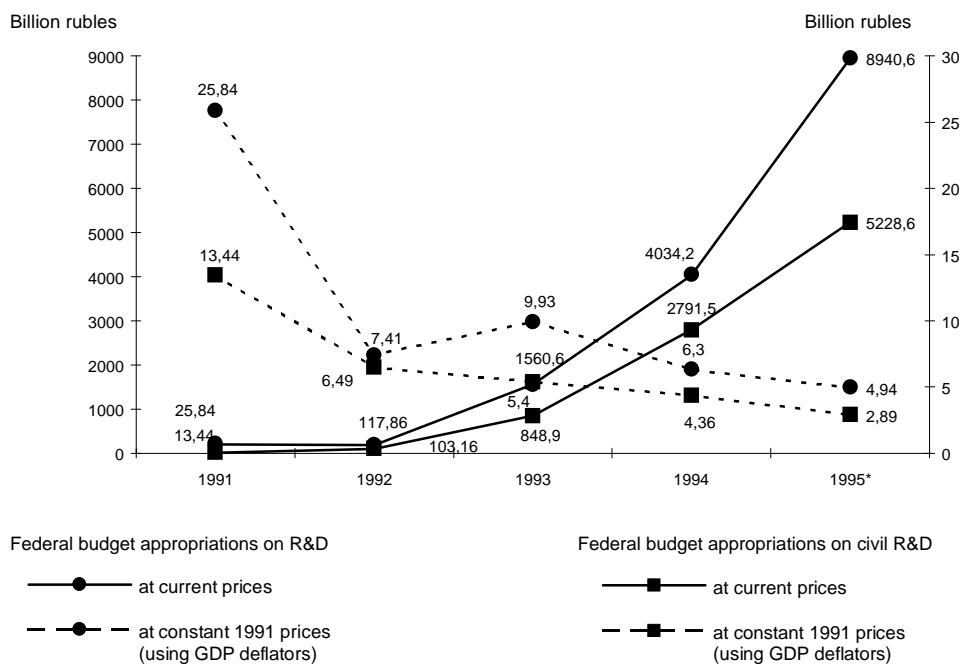
Figure 5. Percentage distribution of gross domestic expenditures on R&D by source of funds



- 1 - Government budget
- 2 - Non-budget funds
- 3 - Business enterprise sector
- 4 - Higher education sector
- 5 - Private non-profit sector
- 6 - Funds from abroad
- 7 - Own funds of R&D institutions
- 8 - Funds of government sector institutions

*Including general university funds (1994 ã. - 0.6%; 1995 ã. - 0.3%).

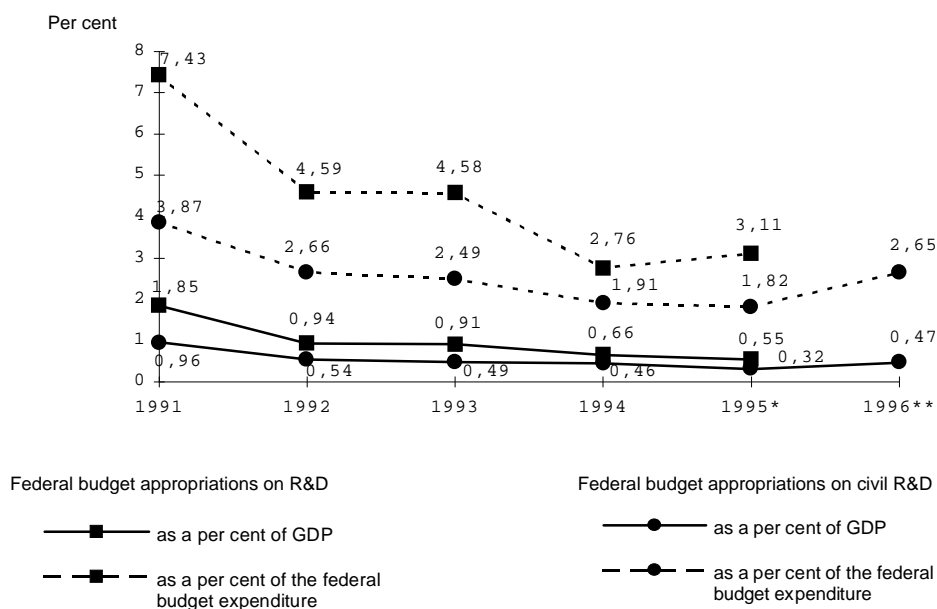
Figure 6. Federal budget appropriations on R&D



¹ CSRS est.

Source: Centre for Science Research and Statistics.

Figure 7. Federal budget appropriations on R&D as a per cent of GDP and of the federal budget expenditure



*CSRS est. **Plan.

Source: Centre for Science Research and Statistics.

Figure 8. **Percentage distribution of gross domestic expenditures on R&D in the Russian Academy of Science by source of funds**

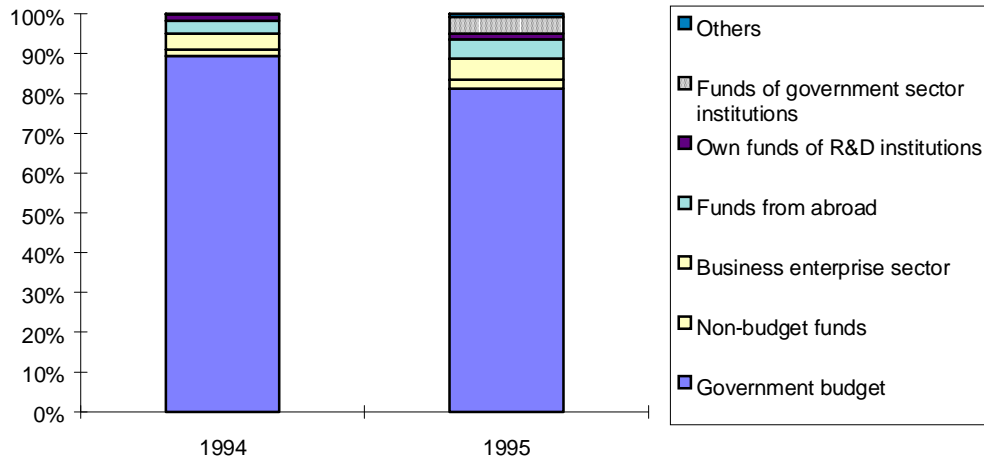
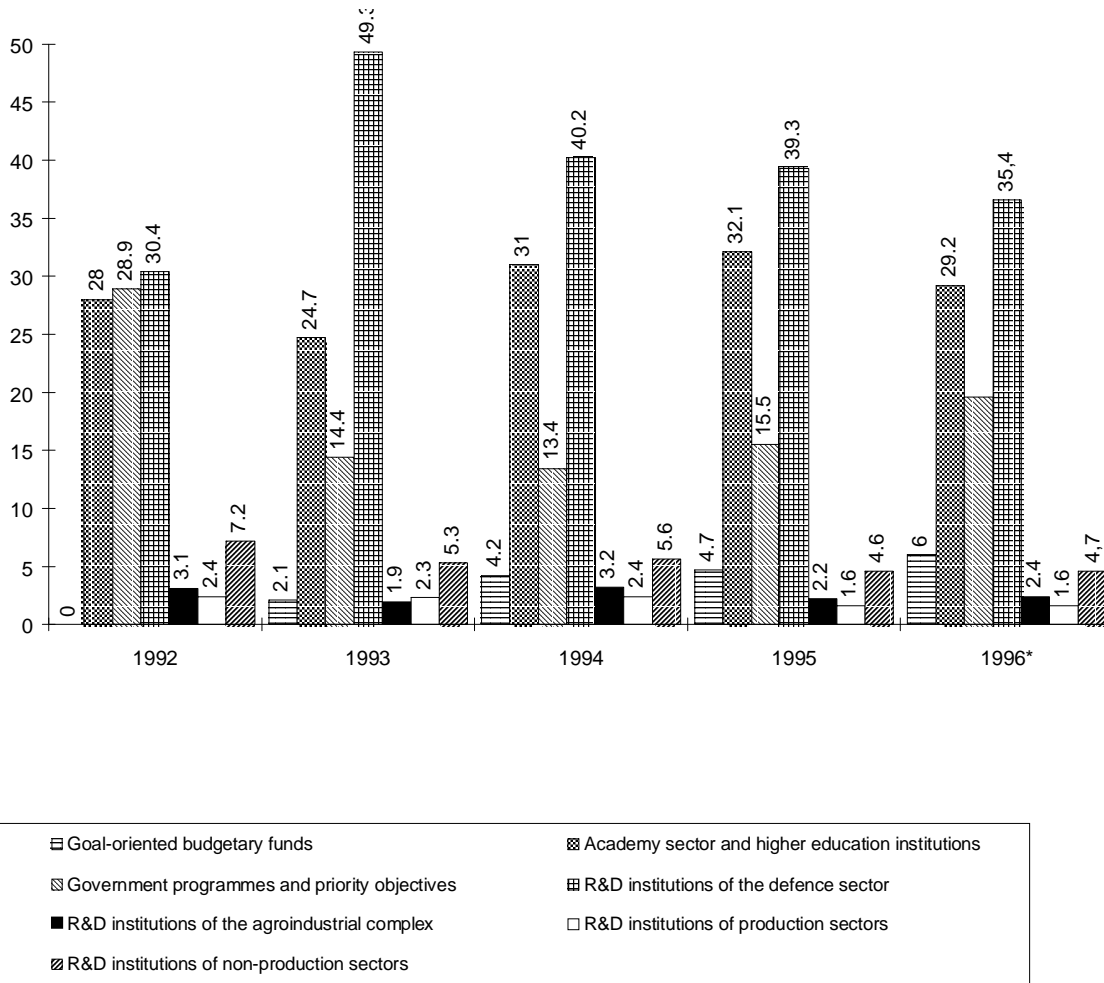


Figure 9. Percentage distribution of the federal budget appropriations on civil R&D: 1992 – 1996



*Plan.

Source: Centre for Science Research and Statistics.

RUSSIAN EDUCATIONAL INSTITUTIONS AND THE TRANSFER OF TECHNOLOGY: THE CASE OF ST. PETERSBURG UNIVERSITY

by Igor F. Leonov

Director, Patent and License Department, St. Petersburg State University

St. Petersburg State University (SPSU) has a long tradition in Russian education. Peter I issued a decree establishing St. Petersburg University as part of the Academy of Sciences. The university later flourished under Mikhail Lomonosov's tenure as rector, 1758-1765.

The university is a state educational institution. The main legal documents governing SPSU are: the Russian Federation Law "On Education" (13.01.96 FZ No. 12), "On higher and post-graduate professional education"(22.08.96 FZ 125) , the "Model regulation on educational organisations of higher professional learning (higher educational institutions -VUZ)" 26.06.93 No. 597, and the Charter of SPSU of 29.08.95. Recent Presidential decrees (from 18.12.91 and 30.11.92) have declared SPSU a national treasure with special forms of state support and given it the status of an independent (autonomous) Russian Federation higher educational institute.

The university independently establishes the contents of its educational programme and plans, establishes the fields of specialisation for the preparation and retraining of specialists, determines the direction of scientific research, and conducts numerous other activities common to most higher educational establishments. The State Committee for Higher Education (Goskomvuz) oversees the educational and scientific activity of SPSU and determines the volume of financing.

SPSU structure

SPSU is comprised of schools (faculties), scientific research institutes, university-wide departments and other teaching, teaching-scientific, scientific-production and auxiliary sub-departments including a scientific library and a university press. All SPSU organisational entities are established by the decision of the SPSU Scientific Council and conduct their affairs in accordance with regulations which are approved by the rector.

University schools (faculties)

SPSU's schools conduct the teaching and scientific research work and are formed out of departments and laboratories as well as other teaching, teaching-scientific, scientific-production and auxiliary subdivisions. SPSU has 19 schools (9 in the natural sciences and 10 in the humanities and social sciences). There are 223 departments which prepare specialists in 66 specialisations and 23 basic fields. Presently 16 791 students, 1 200 graduate students and 104 doctoral students are enrolled. Teaching work is the priority activity of the schools. The minimal annual teaching load for instructional professors ranges from 400 hours for heads of departments and doctors to 700 hours for assistants without an advanced degree.

Scientific research institutes

The scientific research institutes (NII) are organisations that conduct research and, together with SPSU's schools, are involved in some teaching of students and graduate students. They have their own internal organisation and carry out fundamental and applied research.

SPSU has 11 scientific research institutes: astronomy, biology, complex social research, mathematics and mechanics, physiology, chemistry, computational mathematics and systems analysis, earth core research, physics and radiophysics.

Other organisations subordinate to SPSU

SPSU has the following other types of subordinate organisations:

- Special schools. There are about 20 special schools which are teaching subdivisions that charge tuition for post-graduate (supplemental) professional training in the area of management, law, economics, psychology, finance and other subject areas. They have an enrolment of about 2 615 students.
- Other teaching subdivisions. The preparatory department, the Saint Petersburg International Institute of Management, the Republic (teaching scientific humanities) institute, French and Canadian colleges, foreign language courses, an academic high school, etc.
- Scientific and scientific-production organisations and centres. They are established by the university as financially independent legal persons, but they are subordinated to the rules of the university charter and to decisions made by the scientific secretary and the subdivisions. As a rule the agreements which establish these organisations do not contain special sections on intellectual property, for these matters are regulated in the university's charter -- i.e. the objects of intellectual property from employees, which are made in the organisational subdivisions of the university, are the exclusive property of the university, unless specified otherwise in their establishing agreements.
- Educational and scientific bases, such as the marine sciences station, Crimean educational-scientific base, Ladoga scientific base, state nature preserves, etc.
- Scientific Design Bureau "Integral" and the Scientific Design Technological Bureau "Radiophysics", largely conduct research in aerospace instrumentation. They make experimental models for instrumentation and equipment which are developed in the university.
- Educational-Scientific Centres (UNTs). These organisations are a particular organisational form that combines SPSU scientific research institutes with particular SPSU schools. They reflect SPSU's size and are located at its Saint-Petersburg and Peterhof campuses. The School of Physics, the Scientific Research Institute for Physics and other services form the Physics UNTs; the School of Chemistry and the Scientific Research Institute for Chemistry, the Chemistry UNTs.

SPSU administration

The major administrative instances are: the scientific council, rector and deputy rectors. The rector has overall administrative responsibility and is appointed by the Russian Federation Government upon the recommendation of the State Committee for Higher Education.

The rector and deputy rectors directly oversee SPSU's management, which include the following subordinate administrations: curriculum, the development of scientific research, graduate studies, foreign students, international relations, accounting and finance, budgetary planning, security, personnel, supplies, building maintenance, legal and patents and licensing.

Schools and the scientific research institutes are directly subordinate to the Scientific Council and the relevant deans and directors. The patent and licensing department carries out work on the legal protection and commercial sale of intellectual property that are created in the schools or scientific research institutes.

General description of SPSU's technological potential

SPSU is a classic research institute, conducting fundamental and applied research in many areas of natural sciences, social sciences and the humanities. The university is a significant world-class scientific centre. It boasts major scientific achievements from such well-known scientists as Mendeleev, Lents, Mechnikov, Butlerov, Sechenov, Favorskiy, Fersman, Vernadskiy, Timiryazev, Fok, and Frish. The university's main scientific strengths and traditions lie in chemistry, biology, physics, geology, and programming and are the basis for providing significant engineering services.

The university maintains a portfolio of licensable items and promotes and commercialises them both domestically and abroad. It has concluded 13 licensing agreements and engineering contracts for inventions, trade marks and know-how (Russia, Germany, USA, India, Hungary, Czech Republic, etc.). Currently development in this area is being hampered by a lack of staff and a lack of the necessary conditions for developing laboratory models so that they meet industrial requirements, and for developing the technical documentation.

The schools and scientific research institutes (see above) from the natural sciences are, as a rule, the source of most of SPSU's intellectual property. The major schools in the natural sciences are: biology and soil sciences, geology, geography and ecology, mathematics and mechanics, applied mathematics and systems management, psychology, physics, chemistry, medicine, astronomy and the university-wide departments (basic medicine, physical education and military).

As of September 1996 SPSU's natural science schools and scientific research institutes accounted for 5 864 students, 786 graduate students and 42 doctoral students. The faculty consisted of 4 221 persons, of which 7 Academicians and Corresponding Academicians of the Academy of Sciences, 496 doctors and 1 493 Candidates of Sciences.

Budgetary situation

The university receives financing from several sources. Teaching is financed by the State Budget and is indexed for inflation. The scientific research (in 1995 the university completed 1 544 scientific research tasks) which produces most of the intellectual property is financed from the state budget (44.1 per cent) and from non-budgetary sources (55.9 per cent). The breakdown of the state budget funding is as follows: unified state orders (zakaz-naryad) of the State Committee for Higher

Education (23.8 per cent), scientific-technical programmes -- NTPs (5.9 per cent), State Committee for Education grants (3.1 per cent), and scientific technical programmes from the Ministry of Education (11.3 per cent).

This funding is administered for concrete research projects that the SPSU considers important. (These amounts are also indexed to inflation.) Until 1995 a little more than half of these funds went to pay for salaries, and a little less than half for other expenses (equipment, services, travel, etc.). Beginning in 1996, due to low salary levels, all of these funds are now being used for salaries. The different non-budgetary sources are: contracts with enterprises and organisations for specific tasks (27.3 per cent), grants from the Russian Fund for Fundamental Research and the Humanitarian Fund (28.6 per cent), and other Russian and foreign funds and grants funding individual scientists. The volume of funding is continually declining. By September 1996 payments to the university from the state budget were about 80 billion rubles in arrears. The university experiences constant shortages. Of particular concern is the competitive system of financing basic research, for it results in strictly limited themes and reduces longer term research.

Relationships with local authorities

SPSU is autonomous and not subordinate to any local administrative structures and receives no funding from the city. Nevertheless, being one of the centres of academic excellence, it participates in different city programmes that are strategically important (development of the scientific-technical potential, ecology, sociology, etc.), lends its expertise to various programmes, and prepares highly qualified professionals for the city. A local SPSU Alumni Association was founded in 1995.

The Patent and Licensing Department

SPSU's Patent and Licensing Department was founded in 1967. Between 1967 and 1996 it achieved the following results: secured registration for 14 scientific discoveries and about 2 000 inventions (USSR inventors' certificates, Russian patents and foreign patents); concluded 13 licenses and contracts; had more than 20 per cent of its inventions used in the domestic economy; trained more than 600 people in patent courses; and published numerous research works in the area of intellectual property.

The legal basis of patent and licensing work at SPSU

Russian Federation legal acts. Between 1992 and 1996 a number of different types of legal acts were passed relating to intellectual property. These acts, which are oriented to market economy principles, form a qualitatively new legal basis for scientific research and innovation. The basic Russian Federation intellectual property acts include: the Patent Law (23.09.92), the Law "On trademarks, service marks and indications of origin of products", etc.

State Committee for Higher Education Legal Acts. In 1995 the State Committee published two regulations on intellectual property at higher education institutes (Vuzy): "On measures for improving the system of creating and protecting scientific and technological achievements and mechanisms for their use" (25.05.95 No. 782) and "A model regulation on the organisations for intellectual property at Russian Federation higher educational institutions" (08.12.95 No. 13-36-217 and 15).

University regulations. Paragraph 90 of SPSU's Charter from 12.07.95 states: "The University enjoys the exclusive right to objects of industrial and intellectual property created by employees of the

University in connection with their fulfilling their employment duties by receiving from the University a specific task ... The use of these objects by others is only permitted with the University's permission ...” In connection with this stipulation, Paragraph 7 of the Charter states that the University "will seek the protection and commercialisation of the University's intellectual property".

In addition, the University will aid the creation and commercialisation of science-intensive production, information and patent support services, and other activities connected with the legal protection and commercialisation of the University's intellectual property (paragraph 40 of the Charter).

The University also guarantees “the rights ... of teachers, scientists and other employees ... by legally securing their authorship for objects of industrial and intellectual property” (Paragraph 81 b of the Charter).

Rulings made by the rector also determine various aspects of SPSU's patent and licensing activity, for example: “On obtaining patent searches for scientific research”, “On the unified planning for scientific and inventing activities”, “On the disclosure and accounting of patentable scientific research”, “On financing inventing activities”, “On paying bonuses to inventors and those assisting them”, “on patent and licensing work and commercialisation of scientific results abroad” “On licensing, engineering consulting contracts and bonuses for that work, etc.”. Currently SPSU's “Regulation on the Patent and Licensing Department”, approved by the rector on 06.02.87, defines the department's functions.

The legal status of the Patent and Licensing Department

The Patent and Licensing Department is an independent subdivision directly subordinated to the deputy rector for Scientific Research. It is the sole subdivision which organises and performs patent-licensing work in all of SPSU's other subdivisions, including those subdivisions that have status as independent legal entities. It is staffed by six persons, 2 of whom are registered patent attorneys. Its services are available free of charge to SPSU employees at their place of work. Therefore, the department has four offices: one in Saint Petersburg and three in the Peterhof complex. In April 1996 the rector was given a plan for increasing the staff to total 11 to 15 highly qualified employees. This proposal would respond to the varied workload and SPSU's potential in generating intellectual property. This project will be reviewed by the Scientific Council in December 1996.

The Patent and Licensing Department has jurisdiction over the following types of intellectual property:

- inventions, utility models and industrial designs;
- trade marks, service marks and
- software and databases;
- integrated circuit masks;
- know-how (production secrets);
- plant varieties;
- works of science, literature and art.

The Department's functions

The Patent and Licensing Department's principal functions relate to:

- performing informational-analytical support, including patent searches;
- identifying commercially valuable objects of intellectual property;
- identifying protectable (patentable) results of scientific research work;
- legally protecting intellectual property in the Russian Federation and abroad;
- supporting the commercial sale of intellectual property, including market research, the analysis of commercial proposals, advertising, conclusion of licensing agreements and engineering service contracts;
- concluding bonus contracts, as well as other types of intellectual property contracts, with employee-authors for intellectual property which they created while fulfilling their duties as employees;
- participating in the organisations securing intellectual property-related commercial secrets for the University, in particular, taking those measures for the prevention of premature disclosure of the essence of commercially significant objects of intellectual property through publications, expositions, transfer to third persons, demonstrations, open usage and other ways before securing the legal protection in the Russian Federation and abroad;
- securing patent-licensing aspects of SPSU's international scientific-technical co-operation and its entrepreneurial activity inside the country during the conclusion of contracts concluded by SPSU with enterprises, organisations and institutions while carrying out scientific-production activity, and similarly securing the founding documents for SPSU's participation in the creation of new legal entities (prepares sections regulating the relations of the parties in matters of intellectual property and performs the necessary actions for their realisation);
- identifying facts surrounding the illegal use of objects of intellectual property and enforcing the property rights of SPSU and its employee-authors in courts and other bodies;
- performing legal, informational and administrative aid to responsible parties of SPSU and employee-authors of intellectual property;
- conducting academic research on patenting and licensing;
- developing legal, administrative and procedural documents on intellectual property for SPSU;
- analysing the state of patent and licensing work at SPSU and preparing proposals for its improvement;

- participating in the training of SPSU employees and graduate students on the principles of legal protection and commercial sale of intellectual property; and
- making statistical reports and responds to State statistical requirements on intellectual property.

Special issues on patent and licensing work at SPSU

The determination of ownership of inventions and other forms of intellectual property

Every patent application made in the Russian Federation or abroad lists the inventor(s) by name. In the absence of any stipulations to the contrary which are made in a contract between SPSU and an employee-author, current legislation assigns to SPSU the property rights to intellectual property made in the performance of duties or concrete tasks at SPSU. The university has yet to use any such contract. If the object was created outside of official duties, the employee has the right to file for a patent in his name.

Some SPSU employees have filed for patents independently, illegally making the application in their own names. However, in most cases relating to patenting, licensing and financing, inventors work through the university's Patent and Licensing Department. In future cases of illegal acquisition, the university plans to sue in court.

Duties of SPSU employees (under the employment agreement)

SPSU employees who are the authors of employee inventions or other types of intellectual property are required to inform the Patent and Licensing Department on the creation of these objects and to make all applications for patents in the name of SPSU. The Patent and Licensing Department must then prepare and file an application to the Patent Office within four months or assign this task to a third party or report to the author the necessity of keeping his invention secret. If SPSU is unable to take the above-mentioned action within four months from the notification by the inventor, then the inventor has the right to make an application in his own name.

There is a general lack of experience at SPSU in dealing with the issues stemming from employment agreements as they relate to questions on the transfer of rights to inventions. Yet, according to Paragraph 8 article 8 of the Russian Federation Patent Law (23.09.92, No. 3517-1), SPSU is the owner of employee inventions. The law requires no special procedures for these matters. The very fact of the existence of an employment agreement between the employer (SPSU) and the employee (inventor) presumes that the later gives his rights to the invention to SPSU. SPSU has no special procedural requirements relating to these matters, either requiring the signing of a separate intellectual property agreement or periodically notifying all employees of the rules.

Invention disclosure

While employees are required to notify SPSU of any patentable materials, there are no legal requirements to do so. The university also has no procedures that require disclosures until an inventor contacts the Department. The university does use an internal form "Notification on the creation of an invention and the filing of a patent application, but SPSU has no guidance materials for pre-disclosure meetings with SPSU employees.

Retention and ownership of data

Policies on the retention of data relate to ensuring the review of any findings (for replication of results, for further development of the ideas or for the investigation into scientific misconduct) and to intellectual property concerns. SPSU has no central policy on data retention and ownership, nor are there any guidelines on record keeping. Ownership of data is not dealt with in any of the grants received from government agencies. Scientists on their own initiative and in an arbitrary manner keep a “Working Journal” or “Scientific Journal” which are their personal diary-logbooks (including computerised versions) and which cannot be used as sources of proof for the validity of various types of scientific information.

Outside contracting and conflicts of interest

With the permission of SPSU an employee may conclude outside contracts to conduct scientific research work as long as this work does not conflict (or interfere with) the fulfilment of his duties at SPSU. As for inventions issuing from such contracts, they are, as a rule, the property of SPSU unless it is stipulated otherwise in the contract.

“Conflict of interest” is a new concept and legally unregulated in Russian practice, although this problem is very topical. It assumes a clash of interests between the employee and the employer, particularly as it relates to intellectual property. A conflict of interests may arise, for example, when a university employee, based on his own personal knowledge, concludes outside of the university one or more work agreements with other organisations, yet the agreements are related to the subject matter of his university research. In such cases access to confidential university information may be for him a source of financial or other material advantage. SPSU has no current policy that applies to identifying or resolving such conflicts of interest. There is no formally established procedure through which employees must disclose their outside engagements.

Given the current severe economic hardships it is quite likely that some SPSU employees with full-time appointments are unable to fulfil their primary commitment to teaching, to meet regularly with students, to participate in SPSU affairs, or to conduct independent research.

Subcontracting or joint research projects

Contracts for subcontracting are practically never used, but in the case of concluding such contracts, as in the case for other contracts, stipulations on intellectual property are included as long as such agreements are given to the Patent and Licensing Department for review. The university has a special procedure for disclosing and accounting for patentable scientific research. This procedure is conducted jointly by the Director of the scientific research and the Patent department.

Regulations on publications and agreements on respecting commercial secrecy

The Patent and Licensing Department participates as a member of the Expert Commissions of schools and examines patent and licensability of the information in all planned publications and has the right to delay publication of such works until the necessary steps have been taken to apply for patents in the Russian Federation or abroad or to conclude related contracts (licensing, on confidentiality, engineering, etc.) with interested enterprises, organisations or firms.

SPSU is set up to protect state secrets, but lacks a legally based system for protecting commercial secrets. There is no law on commercial secrecy, which would govern the mutual obligations of the responsible parties and co-workers. To protect the confidentiality of patentable and commercially significant information, the Patent and Licensing Department as a practice includes relevant sections on

confidentiality (commercial secrecy) in its agreements on the payment of bonuses for employee-authors and in licensing contracts and engineering service contracts. It also includes confidentiality sections in special agreements with third parties (e.g. potential licensees). The Department also uses a written obligation from employees on protecting confidential information.

Foreign applications

Before 1989-1990 SPSU protected its commercial interests abroad by patenting inventions in the relevant countries. It also sold licenses and engineering contracts. Presently the lack of financial resources has ended foreign patenting, however modest resources are still devoted to advertising inventions.

Transfer of rights and the distribution of royalties

The transfer of the rights for inventions and know-how takes place on the basis of licensing contracts. Royalties are deposited in an SPSU bank account and distributed according to a regulation made by the rector (25.01.95 "On licensing payments") according to the following shares: 55 per cent is paid to the inventor(s) as a bonus, taking into account their contribution in the preparation and testing of models, preparation of technical documents, help given the licensee and other tasks connected with concluding and fulfilling the license agreement; 20 per cent to the scientific research institute (school) in which the object of the license was developed; and 25 per cent to SPSU, i.e. the Central Patent-Licensing Innovation Fund. This latter Fund is used to remunerate individuals [besides the inventor(s)] who help the creation, legal protection and commercial sale of the objects of intellectual property through specific license agreements and engineering contracts, including employees of the scientific research institutes, the Patent and Licensing Department and other divisions of SPSU.

Principal problems

Some of the major problems facing the Patent and Licensing Department are as follows:

- An under-staffing that doesn't allow an effective development of SPSU's potential in intellectual property.
- Low salaries for Patent and Licensing Department staff, which prevents hiring highly qualified specialists.
- The lack of an organised system for protecting SPSU's commercial secrets, which leads to illegal and unsanctioned use of its intellectual property by third parties. Enforcement actions would require significantly more money and staff. Moreover, one questions if the courts are adequately prepared to deal satisfactorily with such cases.
- A lack of technical equipment in the Patent and Licensing Department, which prevents the use of the latest information technology and data bases.
- Undeveloped Russian databases of market information.

Finally, it must be admitted that the current economic difficulties have drastically reduced the ability of SPSU to manage the protection and/or sale of intellectual property developed by its employees. Some employees have founded small businesses, using their university offices and equipment, without reporting anything to the university or misleading the university as to their true activity. Inventions

belonging to SPSU are used without permission, or with the university looking the other way. “After all, they’re paid so little,” is often heard in connection with such situations. Moreover, potential inventions or the sale of know-how related to university-owned inventions are sometimes sold “out the back door”. SPSU’s interests are left unprotected. One also suspects that the intellectual property sold in such a haphazard way goes for far less than its real market value.

EUROPEAN SPACE AGENCY CO-OPERATION WITH RUSSIA AND INTELLECTUAL PROPERTY PRINCIPLES

by Anna Maria Balsano, European Space Agency, Legal Affairs

Introduction to the European Space Agency

The European Space Agency (ESA) is a regional international intergovernmental organisation, whose mandate it is to conduct space research and development for exclusively peaceful purposes. The Agency has currently fourteen European Member States, plus a special co-operative relationship with Canada providing for Canada's participation in several ESA programmes.

ESA activities are based on a long term space program which has been adopted by its highest authority, the Council Meeting at Ministerial Level. In the course of working out such a long-term plan and implementing various spaces programmes, ESA has solved many technological, financial, and legal problems.

It has therefore gained extensive experience in these areas. ESA has another distinctive feature as an R&D organisation. It seeks to extend technical knowledge and develop new technologies and facilities for conducting experiments. These are conducted either by themselves or by making the facilities available to third parties. Furthermore, it develops these facilities for operational use (space applications), for improving product quality, diversifying activities, extending expertise and for using more modern and complex management methods and improving competitiveness in the industrial sphere.

This all stems from the fact that, as an intergovernmental organisation, ESA cannot be directly involved in commercial activities or manage such facilities in place of user communities. They themselves must take over operational use of space systems.

Short overview of activities of ESA

ESA has a twofold structure, part of its activities being mandatory, mainly the science programme, and funded in accordance with the Member States GNP percentages, and part of the programmes (applications, launchers and in orbit capabilities) being optional where the Member States have the option not to participate. Currently, ESA is executing optional programmes in the following areas: Launchers, Earth Observation, Telecommunications, (Manned) Space Transportation and Micro-Gravity. ESA has concluded more than 150 Agreements with third parties. These agreements relate from general co-operation for space research, to a specific project of mission or to, for example, a reception agreement for ERS-1 data.

ESA IP rules

Based on principles laid down in its Convention, ESA has drawn up a number of rules: general clauses and conditions for contracts, provisions in the implementing rules of optional programmes, and the rules included in the international agreements.

ESA Convention

Article III (Information and Data) begins by laying down the principle that "Member States and the Agency shall facilitate the exchange of scientific and technical information pertaining to the fields of space research and technology and their space applications" and goes on to stipulate that "in carrying out its activities, the Agency shall ensure that any scientific results shall be published or otherwise made widely available after prior use by the scientists responsible for the experiments. The resulting reduced data shall be the property of the Agency." Paragraphs 3 and 4 of the same article stipulate that, when placing contracts or entering into agreements, the Agency shall secure such rights as may be appropriate for the protection of its own interests and those of the Member States participating in the relevant programme, by providing for rights of access, disclosure and utilisation as regards the resulting inventions and technical data; furthermore, all "inventions and technical data that are the property of the Agency... may be used for their own purposes by these Member States... free of charge." The requirement that detailed rules for the application of the foregoing principles be established is, moreover, laid down in paragraph 5 of the same Article.

Implementing rules

Before arriving at uniform regulation, however, these principles were incorporated into and applied under the implementing rules of optional programmes, which are mostly applications programmes from which economic spin-offs are expected.

Obviously, no Member State is obliged to take part in optional programmes. Consequently, the levels of contributions and the distribution of work reflect the various participants' commitment to and interest in a given programme. The provisions concerning intellectual property rights under these programmes (see, for example, Eureka, Microgravity, Columbus (Annex C to the Declaration)) have the following characteristics:

- For and on behalf of the participating States, the Agency holds intellectual property rights derived from experiments funded under a programme.
- ESA grants experimenters a right of prior access - for a minimum of 6 months and a maximum of 1 year from the actual transmission of raw data - to data derived from operation of their instruments and experiments.

All inventions and proprietary technical data produced by an experimenter on the basis of analysed data derived from in-flight operation of a payload are reserved for the experimenter. ESA and the Member States are, nevertheless, entitled to a non-exclusive irrevocable licence to use such inventions or data in the area of space technology and research and their applications, free of charge, without having the right to grant sub-licences.

Based on Article III.5 of the Convention, a uniform set of provisions has been developed to regulate intellectual property rights. The aim of the document is to draw together all the basic principles

covering all the various sources of information and data, whether developed in-house or by natural or legal persons having concluded a contract with the Agency, or derived from an experiment.

This document (ESA/C(89)95, rev.1, adopted by the ESA Council in December 1989) contains five chapters. Only chapters II and III are relevant here and are described below.

Chapter II deals with contractor-developed information and data. It is based on the same principles as the General Clauses and Conditions of Contracts (Article 36 et seq.) and, in particular, stipulates that:

- all information and technical data resulting from work funded by ESA shall be made available free of charge for its own requirements in the field of space research and technology, as specified in Article II of the Convention;
- similarly, all inventions and technical data resulting from space programmes and activities shall be made available to participating Member States free of charge.

Lastly, contractors are the owners of the rights over inventions and technical data developed under an ESA contract. These rights can be protected by patent. In order to encourage and improve co-operation among firms in the field of space activities, ESA and the Member States reserve the right to use such inventions and data, free of charge, for their own requirements in the fields of research, technology and their space applications.

The exercise of these rights outside the Member States or for non-space applications gives rise to the payment of royalties to ESA and is monitored by the transfer of technology Committee. This Committee, which is made up of Member State delegates, does not seek to compete with national and European systems for monitoring the transfer of technology to non-member States; on the contrary, the opinion that it gives on technology transfer proposed by industry actually contributes to the accomplishment of the Agency's mission, which, according to Article VII.1(b) of the Convention, includes "encouraging the rationalisation and development of an industrial structure appropriate to market requirements".

Chapter III deals with information and data relating to payloads flown on space vehicles for which the Agency provides flight opportunities. It incorporates existing provisions in implementing rules and lays down further principles applicable to ESA "customers". The relevant rules will be written into a contract or other form of agreement to be concluded between an experimenter or customer and ESA. The main difference between the rules applicable to an experimenter as opposed to a customer is that ESA has the right to use inventions and proprietary technical data resulting from the work of an experimenter, whereas the customer, in funding the flight, has exclusive rights over the resulting information and data.

ESA co-operation with Russia

General co-operation agreements with third countries, or institutions, set out the mutual interests of the Parties to exchange scientific information and data, the exchange of researchers and establishes the framework for developing other possible projects or programs. Examples of this kind of co-operation agreements are the ESA agreements with Poland, Hungary, Rumania, Greece and the Czech Republic.

Typical clauses in these agreements provide that the exchange by each Party of technical or scientific and technical information and literature published will be carried out without restriction as to its use on scientific programmes and projects, as well as exchange of assets, including equipment where

appropriate. With respect to specific projects, implementing arrangements will be established to define the use of intellectual property rights over inventions, data and assets. In general the exchange of information and data must be in accordance with international law and the laws of the parties. ESA signed a first general co-operation agreement with, at that time, the USSR in 1990 which established a framework for co-operation for the coming ten years. For the implementation of this Agreement joint working groups were established and in case of agreed joint projects, implementing arrangements had to be concluded. This framework agreement thus only provided for some general principles for co-operation and created the possibility of further co-operative actions. This Co-operation Agreement was in 1992 confirmed by the Government of the Russian Federation as the successor of the USSR, and the Russian Space Agency (RKA) was designated for the implementation of the Agreement.

After this general co-operation agreement ESA concluded several separate agreements with Russian space entities. These agreements dealt with manned space flights when ESA astronauts were trained and offered flight opportunity on the MIR and with the implementation of the International Space Station Alpha of which Russia became a formal partner in 1995. Finally, ESA established a permanent mission in Moscow for which the agreement was signed in April 1995 and a protocol was added in 1996.

IP clauses applicable on Russia/ESA co-operation

ESA-RKA agreement on co-operation on the manned space infrastructure and space transfer system during the period 1993-1995. This agreement is of special interest as in the Annex 6, special conditions concerning intellectual property and associated rights for study, research and development contracts have been adopted. This was needed as ESA was co-operation and developing technologies for a non-member state and it was thought necessary to elaborate the standard rules which I discussed before in order to better protect the interests of both parties. Without going further in detail the main principles are the following:

- The ownership of all data generated under a contract shall be with the party whose intellectual efforts has produced the data or has made the major financial contribution (major financial contribution is a factual element). Data means recorded information regardless of the form of recording. It includes technical and scientific data and computer software.
- The party which generated data may take measures to protect his ownership or protective rights analogous to ownership, and shall start this action as soon as possible, in any case not later than six months after the termination of the contract. If the party fails to do so the other party shall, after prior notification to the first party, be entitled to take such measures on its own behalf in any jurisdiction. The notified party may not take any actions, like publications, which can jeopardise the owner right.
- In cases of jointly developed data, where results are generated as a result of a funding of both parties, so that ownership cannot be readily distinguished and the results cannot be effectively exploited without using the totality of the data, the following two provisions are applicable:
 - Each party may take protective measures within its own territory but not in the territory of the other party. The party taking these protective measures shall acknowledge the joint nature of the development. For Russian contractors, this means the territory of the Russian Federation, as well as any location of the CIS where those parties conduct space activities.

- Each party may take protective measures in third territories, but shall first consult the other party to reach an agreement as to sharing of the results and benefits. Where possible under the applicable law, the protection shall be taken out in joint names.
- The owner of data shall, under the provisions of the contract, have an unrestricted use of such data. The party who receives the data under the contract shall have the following rights of use:
 - In case of data wholly or predominantly funded by the recipient, there shall be free and unrestricted right to use and to grant licenses to third parties to use, for peaceful space research and technology and their applications within its territory.
 - In case of a contract with the principle purpose of passing data for assessing its suitability for use under a possible future agreement, the recipient shall only have the right to use the data for purposes of the assessment and to make it available to third parties, under conditions of confidentiality.
 - In the case of data transmitted which is a result of pre-existing effort, or funded by the transmitter, and the purpose of handing it over is manufacturing or further development, it may only be used for that specific purpose and not passed to a third party without the consent of the transmitter. The data shall be treated confidentially.
 - Where the data generated does not clearly fall under the three conditions just mentioned but is more a mix of the first two so that it cannot be readily separated, or effectively exploited when separated, the recipient shall have the right to exploit the data under the conditions of a) including the granting of licenses, b) the parties shall agree on terms for compensation for the use of the proportion represented by the previous provision. It shall impose these terms, and an obligation of confidentiality of any licenses.

Confidentiality of data means that a party shall treat the data with at least the same degree of confidentiality as he would treat his own commercially sensitive data. The party that passes the data shall mark confidential data with an appropriate stamp. The recipient shall add such additional marks to ensure compliance by his personnel or contractors.

When, finally, under the contract either party is obliged to make data available to the other, or when making data available is a logical consequence of the contract and needed for performing the contract, the party shall take all reasonable steps to avoid restrictions on his freedom to make the data available.

The parties shall be subject to any overriding provisions of national or international legislation applicable and shall hold free and indemnify the other party from the consequences of any breach.

Examples of ESA-Russia co-operation

The intellectual property principles described above, are reflected:

- in the contract passed between ESA and NPO-Energia in order to carry out two scientific space flights with ESA astronauts on board of "MIR" Space Station within the period 1994-

1995, which aimed to perform scientific experiments and other astronaut supported activities assisted by NPO-Energia;

- in the co-operation agreement, between ESA and the Russian Space Agency, for the development and operations of the service module data management system (DMS) for the Russian segment of International Space Station (ISS) and of the space vehicle docking system;
- and in the co-operation agreement, between ESA and the Russian Space Agency, for the development and operation of the European Robotic Arm (ERA) for the Russian segment of the International Space Station (ISS).

Conclusion

In the Agency's relation with Russia to co-operate in joint space projects, the conditions on sharing of rights to the results of scientific technical co-operation which are based on ESA's general clause and conditions were accepted by Russian industries without serious objections. This is because of the similarity of the (relatively new) Russian legislation with the copyright and patent laws of the other European countries.

With respect to attribution of rights the special agreement on intellectual property discussed before enables a reasonable division in accordance with the creative and financial contributions of the two parties. Moreover, this agreement allows to take well into consideration the specifics of each case and the interests of both parties.

The importance for ESA and Russia is that their co-operation prepares the way for future co-operation between private industries and represents in this way an educational process for both parties and their industries on how to deal with intellectual property when carrying out joint space projects.

A STATISTICAL OVERVIEW OF PATENT AND LICENSE ACTIVITY IN THE RUSSIAN FEDERATION

by V.N. Evdokimova, A.D. Korchagin, and N.A. Rybina

A statistical analysis of applications for inventions, patent grants, and registered licenses confirms the widely-held view that these indicators reflect the general economic situation in the country, especially in the scientific and technological sphere. The data also confirm foreign firms' interest in investing and working in the Russian market.

The 1991-1995 process of economic and legal reform has directly affected industrial property legislation. During these years the legal basis for patenting and licensing was rather unstable.

On July 1 1991, the USSR Law "On Inventions in the USSR" came into force; it proclaimed patents to be the country's sole form of protection for inventions. In addition, it permitted exchanging valid inventors' certificates for patents if the applications for the inventors' certificates had been made less than 20 years ago. Current applications for inventors' certificates were converted into patent applications based on the terms of an agreement between the inventors and the applicants, indicating in whose favour they shall be issued. However, one and a half years later the USSR was dissolved and the granting of USSR patents was halted, for they would have been patents from a non-existent state. These conversions, as well as the development of secondary legislation (e.g. regulations, instructions and interpretations) was also stopped.

On October 14, 1992 the Patent Law of the Russian Federation came into effect. It provided that all valid protection documents issued in the USSR would be recognised and that all applications would be re-registered since the country granting the patents had changed.

Russia's general economic situation, with a massive decline in production, has affected invention activity and, consequently, the number of patent applications. While in 1992 the number of applications fell by 37.8 per cent as compared to 1991, the rate of decline has subsequently slowed down (see table 1). In 1995 applications declined only 15.4 per cent over the previous year's total. Preliminary data for early 1996 (not included) confirm this stabilisation trend.

The four-fold drop in the number of applications submitted for patent examination stemmed mainly from fewer applications being submitted by Russian national applicants. The share of applications submitted by Russian legal entities as a share of the total Russian national applications stabilised in 1992 and began to grow in 1995 (see table 2). As recently as 1985 organisations (legal entities) had accounted for about 85 per cent of the total number of applications submitted for patent examination.

Data on the applications from countries of the former USSR has only been available since 1993. (The authors of the present review have no available accurate data on these countries for the period of 1991 through 1992.) The total number of such applications was relatively insignificant from 1993 through 1995 (see table 3).

Unlike the trend for applications from former USSR entities, applications submitted to Rospatent by other foreign applicants (from countries outside the former USSR) have grown modestly during the review period.

With the exception of 1992, the number of applications submitted by foreign applicants has remained relatively stable, even growing slightly. The increase in the number of foreign applications was due to a growing number of Patent Co-operation Treaty (PCT) applications which entered the national phase (see table 4). The share of PCT applications which entered the national phase increased steadily every year from 1 059 applications in 1991 to 2 355 in 1995 (a factor of 2.2 compared to 1991 and of 1.5 compared to 1994).

The stable number of applications made by foreign applicants reflects their continuing interest in securing legal protection for their inventions in the Russian Federation. Among foreigners, US entities accounted for most applications. US applications grew steadily, from 556 in 1992 to 1 121 in 1995 (see table 5). Germany also accounted for an important share of foreign applications.

In contrast to the growing applications from developed countries, invention applications from the NIS have tended to decrease (see tables 6-8).

In 1992 a new subject of legal protection, i.e. utility models, was introduced. The objects of many of the utility model applications would have been previously submitted for examination as patent applications. At present their number is not significant. However, it grows every year (see table 10).

Almost all applications for utility models were submitted by Russians. In addition, an insignificant number of applications originally submitted as invention applications (100 to 120) were changed into applications for utility models.

It is currently difficult to analyse statistically the patent activity of scientific and educational organisations since the publication of applications made under the Patent Law began only at the end of 1994. Moreover, neither the application nor the publication forms contain an explicit indication as to whether an applicant is a member of a scientific organisation or an educational institution, nor do they indicate if an applicant (an individual) works at such an organisation. An analysis of applicant names is also difficult, for the words "Academy", or "Institute" may indicate both a scientific organisation and an educational institution, or sometimes a commercial organisation which has no relation to either of these categories. Some privatised R&D and design institutes removed these words from their names. Furthermore, applications are often submitted by small enterprises that were established by larger R&D institutes or higher education institutions, but their names often make no reference to this link. Sometimes these applications are submitted by individual employees of such organisations, or the right to receive a patent is transferred to these organisations after an application has already been submitted. Early official publications also do not indicate if the applying organisation is of Russian origin. All these factors shall be taken into account when assessing the reliability of the data mentioned below which was calculated on the basis of the Rospatent official publications on applications and on issued patents.

In the USSR, research, project, and design organisations submitted about 80 per cent of invention applications. However, since the early 1990s, state financing has been stopped, the level of demands made on institutions has deteriorated, and the system of incentives has changed. This resulted in a sharp decline in the number of patent applications and grants. According to data from Rospatent's official newsletter "*Discoveries and Inventions*" published in 1992, out of the 336 patents granted, only

184 (i.e. practically half) came from research, project and design organisations. The other patents were issued to either their authors or other (commercial) organisations.

In the USSR there was a special classification of scientific and engineering organisations: research-and-production associations, R&D and planning institutes, design offices, etc. Some of them have retained their original name and status, others have changed them and became, for instance, state scientific centres, inter-branch scientific and technical complexes, or were privatised. For the purpose of this review all of them are considered as R&D organisations (R&DOs).

The category of “Higher Educational Institutions” (HEIs) includes both civilian (universities, institutes, colleges, academies) and military HEIs. The category of “Organisations of the Russian Academy of Science” (ORASs) includes organisations belonging to Academies of Science in the Russian Federation’s Republics. The most active of them in terms of patents is the Academy of Science in the Republic of Bashkortostan.

In 1994 and 1995 the number of patents for inventions issued in favour of R&DOs, HEIs and ORASs was 20 581 and 25 633 respectively (see table 11).

Sampled information on applications published in issues 1 -- 4 of the “*Inventions*” newsletter in 1995 and 1996 according to the main International Patent Classification categories is presented below (see table 12). Since far fewer scientists work in HEIs than in R&DOs, it appears that the work of HEIs is much more stable (see table 9 for summary statistics on all invention grants).

The former Soviet Union and now Russia have actively participated in the international license trade for more than 30 years. Traditionally, such terms as “license agreement” and “license” were associated with the export of technologies and were not applied to domestic sales. Before 1991 most inventions were protected as state property by inventors’ certificates. Inventions were freely used within the USSR, and the legislation stipulated a bonus to be paid to the inventors.

Articles 10 and 13 of the Russian Federation’s Patent Law stipulate that license agreements and agreements to transfer patent rights must be registered with Rospatent. Without this registration they are deemed invalid, i.e. there is no legal act, either as it concerns the parties to such an agreement or to any third party. Thus the Patent Law regulates the legal basis for license trade in the Russian Federation.

Rospatent registers licenses according to the rules stipulated in the *Regulations on the Examination and Registration of Agreements Concerning the Transfer of Patent and License Agreements on Granting Rights to Use Inventions, Utility Models, and Industrial Designs*. These rules apply to license agreements and agreements on transferring a Russian Federation patent if a party to such an agreement is a foreign citizen and/or a foreign legal entity and whenever the case concerns the validity of agreements on the territory of Russia. Agreements are subject to registration when they are license agreements in the full sense or contained in other agreements such as a contract guarantee, a commercial concession, a founding agreement, etc.

The registration process for agreements on the transfer of patents and for license agreements shows a steady growth (see table 13).

The number of registered license agreements increased by 20.2 per cent in 1993, and by 50.1 per cent in 1994 as compared to the previous year. The small decrease (3.7 per cent) in 1995 may be related to the introduction of the *Rules of Examination and Registration of Agreements on Patent Transfers and License Agreements on Transfer of Rights to Use Inventions of Utility Models, Industrial*

Designs; according to these Rules registration occurs only if a patent (certificate) is available. 1992's sharp rise over 1991 stems from the fact that registration first began in August 1991.

Exclusive license agreements' share of total registered agreements has steadily fallen, possibly reflecting the increasing caution of patent holders when making license agreements and, perhaps, stemming from a sharp increase in the number of registered agreements in the field of light and food industries, as well as in medicine. In these latter spheres, it is practically impossible to saturate markets and the attraction of making non-exclusive licenses is greater.

By 1995 the share of agreements to transfer patents increased, largely reflecting the transfer of patent rights from legal entities to individuals (as a rule due to the liquidation of legal entities).

The registration of license agreements and agreements on patent rights transfer was accompanied by the input of the information into an automated database which provided a complete picture of the use of protected industrial property by licensing.

Thus, the introduction of patent protection in Russia and the mandatory registration of license agreements has generated a new type of information -- information on license agreements, licensors and licensees. In addition, the license market appears to be very sensitive to changes on commodity markets and in the country's economy. Data has been compiled on the transfer of protected industrial property within the country in the period from 1993 to 1995 by field of technology (see table 14).

This data provides an insight into the current demand on the technology market, showing a relatively stable demand for technologies in the chemistry, petro-chemistry, oil and gas extracting industries.

The light and food industries and medicine account for a fairly stable share of registered license agreements. Electronics and metallurgy's shares of the total dropped sharply in 1994 and stabilised in 1995. The absolute number of agreements registered for these areas grew slightly. The participation of different types of entities in transferring patented technologies on the domestic market during 1993 through 1995 also varied (see table 15). State enterprises and organisations are the most active in the invention of technologies and they accounted for relatively stable shares of the total sales and purchases of patented technologies. While both R&DOs and HEIs are included in this group of economic entities, they represent an insignificant share. This situation probably reflects their financial difficulties which prevent them from pursuing an active patent policy.

In 1991 an intensive process of patent transfer began and has included being accorded the right to file for patents which were created by inventors working at HEIs and R&DOs, by individuals or by commercial structures. The participation of commercial organisations and private enterprises in the process of an internal governmental exchange of technologies, both as transferring and accepting parties, has been rather stable. Although their activity decreased somewhat in 1994, their share of registered agreements has grown steadily ever since. The shares for joint ventures and foreign firms grew considerably in 1995. Individual patent holders, who as a rule lack sufficient financial funds to use their own inventions, are the most active suppliers of patented technologies on the country's license market. However, starting in 1994 their participation in the transfer of technologies began to decrease. At the same time, individuals became more active in acquiring patent rights. The share of agreements in which individuals were purchasers increased 4 times in 1994 as compared to 1993 and continues to grow, although at a slower rate, in 1995.

The above data shows that Russia now has a vigorously growing domestic licensing market. The scope and rate of this growth inspire a certain optimism contrary to the glum forecasts concerning the future for inventions in this country, since the use of inventions on a license basis not only reflects the current economic situation in the country, but may change this situation for the better.

Table 1. Patent applications directly submitted to Rospatent, 1991-1995

Years	1991	1992	1993	1994	1995
Total number of applications submitted directly to Rospatent:	90290	56171	38529	26243	22202
of which, from Russian applicants,	87017	53518	34120	21640	17551

Source: Rospatent

Table 2. Relative shares of total patent applications by Russian legal entities and individuals, 1991-1995 (percent of total)

Years	1991	1992	1993	1994	1995
Legal entities	75.5	56.2	56.7	57	62
Individuals	24.5	43.8	44.3	43	38

Source: Rospatent

Table 3. Patent applications made by inventors from NIS outside of Russia, 1993-1995 (number of applications)

1993	1994	1995
1000	1149	839

Source: Rospatent

Table 4. Patent applications submitted to Rospatent by non-NIS applicants (number of applications)

Years	1991	1992	1993	1994	1995
Total foreign applications	3273	2653	3409	3454	3812
of which Patent Co-operation Treaty	1059	1288	1310	1556	2355

Source: Rospatent

**Table 5. Patent applications from non-NIS countries
(number of applications)**

	1992	1993	1994	1995
USA	556	813	723	1121
Germany	503	559	502	780
France	189	190	195	394
Switzerland	183	206	189	245
UK	156	180	144	218
Italy	125	121	135	166
Sweden	40	63	73	173
Japan	no data	151	112	152
Netherlands	51	68	49	70
Finland	39	61	51	63
Austria	42	42	55	40
Subtotal	1884	2454	2228	3422
Total	2653	3409	3454	3812

Source: Rospatent

**Table 6. Patent applications from NIS countries
(number of applications)**

	1992	1993	1994	1995
Ukraine	5605	519	811	672
Belarus	893	149	80	70
Kazakstan	130	85	69	52
Moldova	312	52	40	21
Total for NIS	6940	805	1000	815
Countries outside the former Soviet Union	1884	2454	2228	3422

Source: Rospatent

Table 7. **Applications for patents of the Russian Federation**
(number of applications)

	1993	1994	1995
Applications submitted directly to Rospatent, of which:			
	32216	23081	22202
by applicants from Russia	28478	19482	17551
by foreign applicants	3738	3599	4651
Applicants under PCT procedure indicating the Russian Federation, of which:	11224	15572	19130
by applicants from Russia	52	46	61
by foreign applicants	11172	15526	19069
Total applications for Russian Federation patents, of which:	43440	38653	41332
by Russian applicants	28530	19528	17612
by foreign applicants	14910	19125	23720

Source: Rospatent

Table 8. **Patents granted in the Russian Federation**
(number of grants)

	1993	1994	1995
Total number of issued patents, of which:	27757	40263	31556
in exchange for certificates of authorship	14543	19682	5921
for new applications	13214	20581	25633
to Russian applicants	8938	16052	20861
to foreign applicants	4276	4529	4772
Cumulative total of valid patents by year end	44321	60321	76186

Source: Rospatent

Table 9. **1995 patents granted for new applications in 1995 according to the IPC**

IPC Index	Number of patents	IPC Section
A	4207	Human necessities
B	6129	Various technological processes; Transportation
C	4529	Chemistry, Metallurgy
D	437	Textiles; Paper
E	2042	Construction; Mining
F	3033	Mechanics; Illumination; Heating; Engines and Pumps; Arms and Munitions; Blasting Operations
G	3083	Physics
H	2173	Electricity
Total	25633	

Source: Rospatent

Table 10. **Applications for utility models**
(number of applications)

Years	1992	1993	1994	1995
Total applications, of which:	14	920	1596	2039
from Russia	14	920	1579	1997
from other countries of the former USSR	0	0	13	33
from countries outside the former USSR	0	0	4	9

Source: Rospatent

Table 11. **Patent applications made by R&D organisations (R&DOs), Higher Educational Institutions” (HEIs), and “Organisations of the Russian Academy of Science” (ORASs)**
(number of applications)

	1994	1995
R&Dos	1920	5009
HEIs	1434	1929
ORASs	256	786
Total number of patents issued in the Russian Federation	20581	25633

Source: Rospatent

Table 12. The distribution of a sample of patent applications made by R&D organisations (R&DO), Higher Educational Institutions (HEI), and Organisations of the Russian Academy of Sciences (RAS) according to the International Patent Classification (number of applications)

	1992				1993				1994			
	R&DO	HEI	RAS	total	R&DO	HEI	RAS	total	R&DO	HEI	RAS	total
A	59	20	4	254	21	14	1	180	42	18	1	194
B	42	19	7	269	48	67	16	454	31	39	11	261
C	2	2	1	33	33	10	14	341	38	37	24	379
D	--	--	--	3	6	4	--	40	11	6	--	33
E	40	6	4	219	55	12	7	255	29	14	3	153
F	21	8	--	207	15	13	--	206	34	25	--	368
G	51	27	11	322	18	14	2	119	47	33	14	369
H	29	11	2	183	30	13	5	145	22	11	5	108
Total	244	93	29	1490	226	147	45	1741	254	183	58	1892

Source: Rospatent

A:	Human necessities	E:	Fixed constructions
B:	Performing operations	F:	Mechanical engineering; lighting; heating; weapons; blasting
C:	Chemistry and metallurgy	G:	Physics
D:	Textiles and paper	H:	Electricity

Table 13. Annual Changes in the Registration of License and Patent Transfer Agreements, 1991-1995 (number of agreements registered)

	1991*	1992	1993	1994	1995
Patent transfers	26	98	97	214	292
Exclusive licenses	39	98	80	101	101
Non-exclusive licenses	67	433	579	820	702
<i>Total</i>	132	629	756	1135	1095
Share of total (percent)					
Patent transfers	20	16	13	19	27
Exclusive licenses	30	16	11	9	9
Non-exclusive licenses	51	69	77	72	64
<i>Total</i>	100	100	100	100	100

Source: Rospatent

* The registration of agreements began in August 1991.

Table 14. **Share of Total Registered Licensing Agreements According to Field of Technology**

Field of technology	Share of the total registered agreements, (%)		
	1993	1994	1995
Construction and construction materials	7.8	12.9	9.5
Machine and machine-tool building, tool production	12.8	13.3	9.3
Chemistry, petro-chemistry	11.5	15.9	13.7
Metallurgy	12.3	3.6	5.0
Electronics, computers, instrument making	10.7	5.7	7.9
Light, food industries	7.6	13.9	15.2
Power engineering, electrotechnics	7.2	8.3	5.0
Medicine	6.6	15.6	21.0
Oil and gas extracting industry	5.7	6.7	4.5
Other	7.8	4.1	8.9

Source: Rospatent

Table 15. **Activity of Registered Agreements Parties**

Type of economic entity	Share of the total registered agreements, (%)					
	Transferring party			Accepting party		
	1993	1994	1995	1993	1994	1995
State enterprises, R&DOs, HEIs	24	28	32	60	62	57
Commercial structures, private enterprises	18	16	18	36	22	25
Including:						
Joint ventures	0.1	0.1	0.2	0.8	1.1	0.9
Foreign firms	0.1	0.1	3.6	0.9	0.7	4.8
Individuals	58	56	49	4	16	18

Source: Rospatent

THE ORGANISATION OF PATENTING AND LICENSING IN RUSSIAN INSTITUTIONS OF HIGHER EDUCATION

by Yury I. Buch, Tatyana V. Klyueva and Alexei M. Markov

A survey was conducted of the organisational situation and development prospects for patenting and licensing in Russian higher educational institutions. The survey was conducted under the general guidance of Professor Alexander Suvorinov, candidate of technical sciences, and Mikhail Surovy, candidate of sociological sciences.

The adoption of a number of market-oriented laws in the sphere of intellectual property, together with other measures aimed at developing a market economy, form a new legislative and economic environment for scientific research, innovation and production in Russia. Over the past four years, a legislative basis for protecting intellectual property was established and it continues to develop. The legislation consists of Russian laws on patents, on trademarks, on service marks and names of commodity origins, on copyright, on legal protection of computers and databases, and on legal protection of integral micro-circuits typology. Rights for know-how (commercial and trade secrets) have been legislatively instituted. Finally, the legalisation of intellectual property rights in the Russian Constitution and the new Civil Code are grounds for hoping that science and industry have received an important impetus for development.

This circumstance opens new prospects for developing science at higher educational institutions, creating a real opportunity to commercialise the inventions and other "intellectual" products of these institutions. At the same time, there is an obvious contradiction between new legislative and economic possibilities and the current organisation of work that promotes scientific and innovational activities, and the legal protection and commercial realisation of these results at institutions of higher education.

Patenting and licensing at institutions of higher education of the USSR

University patent departments, until recently, mainly assisted authors in preparing applications and correspondence with the Committee for Inventions and Discoveries to obtain author's certificates for inventions and industrial samples. The rights issuing from these documents belonged to the state, so any commercial use was impossible for the educational institution at which those inventions and industrial samples originated.

The economic issues with which patent departments dealt were mostly limited to the bonuses paid by the university, to the promotion of an invention by its scholars and researchers, and to rewards for using inventions and industrial samples -- either in their own production or at that of other enterprises, which often were the institution's customers for scientific research and development of new technologies.

Foreign patenting, supported through the state budget, was an exception from the usual practice rather than a conscious and, in particular, economically responsible business for a higher educational establishment.

State central planning and a mandatory financing of scientific research by producers guaranteed rather stable orders to higher educational institutions, without linking them to producing high level or commercially significant results. This approach lacked competitive forces and undermined any need to conduct market studies to discover prospective research areas and led to actively advertising and promoting new developments for which, in fact, markets did not exist at all.

The administrative policy for invention remained quite active. The existence of a patent department was obligatory for higher educational institutions, patent budgets were set up, a significant role was given to socialist emulation between different higher educational establishments, as well as to measures of material and moral encouragement of inventors. Seminars and meetings of experts of patent departments were held on a regular basis to exchange experience. A special department was established to organise and co-ordinate activities in the field of invention.

Patenting and licensing at Russian institutions of higher education and new tasks in its organisation

New relations are taking form in scientific and technical work, and they are setting new requirements for organising patenting and licensing at higher educational institutions. The patent services have new tasks and key objectives in the organisation of scientific and innovational activity. All this requires an urgent and radical restructuring of institutions' patent departments into divisions with legal and commercial functions that are equipped with modern computer software and hardware, the necessary patent and legal specialised literature and access to world information resources. These changes can guarantee a timely legal protection and commercial use of the results of scientific research inside the country and abroad and contribute to the preservation and effective use of the institutions' educational and scientific potential.

A modern organisation of patenting and licensing suggests establishing an institution's patenting and licensing policy as a uniform scientific-educational-production complex through creating the necessary legal and economic conditions for an efficient commercial exploitation of the rights to intellectual property objects on internal and external markets. The implementation of this concept by an educational institution may be based on the following principles:

- a single patenting and licensing policy for an educational institution;
- a single department of intellectual property for an institution, exercising this policy;
- combining the legal and commercial functions of the intellectual property department, both oriented to attaining commercial results;
- guaranteeing commercial secrecy of the results of educational and scientific research activity; and
- remuneration of the authors of intellectual property objects, proportionate to their level of profitability.

At the same time, the overall economic crisis which has swept the country during the past 5 to 7 years has noticeably hampered the development of patenting and licensing at higher educational establishments. Financing scientific research from industrial orders -- the framework in which most new, patentable technologies had been created -- was seriously reduced. The lack of demand for the services of patent workers also decreased their number.

The cut in financing resulted in an almost total end to developing patent departments at educational institutions and their outfitting with technical equipment and information. The suspension of networking among higher educational institutions on organising and implementing patenting and licensing also seriously impeded progress.

Measures of development of patenting and licensing at higher educational institutions

The Russian Federation State Committee for Higher Education (Russian Goskomvuz) acknowledges the importance of patenting and licensing and, while taking into consideration the development problems at higher educational institutions, is taking a number of measures to remedy the present situation.

The inter-institutional scientific-technical programmes "Intellectual Property of the School of Higher Learning" and "Preservation and Development of Intellectual Potential of Russian Higher Educational Institutions," launched in 1993, have become an important sphere of Goskomvuz activity. The third part of the latter programme, which is of a general methodological nature, deals with the following problems:

- an analysis of the state of protection and commercialisation of scientific achievements, including intellectual property objects, in Russian schools of higher education, as well as foreign experience and the practice of domestic higher educational institutions in this field;
- the elaboration of normative, normative-methodological, reference-informational and other documents and materials for organising and implementing the creation, legal protection, and realisation of scientific and technical achievements at higher educational establishments;
- the dissemination and use by higher educational institutions of materials obtained within the framework of the programme; and
- the promotion of knowledge in the field of intellectual property during the training and re-training of experts in the higher education system.

It is important that work under the programme is conducted by leading experts from more than 15 Russian higher educational institutions, some of whom are also members of the Co-ordinating Council.

Another significant step in this direction was the creation of the Co-ordinating Council on Intellectual Property in the area of Science and Technology under the Russian Goskomvuz. The Co-ordinating Council, as a public analytical body, was given several tasks, specifically to:

- prepare recommendations on forming and implementing a single policy on intellectual property for higher educational facilities, both in professional training for experts and in scientific research and innovational activity;
- examine the existing legislation and regulatory basis for intellectual property, drafting proposals for improvement, as well as participating in the Russian Goskomvuz's legislative activity in undertaking legislative initiatives in the sphere of scientific and technical, innovational, investment, financial, and tax policy;
- draft proposals, for inclusion in organisational-instructive and regulatory documents of the Russian Goskomvuz, that promote the development of entrepreneurship at higher educational

institutions in science and technology and the production and marketing of scientific and technical output, including that done within the framework of scientific and technical and innovational programmes and projects; and

- analyse the activity of higher educational institutions that is directed at creating, protecting and commercialising intellectual property objects and help spread knowledge and practical experience of this nature throughout the higher educational system.

Gathering information on the organisation of patenting and licensing

It is difficult to make decisions and take practical steps on the development of invention, patenting and licensing within the higher educational system without having objective information on its current situation. Therefore in 1996, at the request of the Russian Goskomvuz's Main Department for Development of Scientific Research, a questionnaire was distributed to higher educational establishments to analyse the state of organisational work for protecting and commercialising intellectual property. As a rule, such work is organised at higher educational institutions through patent departments or other similar divisions, therefore the analysis was based on an evaluation of the state of patenting and licensing services of higher educational establishments.

For the purpose of obtaining initial information, a specially developed questionnaire was forwarded to all higher educational institutions within the system of the Russian Goskomvuz. The questionnaire included the following sections.

- *General information about the higher educational institution.* This data is necessary for classifying the institutions according to regions, sphere of education and volumes of scientific and educational activity of the institution.
- *General information on organisation of patenting and licensing.* This section includes the main data on the structure of organisation of patenting and licensing at the institution, specifically, the existence of a specialised department, its functions, professional composition, as well as information sources and volume of financing.
- *Material and technical supply of the department.* This section contains information on the space occupied by the department and on its technical provision.
- *Information supply.* The data contained in this section reflects the existence in the department of informational patent editions and normative-methodical literature, as well as the possibility of using various electronic databases of patent information.
- *Participation in the educational process.* This section contains information characterising the educational activity of the institution in the sphere of intellectual property.

The questionnaire additionally envisages gathering information that reflects the opinion of the administration and heads of patent departments of the institution on the main problems of organising patenting and licensing.

Representativity of the collected data

According to Goskomvuz data, in 1994 Russia had a total of 680 higher educational establishments, the majority of which - 82 per cent - were state institutions, and 18 per cent non-state colleges.

Russian state institutions of higher education can be classified for the purposes of the present survey into several groups:

1. classical and technical universities and institutes;
2. economy and law schools;
3. pedagogical schools;
4. medical schools;
5. physical culture;
6. other humanitarian institutions.

The numerical strength of institutes based on this classification was as follows:

- physical culture, 2 per cent
- medical, 9 per cent
- pedagogical, 16 per cent
- humanitarian, 11 per cent
- economy and law, 6 per cent
- general and technical, 56 per cent.

State institutions of higher education are subordinated to different agencies. Over half of them are under the jurisdiction of the Russian Goskomvuz, and the rest, of other agencies. For example, medical institutions mostly refer to the Health Ministry, pedagogical institutions to the Ministry of Education, and transport institutions to the corresponding transport ministries.

Questionnaires on the state of patenting and licensing were sent to 226 schools of higher education within the jurisdiction of Goskomvuz. Replies were received from 133 institutions, which amounted to 58 per cent of the total number of questionnaires, 122 of which (62 per cent) were questionnaires received from classical and technical universities and institutes.

The present survey contains particularly interesting data concerning classical and technical universities. The majority of such institutions in Russia are under the jurisdiction of Goskomvuz.

The results of the present survey are quite representative and on the whole reflect the state of affairs in organising the protection of intellectual property at higher educational establishments of the Russian Federation. The results of the survey refer to the beginning of 1996.

General information on higher educational institutions

During the processing of questionnaires, the institutions of higher education were classified according to three criteria:

- region (Moscow, Northwest, Central region, Central Volga, South Russia, Urals, Siberia, Far East);
- training specifics (classical and technical universities and institutes, humanitarian and economic colleges);
- number of students (under 5 000; 5 000 to 10 000; over 10 000).

The classification of institutions of higher education according to this criteria is presented in the figures at the end of this paper. Figure 1 shows the disposition of institutions in Russia's regions. On the whole, its nature corresponds to the disposition of institutions across the territory of Russia, which confirms the representativity of data obtained with the help of questionnaires.

The classification of institutions according to training specifics (see figure 2) demonstrates that the principal data on the state of patenting and licensing have been obtained with respect to classical and technical universities.

Figure 3 shows the classification of institutions based on the number of students. It is obvious that the number of students in half of them is less than 5 000. Large institutions of higher education, where over 10 000 students undergo training, amount to approximately 10 per cent.

All subsequent results of the survey are presented according to the described classification.

Organisation, functions, and financing of patent departments

Sixty eight per cent of higher educational establishments have specialised patenting and licensing departments. Figures 4 and 6 present the data on the existence of these departments in accordance with the accepted classification of institutes. The situation in different regions is approximately the same. Naturally, classical and technical universities, as a rule, have such departments (73 per cent of universities), while humanitarian and economic colleges usually do not have them. The larger the institution, the higher the probability of a patenting and licensing department existing in it.

On average, the departments consist of 2-3 people. In 80 per cent of institutions, their staff ranges from 1 to 4 people.

Number of employees (distribution)

The number of employees in patenting and licensing departments in different regions is presented in figure 7. The distribution presented in figure 8, taking into account the prevalence of classical and technical universities, practically repeats the distribution of the number of employees in educational institutions in Russia as a whole. Naturally, the number of employees of patent departments in large institutions is on the whole greater. It is noteworthy that as a rule, medium-sized institutions have patenting and licensing departments.

On an organisational level, patenting and licensing departments are most frequently (59 per cent) included in the scientific research departments, nearly a third of them (31 per cent) are main divisions of the institution, and the rest (10 per cent) are parts of other units.

About 40 per cent of patent departments have additional duties: supplying scientific and technical information, marketing, and advertising of the institution's developments. This may be connected both with the administration's decision not to dismiss qualified workers of patent departments by redistributing the duties of other reduced services and with the natural process of extending their functions towards commercial realisation of the institute's property.

The volume of financing of patenting and licensing in a higher educational establishment, as a rule, is not large; in 1995 it did not exceed 10 million rubles at most institutions. Only 8 per cent of institutions finance patenting and licensing with more than 50 million rubles. A distribution of financing volumes for institutions in general is given below:

- over 50 million rubles - 8 per cent
- from 10 to 50 million rubles - 36 per cent
- under 10 million rubles - 56 per cent

Figure 10 shows the distribution of volumes for financing patenting and licensing in the higher educational institutions of different regions. The situation is the most favourable at institutions in the Urals region, where the financing volume is noticeably higher. Patenting and licensing is financed worst of all in the Northwest, Central region, South Russia, and Siberia.

Qualification of personnel of patent departments

The majority of employees of patent departments (80 per cent) have a higher technical education and, as a rule, are graduates of the same institution. They are quite familiar with their institute's areas of scientific research and are well acquainted with its professors and scholars, which is very important for their professional activity. Nearly two thirds of employees have specialised patent education, while 4 per cent are patent attorneys of the Russian Federation.

Taking into consideration that the patent departments also have technical workers, it can be stipulated that practically the entire professional staff has higher technical and specialised patent education.

Such a situation is characteristic for all regions (see figure 13 and figure 16) and independent of an institution's size (see figure 15 and figure 18). Quite naturally, at the humanitarian and economic institutions, the qualification level of personnel in the sphere of patenting and licensing is lower (see figure 14 and figure 17).

The regional distribution of the number of Russian patent attorneys at patent departments is noteworthy (see figure 19). The highest percent of patent attorneys was encountered at educational institutions of the Northwestern region. There are no patent attorneys in South Russia, Siberia, and the Far East, which is probably connected with the remoteness of those regions from Moscow and reflects the related difficulties in taking the qualification exams. There are no patent attorneys in humanitarian and economic institutes.

The absolute majority (93 per cent) of heads of patenting and licensing departments have a higher patent education, 15 per cent of them are patent attorneys, and 15 per cent hold a scientific degree of candidate of sciences (technical, as a rule), which reflects their high qualification and professional training.

One indication of a willingness to maintain a high professional level of the employees of patent departments is a subscription to professional journals, such as *Intellectual Property, Patents and Licences, Patent Information* (presently - *Problems of Intellectual Property*). The results of the questionnaire show (see figures 22 and 24) that the majority of educational establishments in all regions subscribe to these journals, although preference is given to the traditional magazines *Intellectual Property* and *Patents and Licences*.

On the whole, the qualification of employees of the patent departments of educational institutions is rather high and can guarantee the solution of new patenting and licensing tasks.

Material and technical supply

In the present survey, material and technical supply covers: office space, existence and quality of personal computers, existence of copying and communicational equipment - e-mail and fax machines.

Most (82 per cent) patent and licensing departments occupy small premises - up to 50 square meters of floor space, while only 3 per cent of departments occupy over 100 square meters.

The technical furnishings of departments are obviously insufficient. Only 40 per cent of them reported having personal computers, most of which are, as a matter of fact, outmoded PC286 and PC386s. A mere 5 per cent of the available computers are equipped with a CD-ROM. Only 38 per cent of departments have copying machines, 32 per cent have fax machines, while e-mail is accessible to 28 per cent of departments.

The most poorly-furnished patent departments were the higher educational institutions of Central Volga, Moscow, and South Russia (see figure 25). Moreover, most of them have outmoded types of computers (see figure 28). On the other hand, despite a generally insufficient quantity of computers, educational establishments in the Northwest, in the Central region of Russia, and the Urals pay attention to supplying the departments with more progressive equipment. It is also apparent (figure 30) that large institutions have a greater opportunity for equipping their departments and modernising the appliances.

E-mail and fax are used more intensively in remote regions - in the Urals and the Far East, as well as Northwest and Central Volga, and least of all in Moscow (figure 31, figure 34).

Information supply

The information supply of patenting and licensing has been traditionally based on official editions of the patent agency, reference materials on foreign patents, as well as patent funds of libraries of Moscow, St.Petersburg, and regional centres of scientific and technical information.

At present, the official editions of Rospatent are delivered as follows:

- the *Bulletin of Inventions*, to 50 per cent of higher educational institutions;
- *Utility Models and Industrial Designs*, to 30 per cent;
- *Trademarks and Marks of Origin*, to 25 per cent.

The reference edition, *Inventions of Countries of the World*, is delivered to only 30 per cent of institutions, while subscription to thematic issues is not high and makes up an average of 10-15 out of 112 issues published by Rospatent VNIPI.

As the institutions of remote regions have less access to patent funds of libraries, they subscribe to more information editions than educational establishments in Moscow, Central and Northwestern regions (see figures 40 and 41).

Surveys reveal that educational institutions have practically no access to world electronic databases of patent information: only 5 per cent of institutions have such an opportunity.

One can conclude that compared to the preceding period and taking into account modern opportunities of world information systems, the information supply of patenting and licensing at institutions of higher education should be recognised as highly unsatisfactory. Institutions will hardly be able to tackle this problem in the near future on their own, which is connected above all with an inadmissibly high cost of Rospatent information editions, including the issues of patent information on CD-ROM, as well as a high price of connection and use of electronic databases.

Training in the field of intellectual property

Surveys revealed that many higher educational establishments (74 per cent) conduct training in the field of legal protection and commercial realisation of intellectual property. This concerns not only technical, but also humanitarian institutions. Different forms of training are employed:

- compulsory education - 59 per cent;
- optional training - 17 per cent;
- elective study - 24 per cent.

The training is conducted for different categories of students:

- full-time students - in 22 per cent of institutions;
- post-graduate students - 17 per cent;
- professors - 20 per cent;
- experts (re-training) - 16 per cent.

On the whole, all institutions of higher education (with the exception of South Russia) make quite vigorous attempts to conduct education in the sphere of intellectual property (see figures 44 and 45).

There is no certainty, however, that this training bears a mass character. It is noteworthy that institutions with a moderate number of students are most active in this respect, while large colleges include this course in the educational process less frequently (see figure 46).

The distribution presented in figure 47 makes it possible to evaluate the extent to which educational institutions of different regions train corresponding categories of students. The data presented reflects the percentage of the region's institutions where some category or other of students are trained. On the whole, the main bulk of trainees consists of full-time students.

The quality of training is affected by the attraction of employees of patenting and licensing departments to the educational process. Unfortunately, patent workers participate in the educational process in only 50 per cent of institutions. The situation is more favourable in the Urals, the Far East, and the Northwest (see figure 50), and not so good in South Russia, the Central region, and Moscow.

Proposals of higher educational institutions for the development of patenting and licensing

As part of the questionnaire, educational institutions were asked to formulate proposals on solving problems of developing patenting and licensing. The proposals received reflect the most acute problems concerning the organisation of patenting and licensing, their financing, advanced training of personnel, material and technical provision and information supply of patent departments, as well as training of students. The greatest concern is caused by insufficient budgetary support for patenting and licensing, namely: foreign patenting, rewarding authors, receiving patent information, and paying a good salary to employees.

As far as the retraining of patent workers is concerned, it is proposed to organise seminars for training and the exchange of experience, to obtain experience in the patent services of foreign universities, and to organise and finance the training of patent attorneys in regions.

In the opinion of educational institutions, the lack of modern technical equipment strongly interferes with the development of patenting and licensing. In particular, it prevents the use of modern information technologies. It is proposed to ensure purposeful financing or grant privileges in the use of world electronic databases of patent and scientific-technical information, and information on CD-ROM. In the sphere of education, it is suggested to include the course Intellectual Property in compulsory programmes for training students of technical specialities.

Conclusion

An analysis of the survey results suggests that the current level of organisation and support for patenting and licensing at higher educational institutions does not satisfy contemporary needs.

Specialised patent and licensing departments exist at only two thirds of educational institutions, which reflects a recent reduction, for previously practically all technical institutions had such departments. Staffing at patent and licensing departments was also reduced to an average of one to four people.

A considerable share of patent departments carry out additional functions, such as supplying scientific-technical information and marketing and advertising of the institute's output. This trend should be evaluated as a natural process.

The professionalism of departments remains high. Most employees have patent training. Patent attorneys have appeared on the staff of departments, which is evidence of a high professional level and opens new opportunities for protecting the institutes' rights to objects of industrial property. It is apparent

that patent workers are willing to maintain their high professional level, as they eagerly participate in seminars and subscribe to normative-methodical literature.

The financing of patenting and licensing at higher educational institutions is on the whole low.

Technical support of patent departments obviously does not conform with contemporary requirements: many departments have no computers, nearly two thirds lack copying equipment and fax machines, and there is practically no opportunity to use remote databases and information on CD-ROM.

The supply of higher educational establishments with patent information has noticeably deteriorated and continues to languish. For instance, only one third of institutions have an opportunity to use the reference information, *Inventions of Countries of the World*.

One unexpected result of the survey was the high share of institutions that conduct training in the sphere of legal protection and commercialisation of intellectual property. Educational institutions use different forms of training, and teach different categories of trainees: full-time students, post-graduates, professors, and retraining experts. Only half of the colleges conducting such training attract employees of patenting and licensing departments to the educational process.

At the same time, the survey uncovered a great interest of institutions of higher education in developing patenting and licensing, which is demonstrated by their active response to the questionnaire. Taking into consideration the remaining high potential of many patent departments, there are grounds to hope that appropriate managerial effort from the Russian Goskomvuz, financial and technical support, as well as methodical support, will stimulate the proper development of patenting and licensing in institutions of higher education.

Figure 1. Disposition of institutions of higher education in different regions of Russia

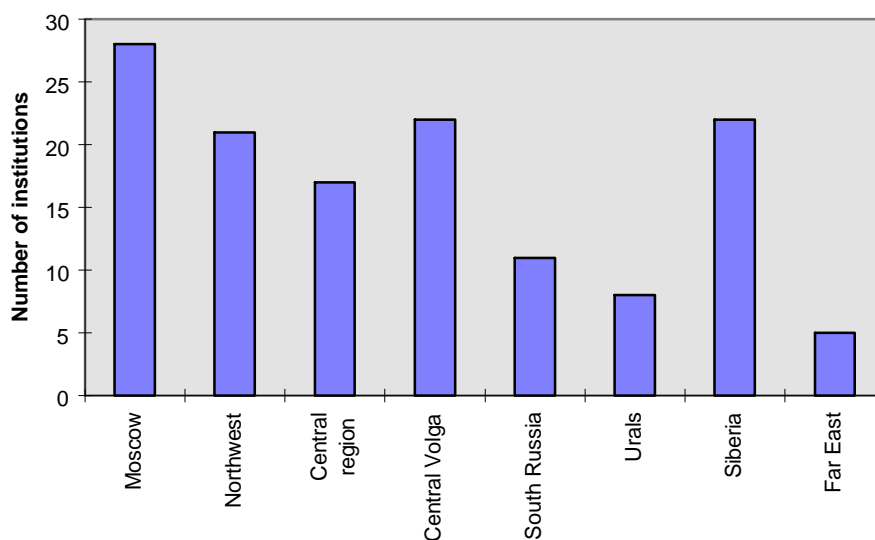


Figure 2. **Disposition of institutions according to educational specifics**

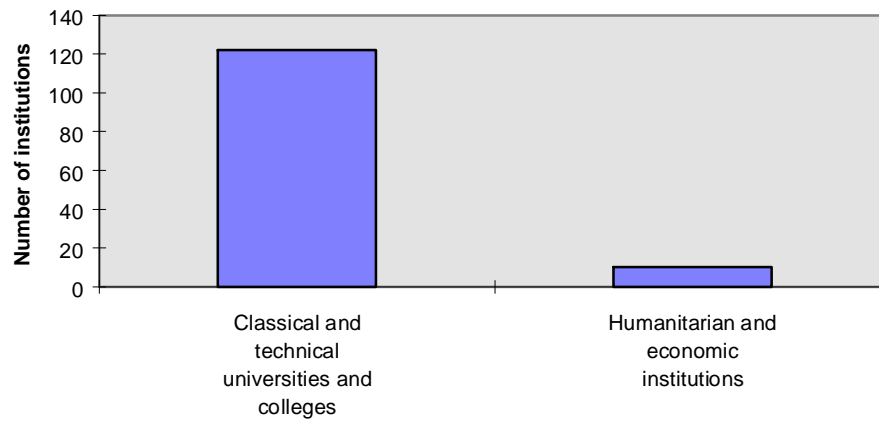


Figure 3. **Disposition of institutions according to the number of students**

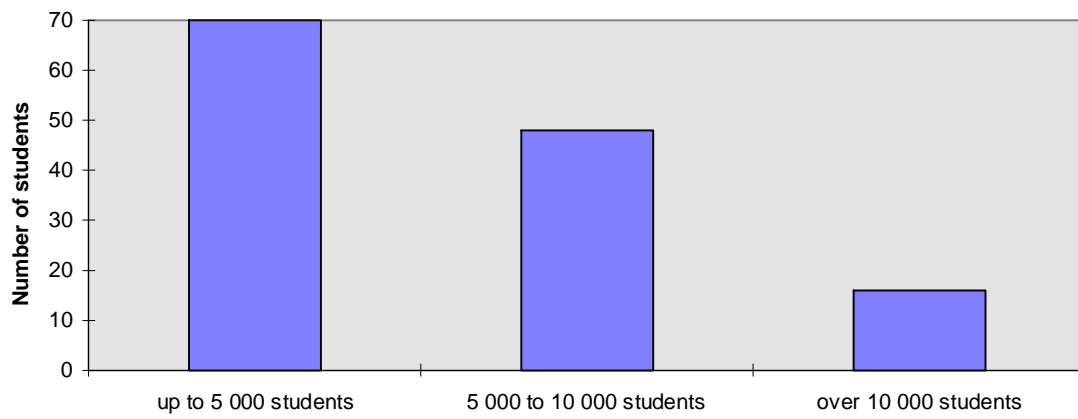


Figure 4. Existence of patent departments in different regions

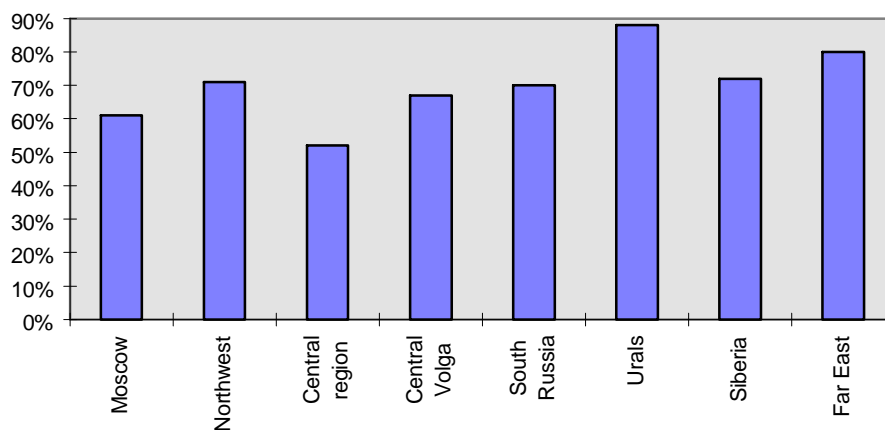


Figure 5. Existence of patent department by type of establishment

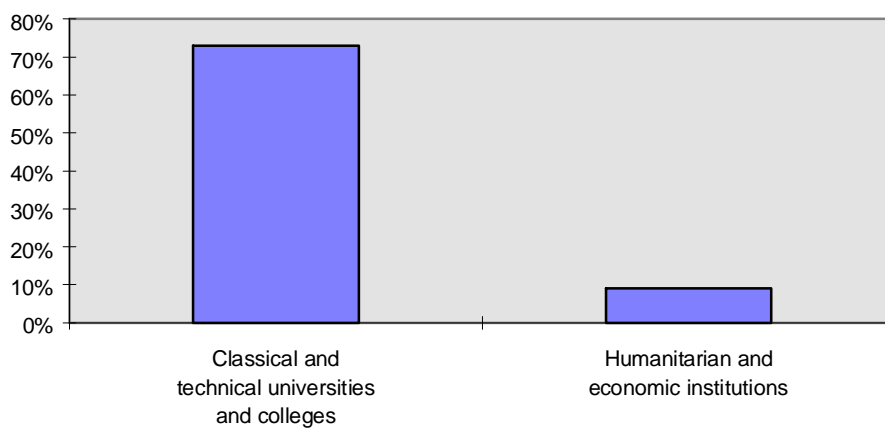


Figure 6. Existence of patent department by size of establishment

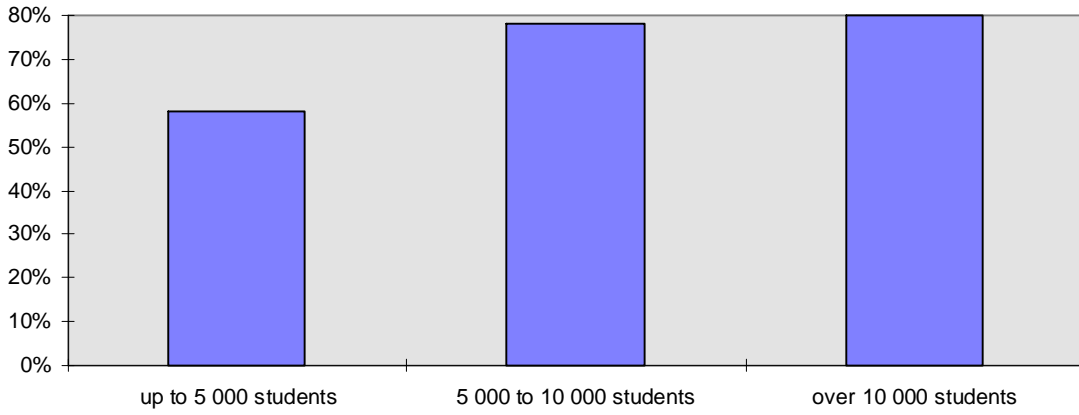


Figure 7. Number of employees in patent departments by region

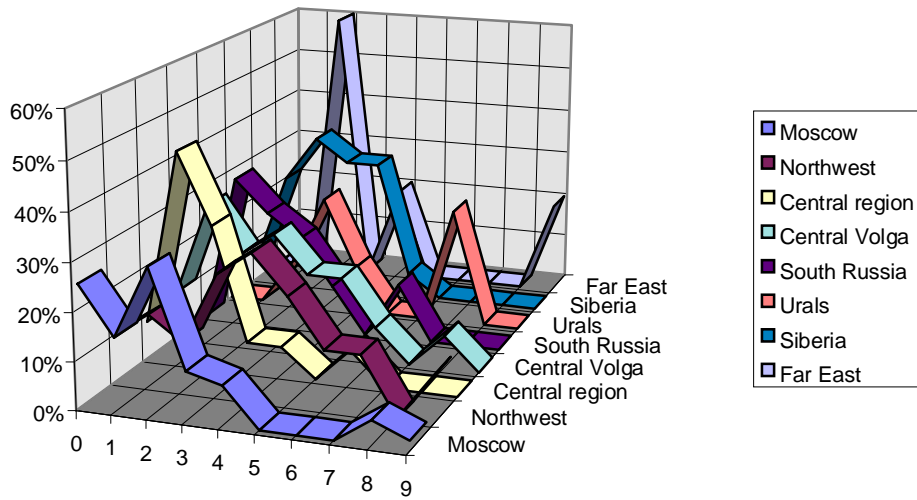


Figure 8. Spread of number of employees in patent departments

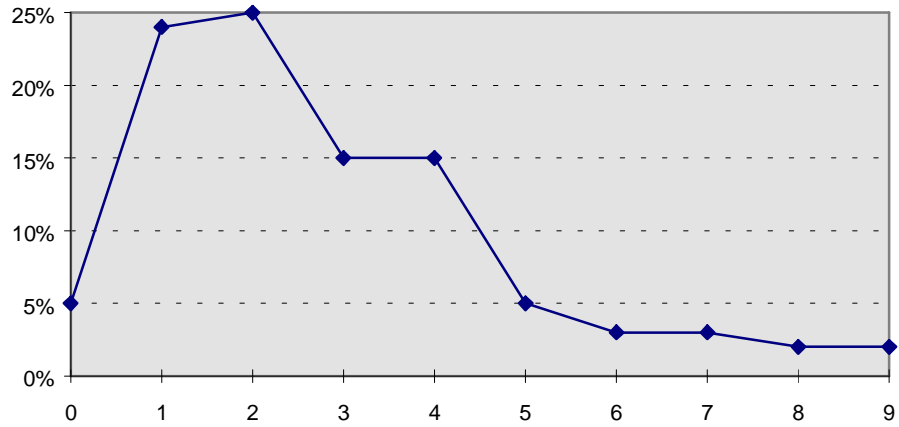


Figure 9. Number of employees in patent departments by size of institution

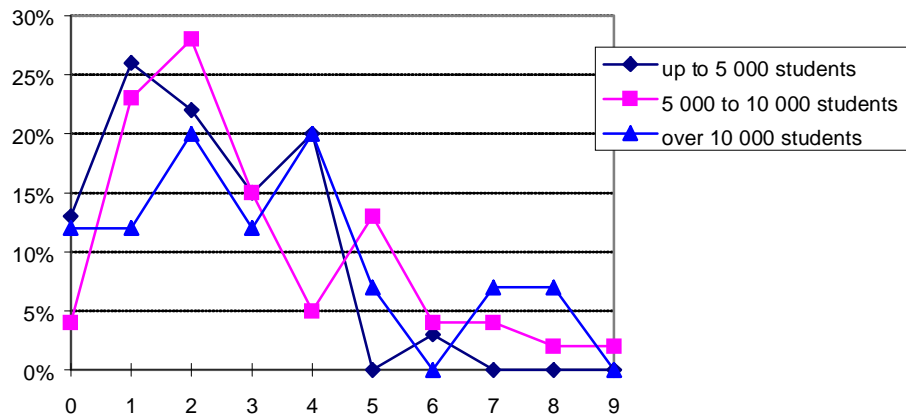


Figure 10. Volume of financing

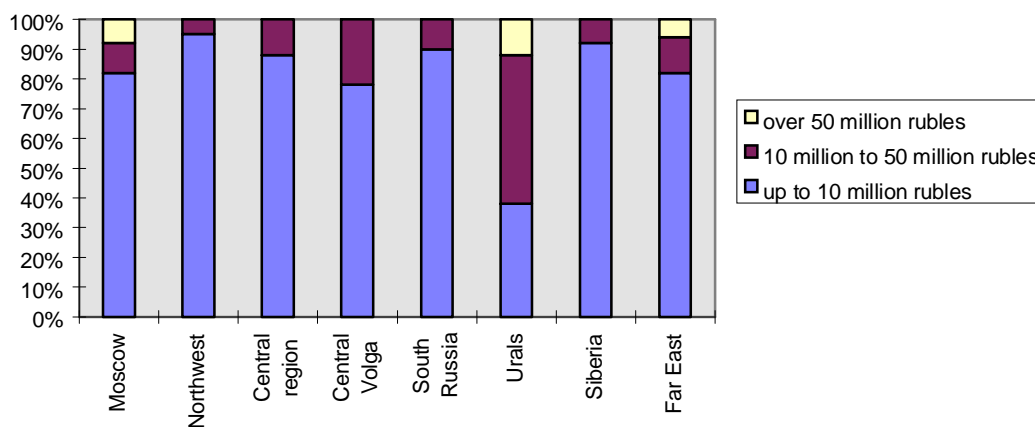


Figure 11. Volume of financing of classical and technical universities

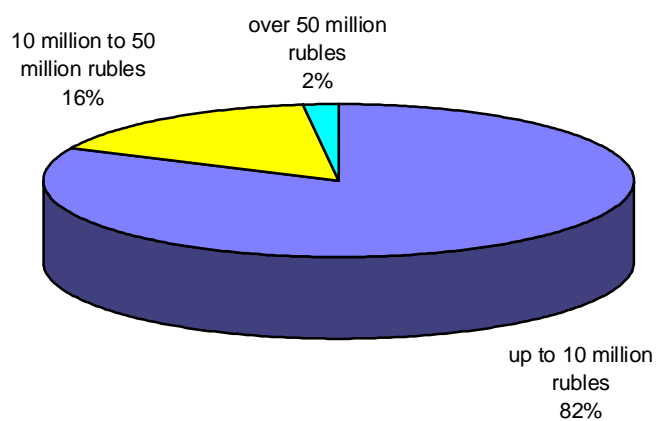


Figure 12. Volume of financing by size of establishment

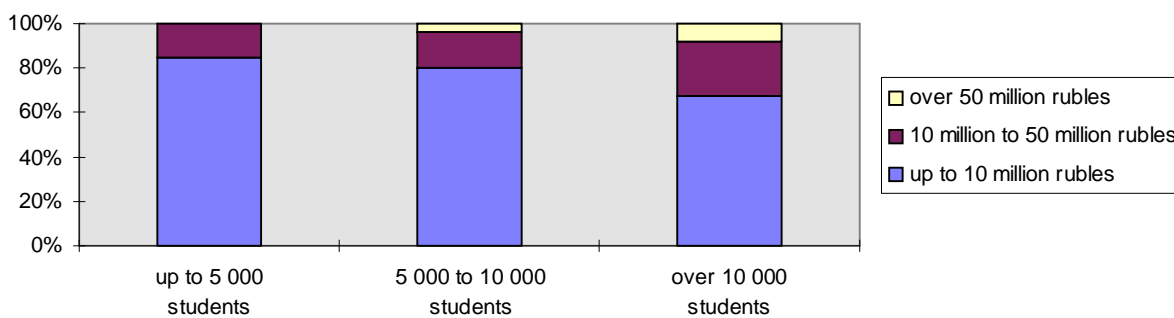


Figure 13. Number of employees with technical education by region

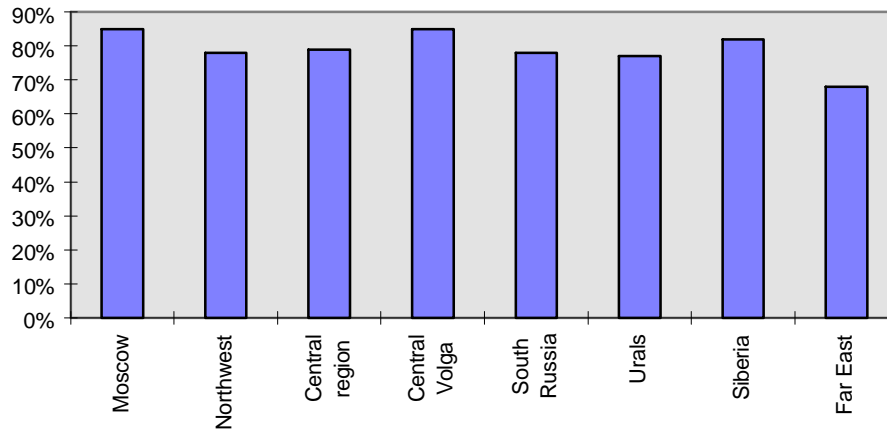


Figure 14. Number of employees with technical education by type of establishment

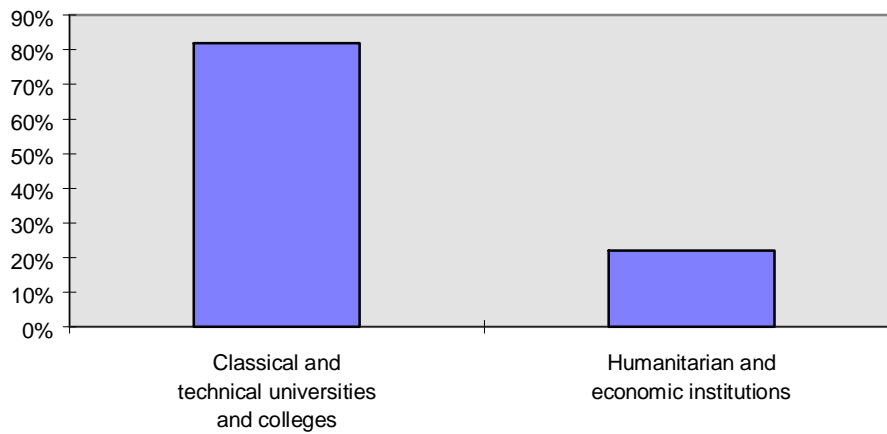


Figure 15. Number of employees with technical education by size of establishment

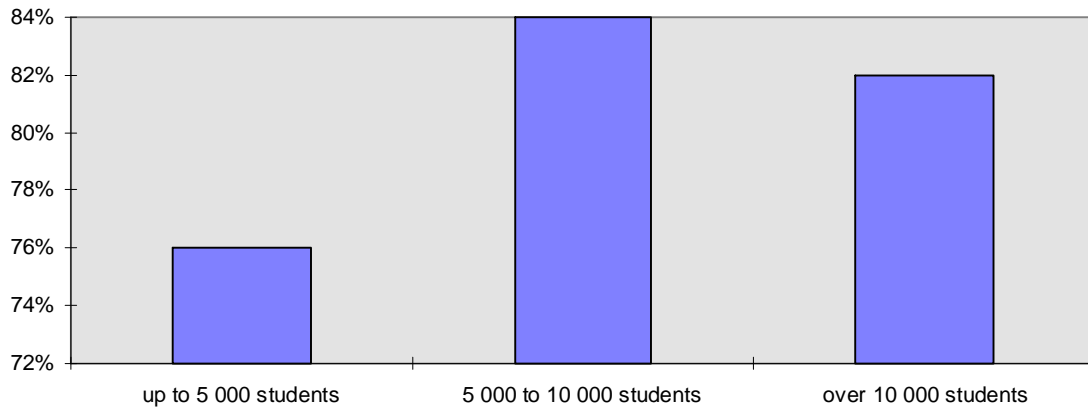


Figure 16. Number of employees with patent education by region

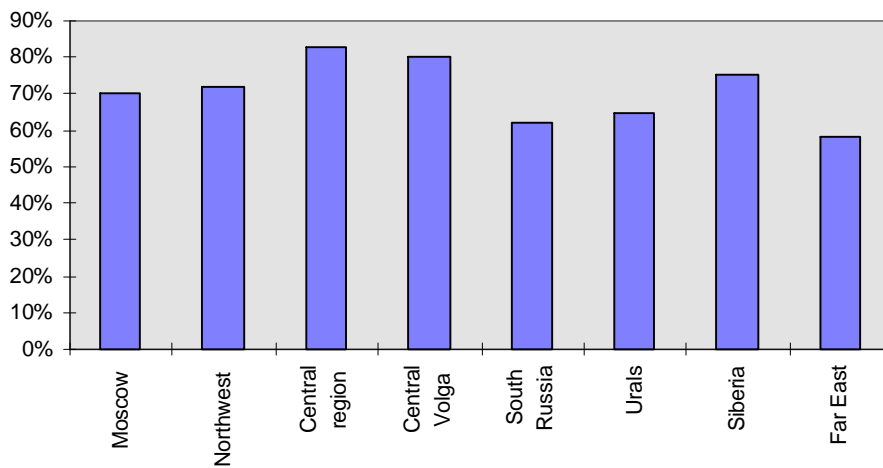


Figure 17. Number of employees with patent education by type of establishment

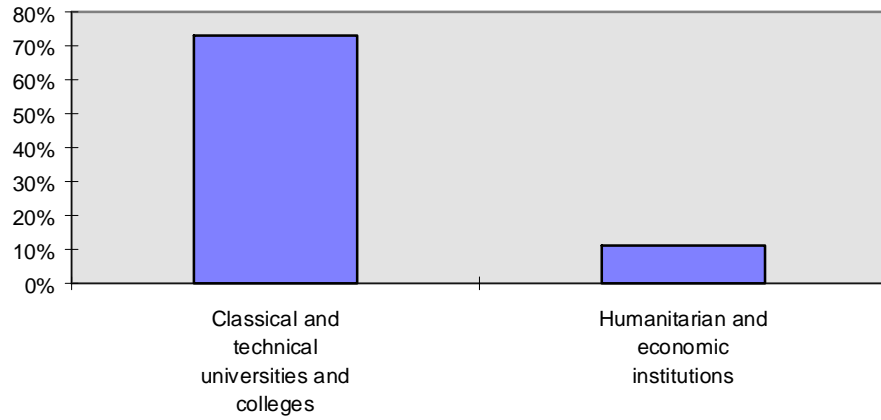


Figure 18. Number of employees with patent education by size of establishment

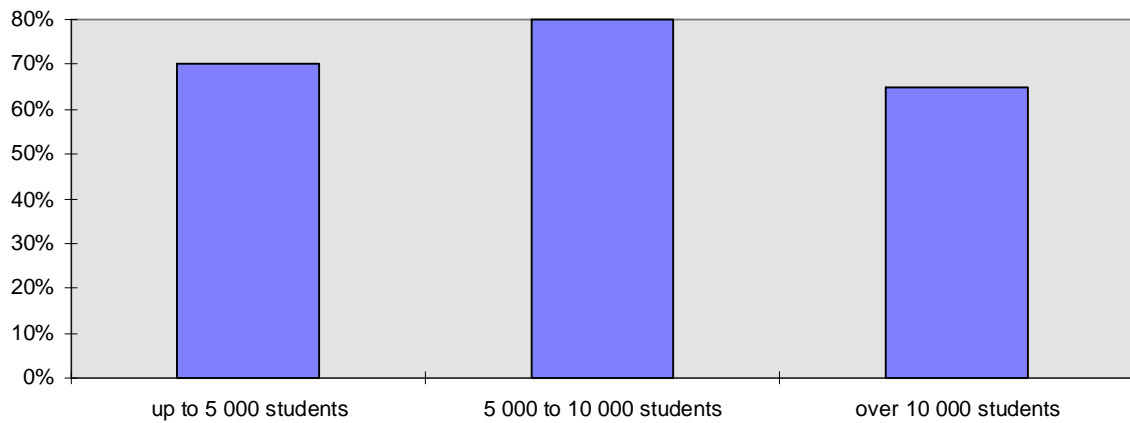


Figure 19. Number of patent attorneys in departments by region

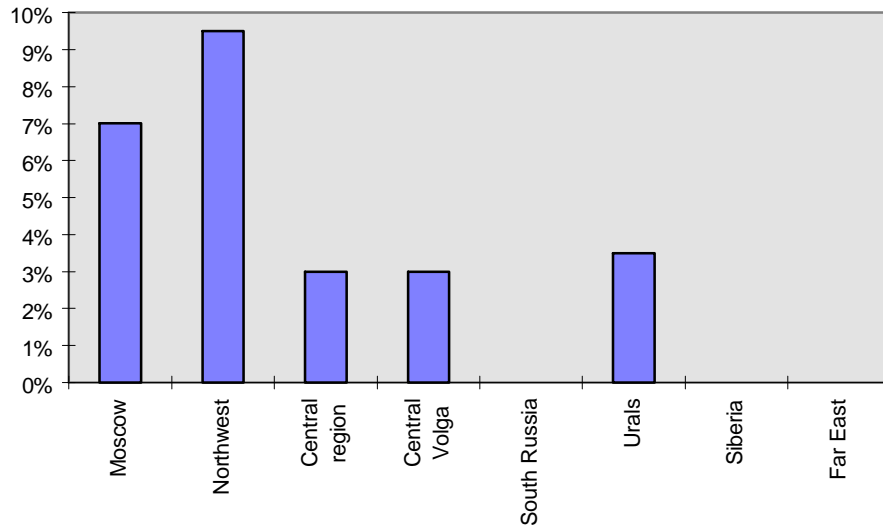


Figure 20. Number of patent attorneys in departments of classical and technical universities and colleges

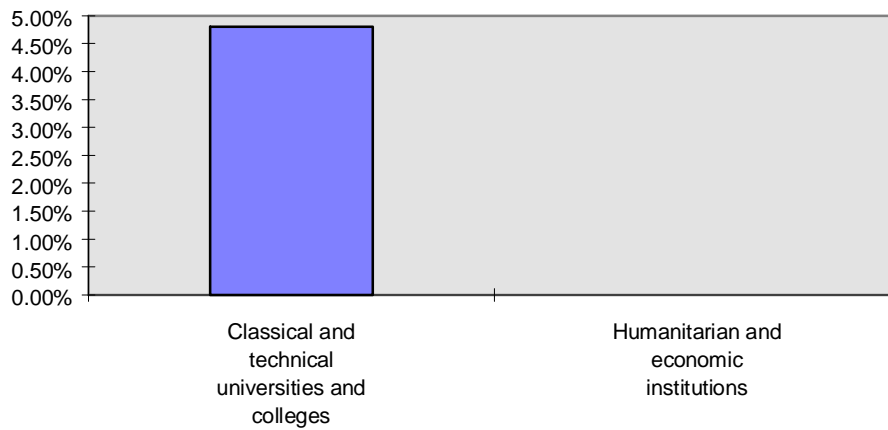


Figure 21. Number of patent attorneys in departments by size of establishment

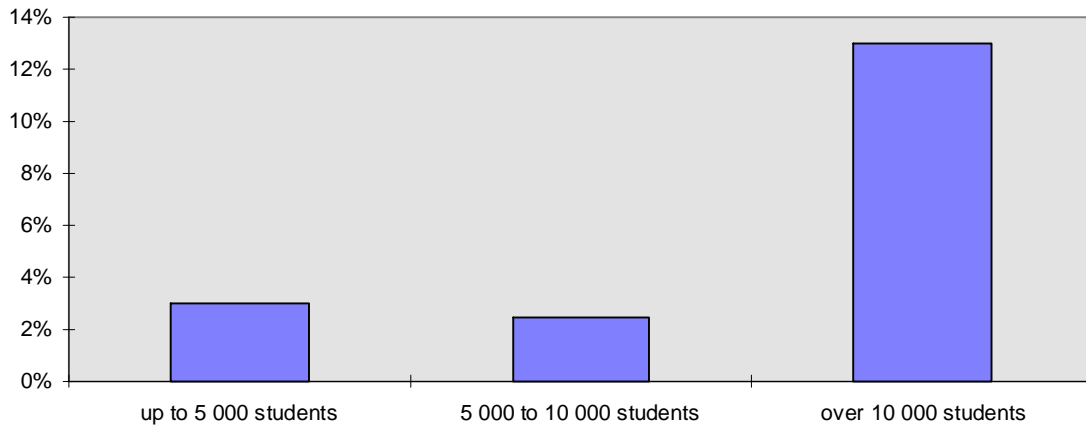


Figure 22. Availability of professional journals by region

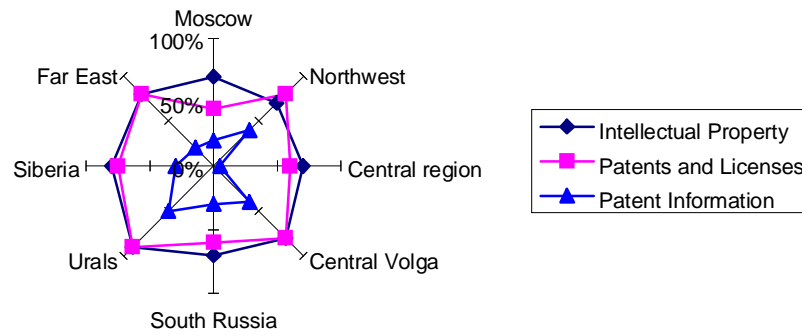


Figure 23. Availability of professional journals by type of establishment

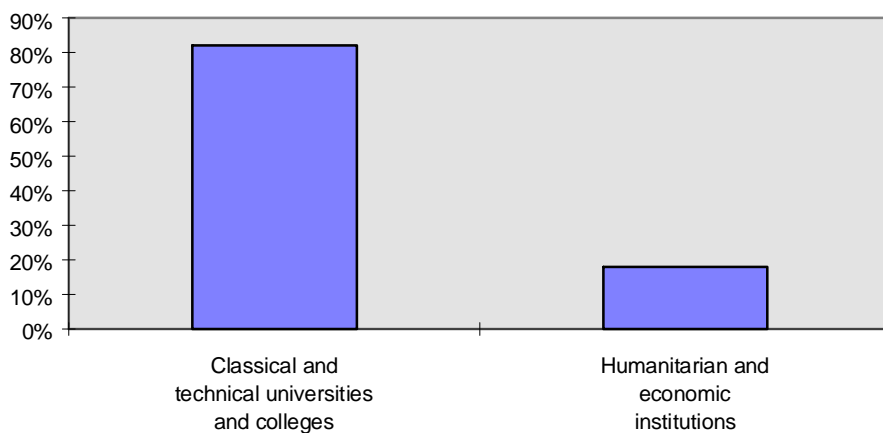


Figure 24. Availability of professional journals by size of establishment

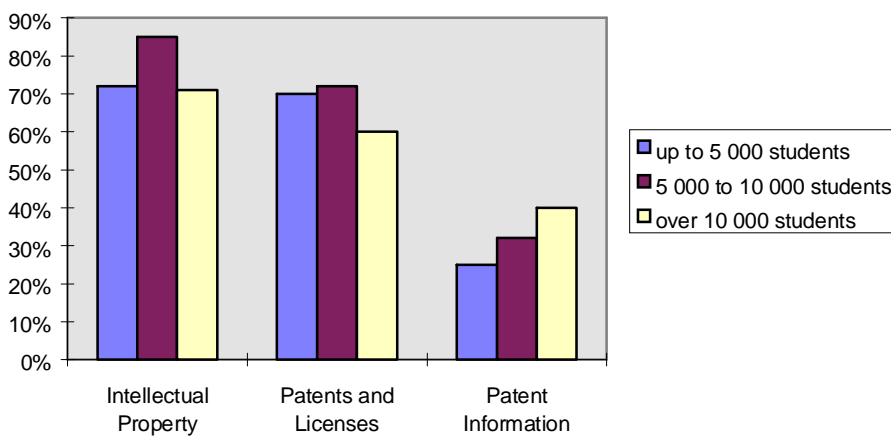


Figure 25. **Departments equipped with computers by region**

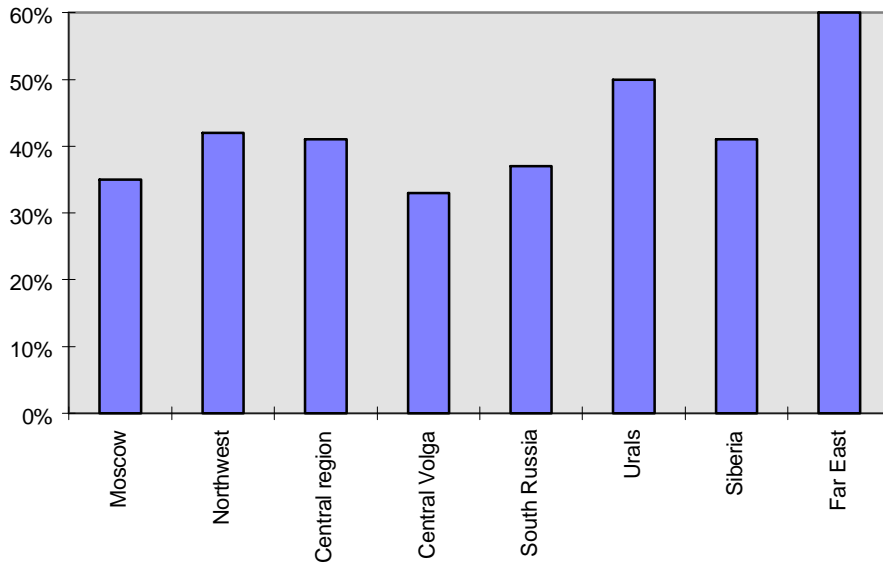


Figure 26. **Departments equipped with computers by type of establishment**

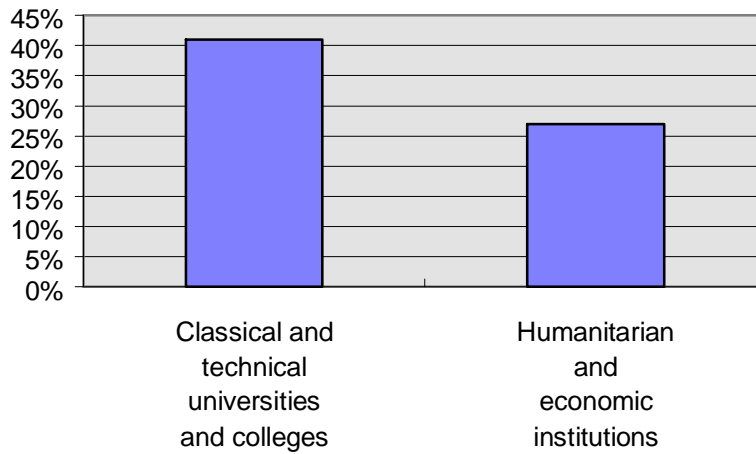


Figure 27. Departments equipped with computers by size of establishment

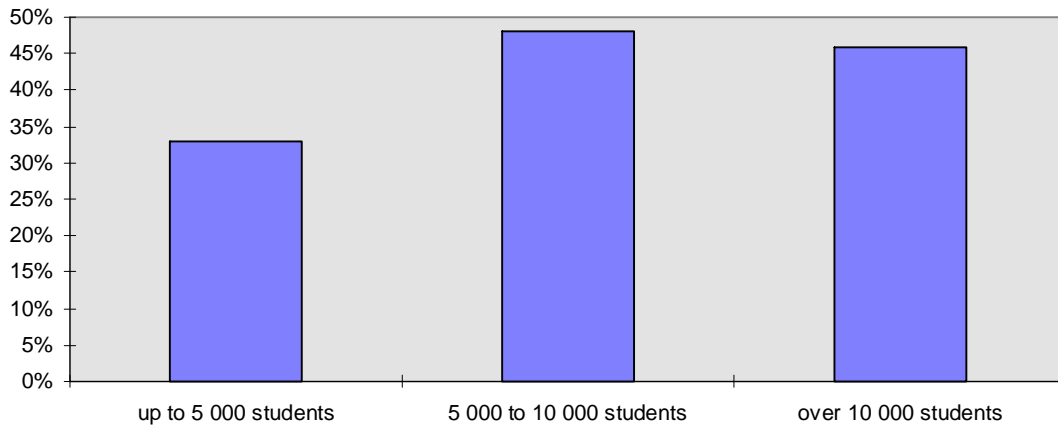


Figure 28. Types of computers in departments by region

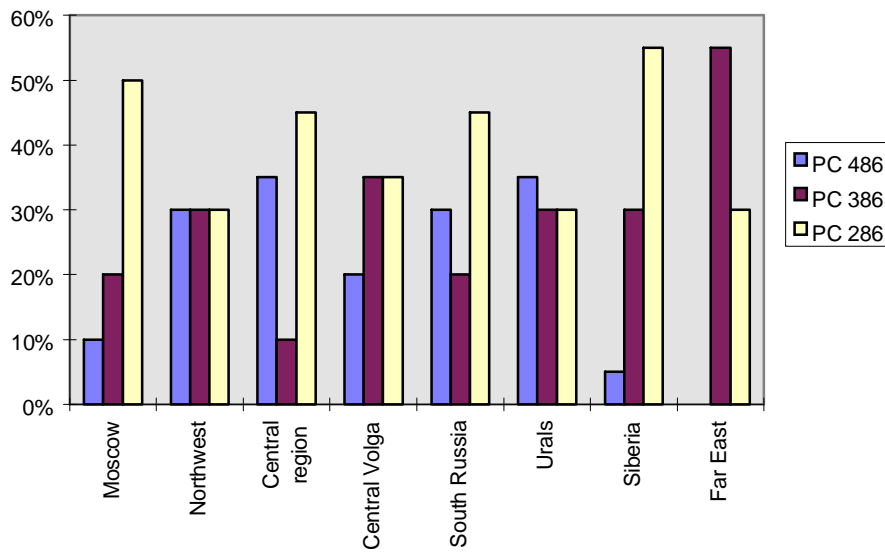


Figure 29. Proportions of types of computers in departments

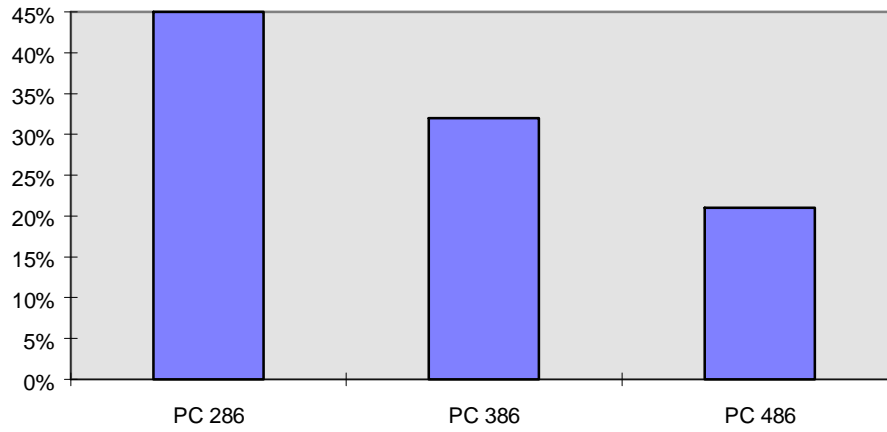


Figure 30. Types of computers in departments by size of establishment

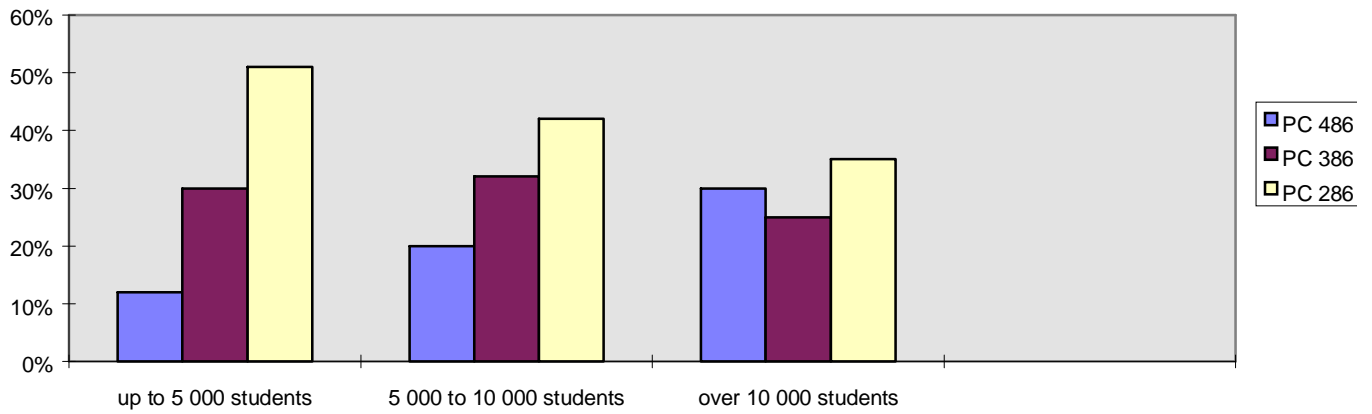


Figure 31. Departments equipped with e-mail by region

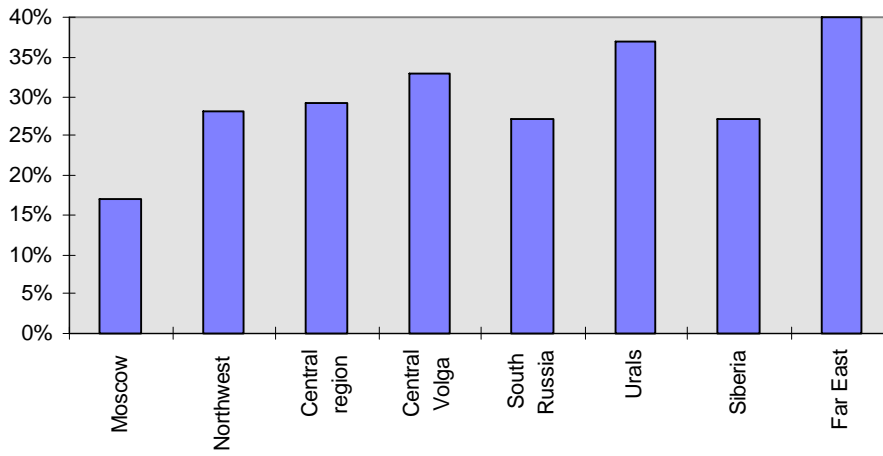


Figure 32. Departments equipped with e-mail by type of establishment

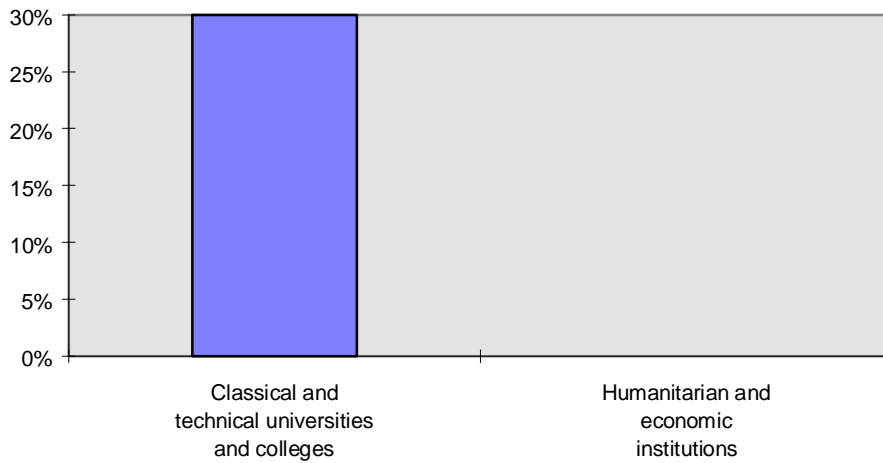


Figure 33. **Departments equipped with e-mail by size of establishment**

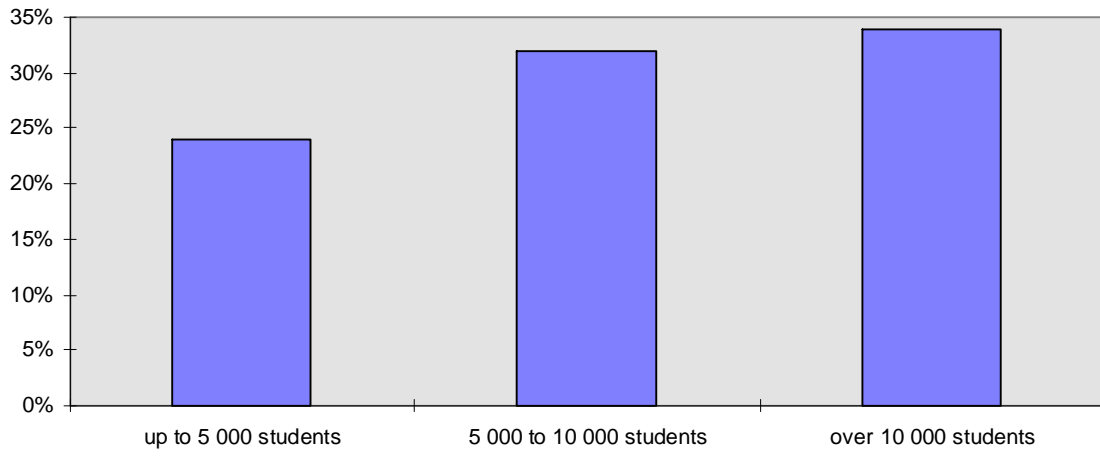


Figure 34. **Departments equipped with fax machines by region**

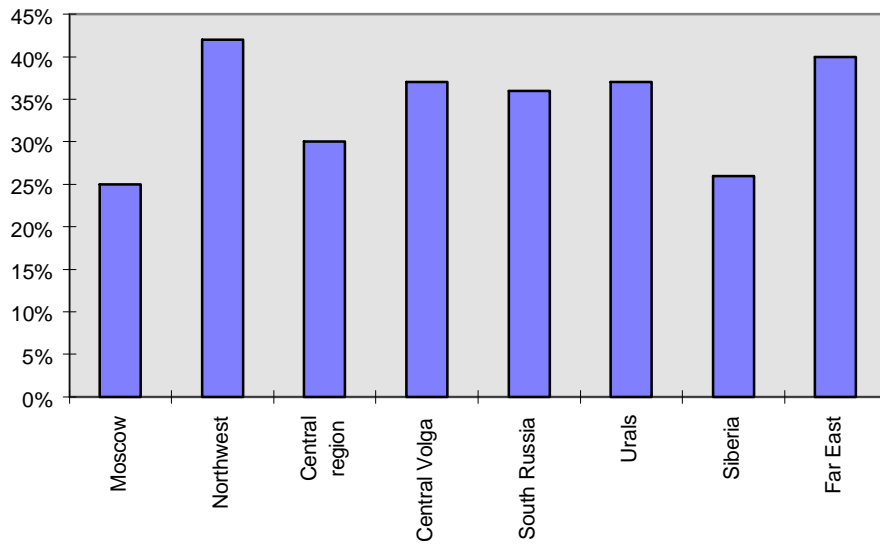


Figure 35. **Departments equipped with fax machines by type of establishment**

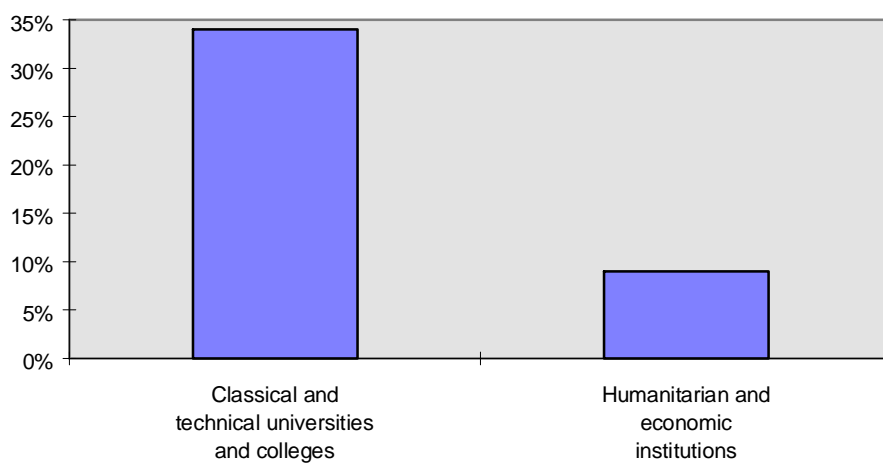


Figure 36. **Departments equipped with fax machines by size of establishment**

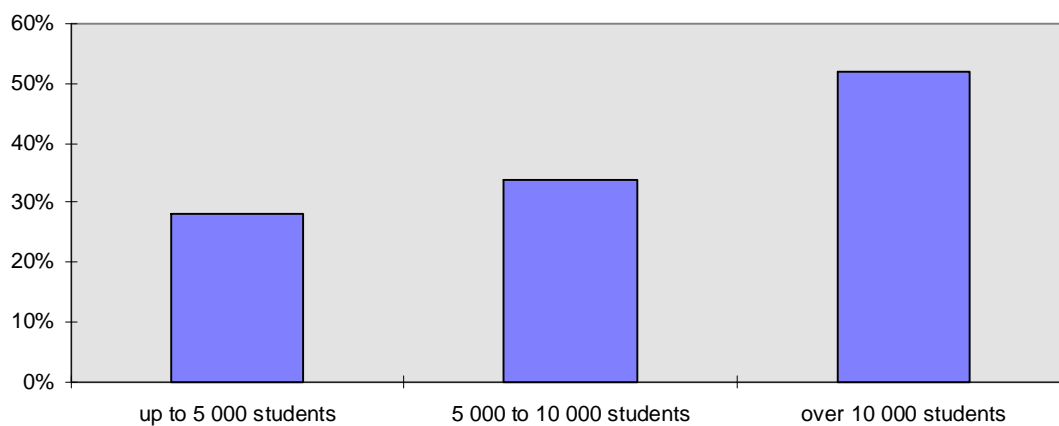


Figure 37. Departments equipped with copying machines by region

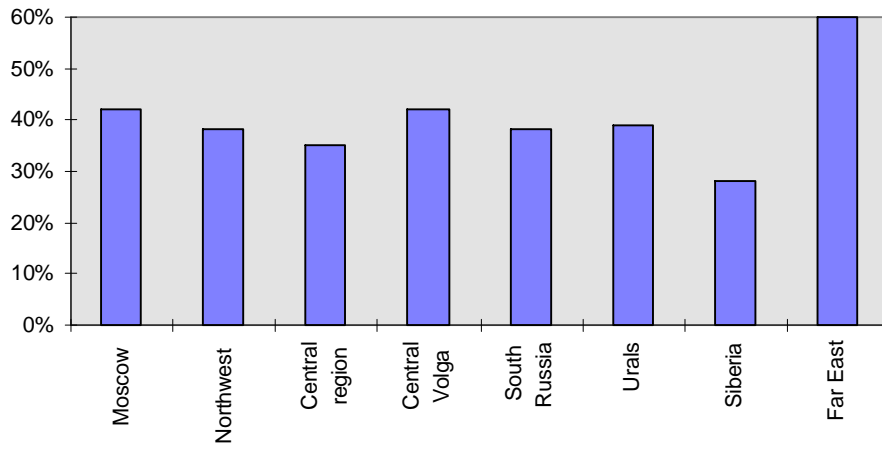


Figure 38. Departments equipped with copying machines by type of establishment

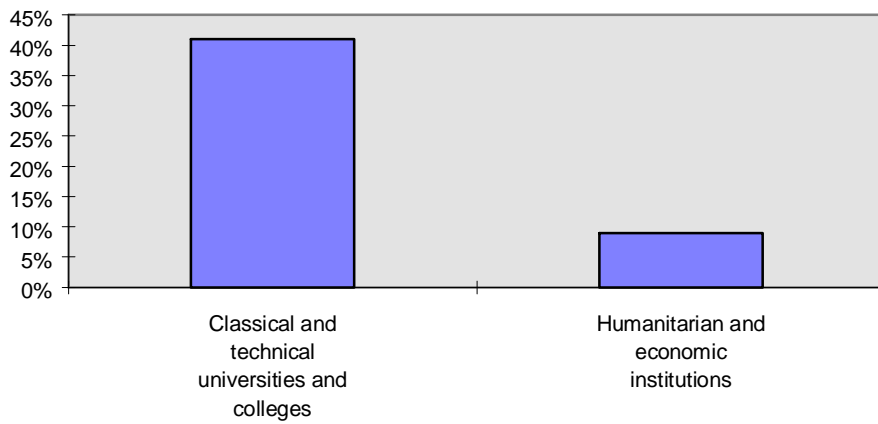


Figure 39. **Departments equipped with copying machines by size of establishment**

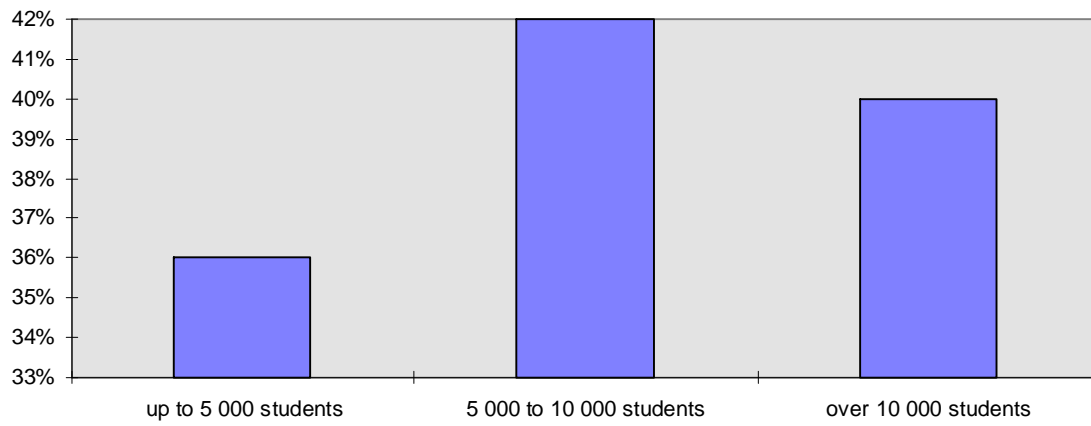


Figure 40. **Availability of information: *Inventions Bulletin***

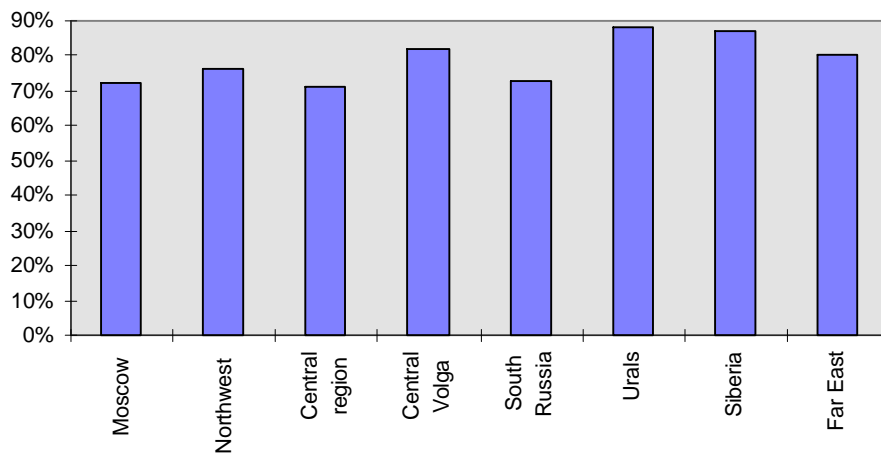


Figure 41. Availability of information: *Inventions of Countries of the World*

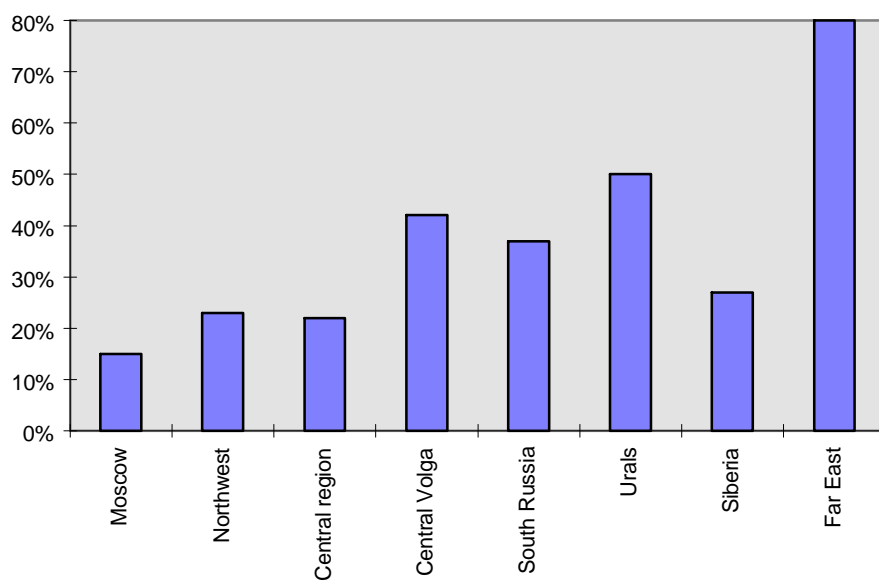


Figure 42. Availability of information by size of establishment: *Inventions Bulletin*

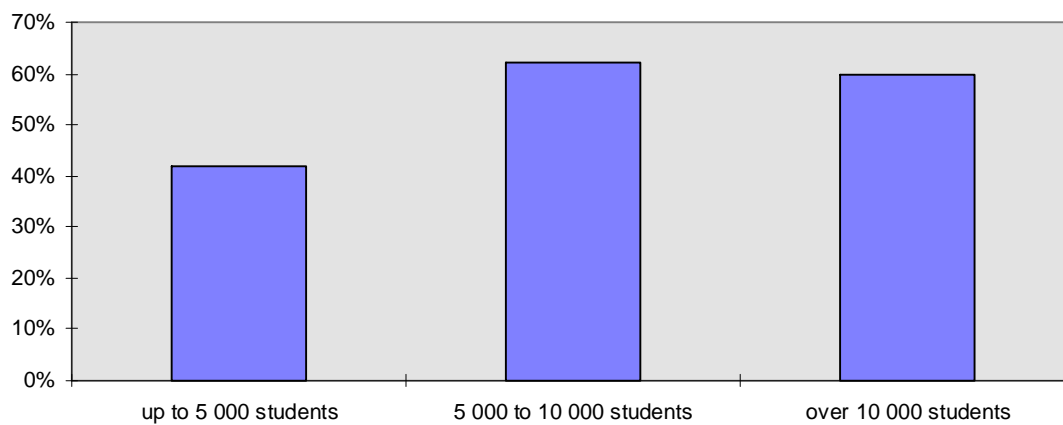


Figure 43. Availability of information by size of establishment:
Inventions of Countries of the World

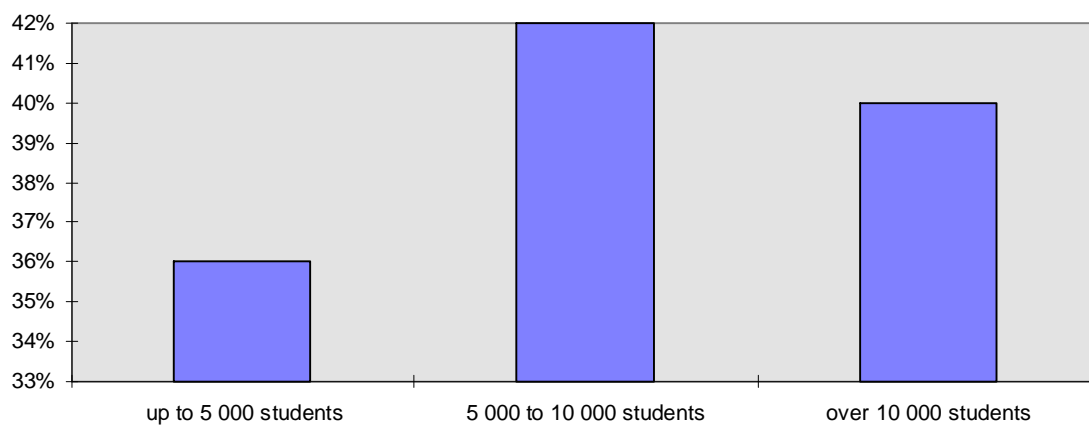


Figure 44. Training in the sphere of intellectual property by region

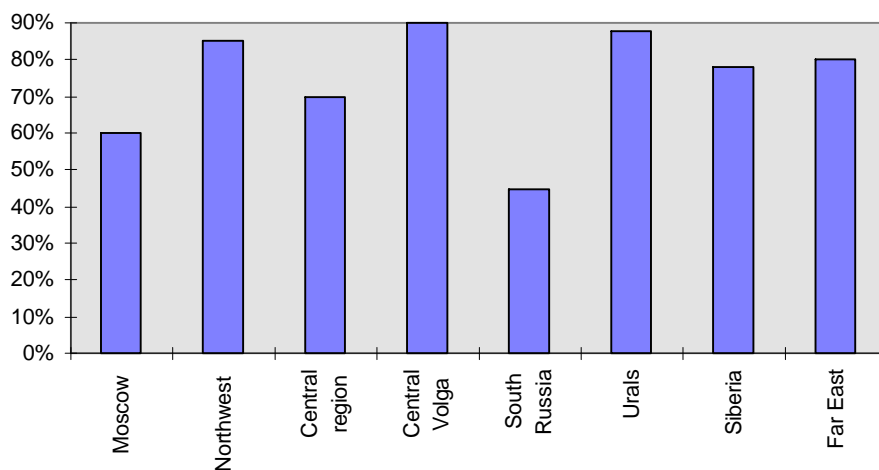


Figure 45. Training in the sphere of intellectual property by type of establishment

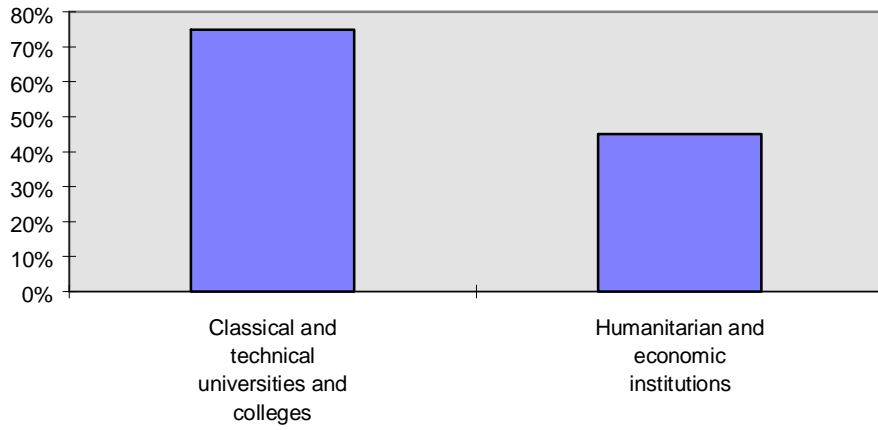


Figure 46. Training in the sphere of intellectual property by size of establishment

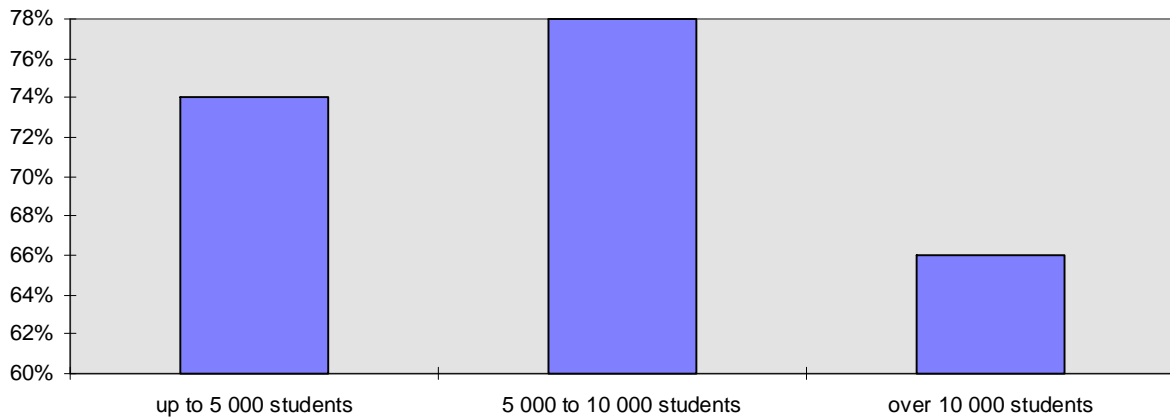


Figure 47. Categories of trainees by region

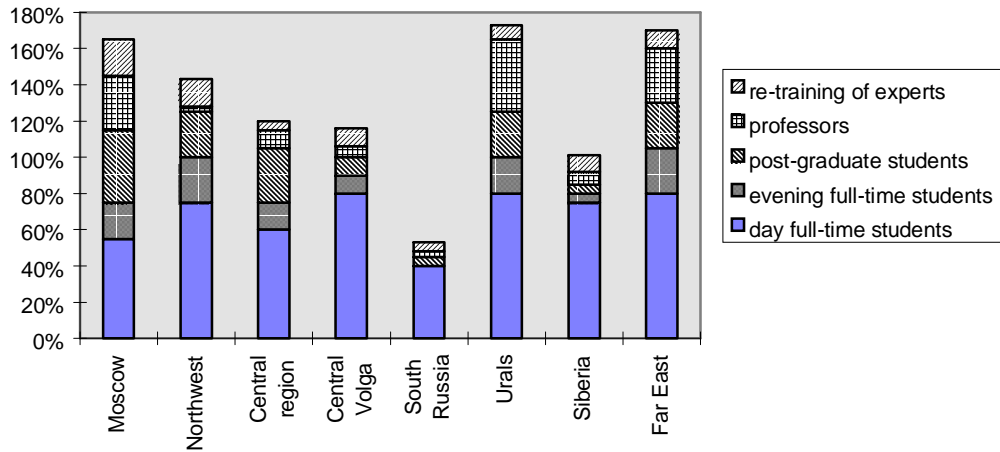


Figure 48. Categories of trainees by type of establishment

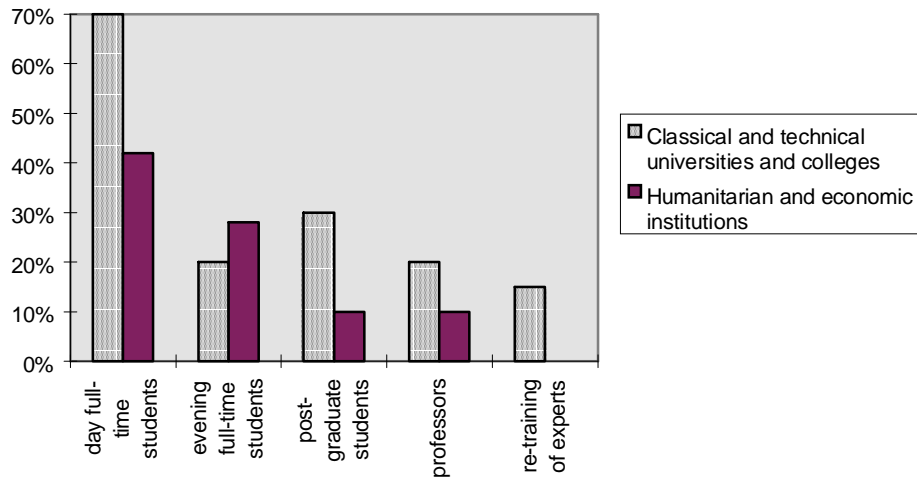


Figure 49. Categories of trainees by size of establishment

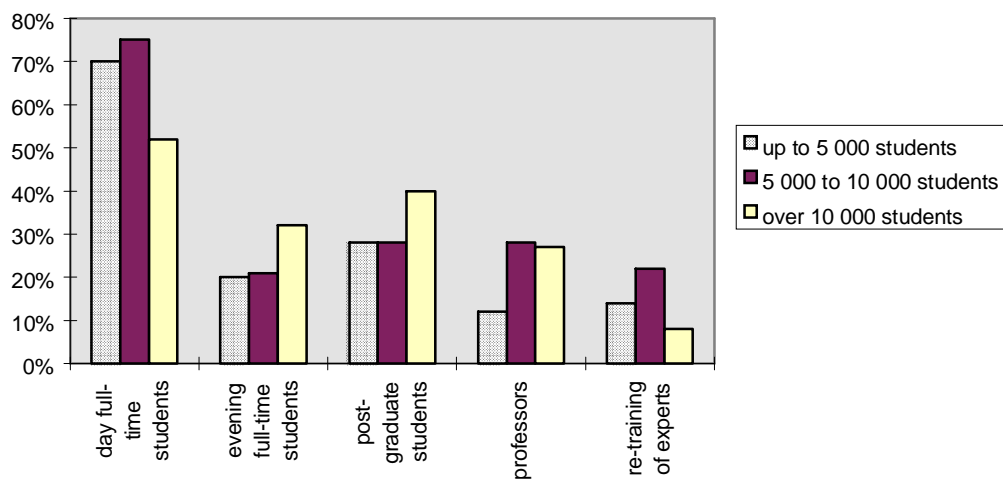


Figure 50. Participation of department employees in education process by region

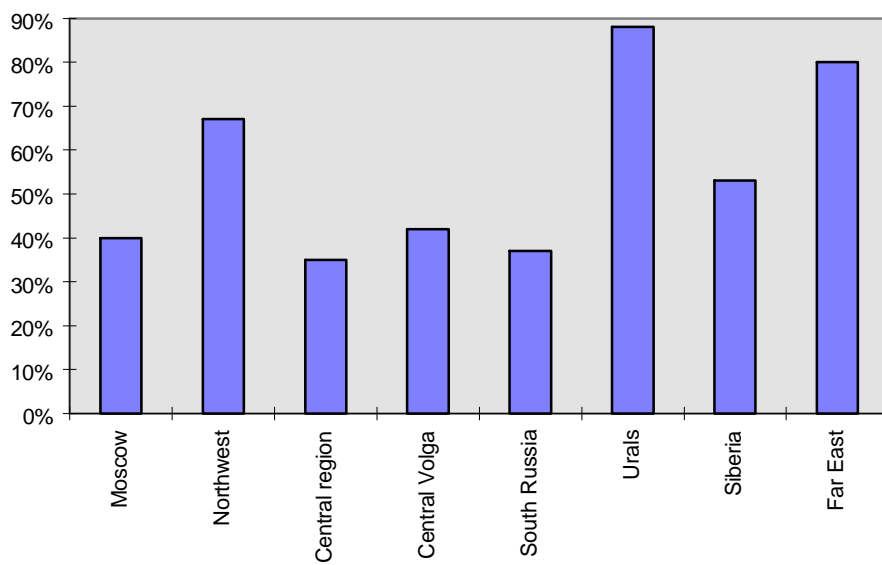


Figure 51. **Participation of department employees in education process by type of establishment**

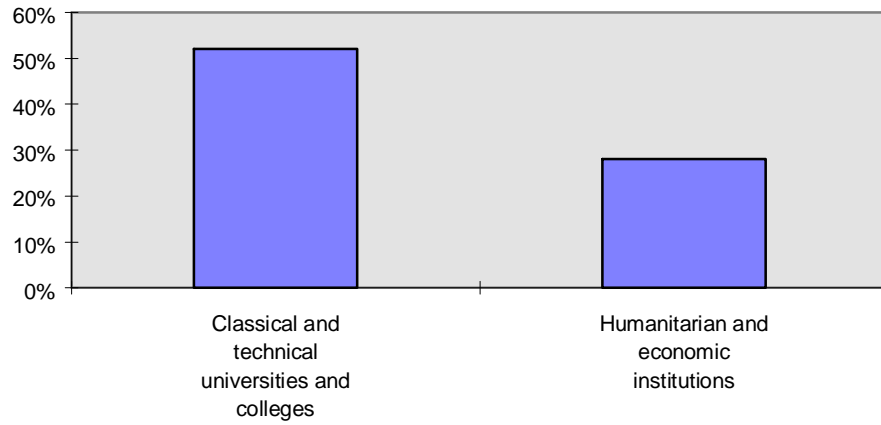
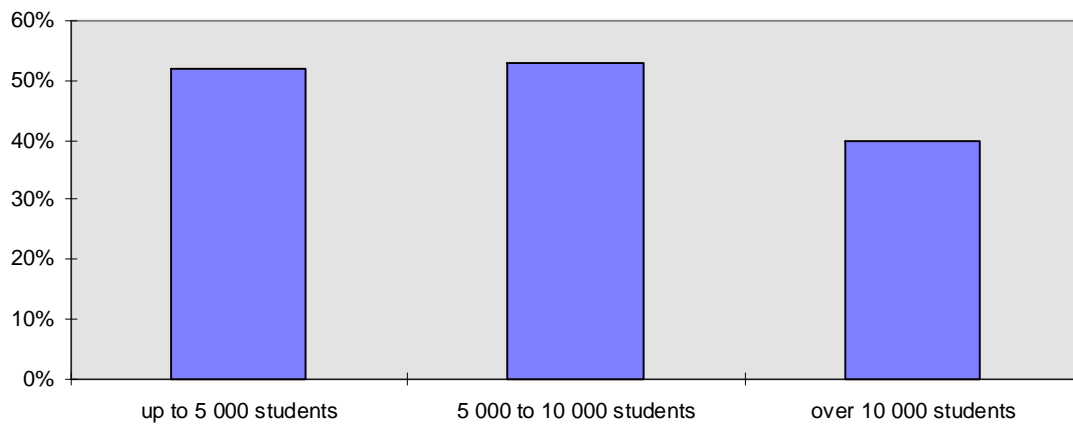


Figure 52. **Participation of department employees in education process by size of establishment**



TITLE, OWNERSHIP OF DATA, OBLIGATIONS OF EMPLOYEES (EMPLOYEE AGREEMENTS)

*by Alexander Von Föner
Föner Ebbinghaus Finck, Munich*

Who is the owner of an invention? In the context of intellectual property rights, who owns data, and how is the relationship between employer and employee governed? Laws on patents and inventions in practically all countries stipulate that an invention belongs to its author. The very word "author" is evidence that this principle is based on the right of authorship, i.e. the right to the created object belongs to its author. The author is entitled to sell his "masterpiece" to publishers both before and after its creation. And being an artist, he can hand his creation over to a gallery, an exposition, or sell it to a private collector.

In Soviet times, the invention belonged to the author, but the right to use the invention and to exploit the objects created belonged to the state. As a result of privatisation carried out in the Russian Federation, Russian legislation presently also regulates relations between employer and employees. But how do things stand in this sphere abroad?

Being German, I would like to focus on German law, as it is close to me. Beginning in 1937, Germany had, besides patent legislation, also a law regulating the rights of an inventor working as an employee - the so-called "Arbeitnehmererfinderrecht." It is impossible, however, to apply this law with respect to all employees. An exception is made, for example, for independent inventors, including professors at higher educational institutions, doctors, etc. These occupations fall into the category of state employees, i.e. officials, and the aforementioned German law does not concern them. This relates to the existence of two categories of employees in the FRG:

- ordinary employees who work at enterprises, firms, companies, etc. ("Angestellte");
- state employees discharging the functions of officials ("Beamte").

Officials who are employed at universities have the status of independent inventors. Independent inventors may defend their ideas anyway they choose, at their own discretion. They do not need to coordinate their intentions with institutions, universities or state bodies and departments, and may act at their own risk.

But this also has a negative aspect. Whenever an independent inventor decides to apply for a patent, he should bear in mind that he will have to cover all expenses connected with obtaining a patent -- be it state duty, royalties of patent attorneys -- from his own pocket. Of course, he may seek the financial support of various foundations. In Germany these foundations do not belong to the state and include, for example, the "Frauenhofer-Stiftung" foundation. When such a foundation agrees to cover his expenses,

the inventor, as a rule, surrenders his rights to the foundation and receives an allowance as soon as money is collected from the sale of the invention or from its licensing.

What are relations between employer and employee like? They are regulated rather strictly by legislation, and employers (firms, enterprises, plants, factories, etc.) have no need to conclude special contracts with employees. Employees are simply hired and paid a monthly salary for their work.

When an employee invents something during his work, or even outside work, he is obliged to inform his employer in writing. The employer must notify the employee within a certain period of time about his decision, for example, that he is interested in the proposed invention and intends to organise a broad advertising campaign both in Germany and abroad. There is a special term for this in German: "uneingeschränkte Inanspruchnahme," which means "unlimited right to use an invention." However, if the employer is restricted in his actions, he may inform the employee that he is interested in non-exclusive use of his invention.

This concerns all inventions, whether created by an employee at his work place, in his kitchen, or anywhere else. But this provision cannot be applied to independent inventions, i.e. inventions which are not included in the sphere of interest of the employer or the sphere of activity of the employee. It goes without saying that this is a very debatable area, as many different situations may arise, leading to a conflict of interest between employer and employee. For instance, large enterprises frequently concentrate their production in several technological sectors at a time, about which the employee may have had absolutely no idea.

Following the notification of the employer, but not later than four months after he receives the letter from the employee, all rights pass from the inventor to the employer, who must pay a certain remuneration to the hired inventor. The size of the remuneration is calculated according to special parameters.

After receiving the rights to the invention, the employer becomes committed to submit a patent application. If he does not, the right to file an application automatically passes to the employee who created the invention. After the invention becomes "independent," the employee may submit a patent application himself, at his own expense. If the employer does not wish him to do so, they may agree, by mutual consent, on the payment of a certain compensation.

In some instances the employer, after submitting the application to a Patent Department, comes to the conclusion that it is unprofitable for him to pursue proceedings on the case. In such cases he must notify the inventor about his decision to give the matter up at any stage of the expertise, and if the patent has already been issued, consequently, about the payment or non-payment of annual duties. Having received a notification, the inventor, in his turn, is empowered to re-register the patent application on his own account. The same goes for the right to the initial submission of an application abroad with a request for priority on national application.

Determining the parameters for the calculation of the size of the remuneration is a special procedure. If a dispute arises between the employer and the inventor, the inventor may file an official petition with the Arbitration Commission of the FRG Patent Department, which consists of three members who shall consider the demands of the applicant. Two members of the commission are experts in the sphere of the invention, i.e. they are specialists in technology, and they examine patent applications in the field of their professional activity. The commission is headed by a lawyer. The commission's decision, which in fact is a proposal rather than a decision, may be contested in the Civil Court.

Not everything which is created at firms or state institutions can be qualified as an invention. It is worth mentioning, for instance, the right to computer data, laboratory files, or recordings of a similar nature. All rights can be divided into the right of authorship and the right to use the invention, which belongs to the employer.

Another important aspect is the fact that there are proposals on the European level which have not yet entered into force. Any interested person may, for example, familiarise himself with a researcher's work, comparing the German legislation with the European proposal and with the legislations of a number of countries, including the former Soviet Union, CIS states and Russia.

German law is closest to Russian law. In France, the invention belongs to the inventor or his legal successor. If the invention is created by an employee, the right to the invention passes over to the employer who must pay a certain compensation to the employee if he wishes to acquire the right to the invention. This bonus should by no means be part of the employee's monthly salary.

All inventions which cannot be classified as inventions resulting from relations between the employer and the employees ("Angestellte" category), are independent inventions. If a dispute arises, specifically concerning the amount of compensation, organisations such as the Arbitration Commission or the Supreme Court of France, the "Tribunal de Grand Instance," join in the argument.

In Great Britain, the right to an invention belongs to the inventor. The inventor is entitled, by means of a contract, to hand his invention to the employer either automatically, or individually, in each particular case. The owner of data is always the author, if it is not stipulated otherwise by a labour contract. The question of whether the invention is included in the sphere of the inventor's work is decided in accordance with a corresponding article of the contract concluded between the employer and the employee. In other words, if an invention is part of the employee's job, the invention is the property of the employer.

The higher the post of the inventor, the broader is the range of his duties. For example, a managing director can practically never be the author of an independent invention. He is too deeply involved in production technologies, and therefore, must observe confidentiality. All his inventions would indisputably be regarded as inventions of the enterprise itself. An exception can perhaps be made when the director is a cook whilst the company is engaged in electronics.

In Holland it would appear that the inventor is always the owner of the invention. If the inventor is an employee, in certain cases the employer may claim the right to the invention, i.e. in cases when invention is the employee's professional duty. If the employee listens to lectures in universities, institutes, colleges, or participates in the work of scientific research institutions, the priority right to the invention belongs to those universities, institutes, colleges, research institutions, etc.

The situation is similar in Denmark, where the right to the invention belongs *a priori* to the inventor. However, if he is an employee, his employer is empowered to claim the right to the invention. Here, too, the inventor must report the invention to the employer and give him a certain period of time to decide whether he is interested in the invention or not. If the decision is positive and the employer claims the right to the intellectual object, he must pay a remuneration to the employee, the size of which may give rise to heated debates.

The situation in Sweden is identical to Denmark. In the beginning, all rights belong to the inventor, and later they pass over to the employer if an invention falls into the sphere of the inventor's professional duty. There are also borderline cases, when the employee can issue a license to the employer.

It should be mentioned that labour legislation in Sweden is based on the principle of loyalty. This means that any information on entrepreneurial activity, no matter its nature, must remain secret, and the employee has no right to divulge it.

Moreover, the inventor must in any case inform his employer of all his inventions. In practice it means that if the employee wants to keep his job, he should report all his inventions.

But the law is one thing, and real life is quite another. I have already touched upon confidentiality, and it is clear that the inventor must observe it. But nevertheless, there still exists a possibility that an employee may start divulging secret inventions in the press. Besides, he may be tempted to submit some patent applications without permission, which may one day surface in another country. All this is quite probable.

Unfortunately, I did not get information on all European countries, as not all our colleagues answered my questions. But I have one more report - from Italy, where the invention also belongs to the inventor. But if the inventor is an employee and invention is one of his professional duties, the invention belongs to the employer. According to the law, the company does not have to pay any special remuneration to the inventor, who is merely entitled to being mentioned in the patent document. In other words, the inventor should already envisage instances which may occur in connection with creation of an invention during the signing of the labour contract, including a reservation on the payment of bonuses for an invention.

The employer is empowered to notify the inventor of his interest in the invention, even if it does not fall into the sphere of the employee's activity. But in such a case the employer would have to pay a remuneration if the invention is in some measure connected with the employer's production. As for the rights to data ownership, there is no such law in Italy.

In Norway, the right to the invention belongs to the inventor. However, if he is an employee, the right to the invention passes over to the employer. This rule does not spread to professors and doctors, employed in universities, or other scientific personnel.

As for the rights to data, they are covered by the right of authorship. This concerns computer programmes, data bases, word processors and other software. It is necessary to bear in mind that software is not included in the patent law.

THE ECONOMIC RATIONALE OF THE PROTECTION OF INTELLECTUAL PROPERTY RIGHTS AND THEIR ENFORCEMENT

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Introduction

The focus of this paper is primarily an economic one. It is descriptive rather than analytic, and it presupposes certain prior knowledge of the key elements of the market economies' system for the protection of intellectual property. Since there are important differences between national regimes, I shall not refer to any specific national system, but rather deal with the economic implications of a stylised system of intellectual property rights.

There is no universally valid definition of intellectual property. One frequently used in international trade negotiations within the framework of the past Uruguay Round described intellectual property as information that derives its intrinsic and also commercial value from creative ideas. Intellectual property rights (IPRs) are conferred on owners of ideas, inventions and creative expressions that have the status of property. Like material property, IPRs give owners the right to exclude others from access to or the use of their property. The legal instruments for protecting IPRs include patents, copyrights, trademarks, industrial designs, utility models and geographical indications.

In market economies, the commercial value of an IPR is ultimately determined by market forces. For the owners of IPRs, to appropriate the commercial value, a national IPR regime must provide effective protection. This depends also on the means of enforcement provided.

The principal tenet underlying all IPR regimes, which is that protection stimulates research, technological innovation and creativity, can be traced back to the late 16th century. So-called invention privileges granted by feudal lords were a preferred means of mercantilist economic policies. They had a dual nature; on the one hand invention privileges conferred on the inventor/innovator a temporary exploitation monopoly to create, introduce and utilise a novel technique; on the other hand they exempted from the obligation to join a craft guild or from other occupational restraints. This amounted to a kind of occupational freedom which introduced a measure of competition into the old ways of doing business by the traditional craft guild system.

To this day, any IPR regime faces the challenge to strike a proper balance between conferral of exclusivity and nurturing competition. The former allows individuals and companies to enjoy the benefits of their creative efforts, the latter enhances innovation, economic growth, and living standards. Adequate IPR protection and enforcement favour the allocation of resources to technological development.

Given the constraints on time, the following deals with patents only, leaving aside copyrights, the other major type of IPR. Both are becoming ever more important, as economies progressively shift to more knowledge-intensive growth.

To demonstrate the economic benefits of patent protection and its enforcement, three levels of aggregation will be distinguished: the firm level, economy-wide effects and the international dimension. The latter will be explored by highlighting key economic effects of the Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) that came into force on July 1, 1995. It is also helpful to distinguish between market-induced and infringement-induced obsolescence of a patent.

The firm level

In the field of technical design patents are rightly viewed as catalysts of technological innovation. Patents transform technical knowledge into an economic commodity. However, as has been noted, patents cannot add significant value to a worthless technology or product. They enhance the rewards appropriated - the "innovation rent" - from some valuable innovations. In other cases patents virtually play no role. In a 1994 survey of German SMEs with in-house R&D activities, only one third of the respondents said they used patents to protect their industrial property. Another third relied on secrecy, pointing to the high cost of litigation. The last third answered they introduced innovations faster than their competitors, the life-cycle of their products being on average not much longer than the time required for a successful patent application in Europe (about 2 $\frac{1}{2}$ and 3 $\frac{1}{2}$ years). Across industries, the propensity to patent is most pronounced in pharmaceuticals, agri-chemicals, bio-technology and, to a lesser extent, in machine-tools.

As regards enforcement, a study in several EU-countries has shown that more than two thirds of all patent litigation brought before the courts are filed by SMEs. This underscores the importance of patent protection and efficient legal enforcement instruments for this particular group of entrepreneurs to defend their industrial property against infringement. In contrast and compared with the number of patents they own, larger firms and corporate enterprises file less patent infringement suits to protect their innovations. Apparently, they have other means of defence commensurate with their bigger market power.

According to estimates by the EU-Commission infringement in the wide sense of the term (technical infringement, trade-mark copying, piracy) represented between 3 % and 5 % of world trade at the end of the 1980s, and for France alone an annual loss of revenue of about 1 billion US\$.

To illustrate the economic impact of patent protection it is useful to proceed in steps. A first one consists in deriving a synthetic measure of the overall net benefits from a patented innovation for an entrepreneur or a firm, by identifying the principal cost and revenue elements. In a second step the net benefits of selling the innovation in a freely competing market will be compared with a market protected by a patent. Infringement is explored in a third step. The reasoning will be supplemented by a number of graphs.

Innovation may start with an invention or with applied research. The ensuing process can be decomposed into several - successive or parallel - stages: specification, development, prototype or pilot plant, tooling and manufacturing facilities, manufacturing and marketing start-up, and sales. To simplify matters, the costs associated with each of these stages are lumped together here into three blocks, corresponding to three economically distinct periods of the innovation process. The gestation period comprises the time from project-inception to completion including prototyping, the attendant R&D costs being denoted by C_{R+D} . The application period covers manufacturing and marketing start-up, with the attendant costs denoted by C_{M+M} . The exploitation period begins when revenue from sales or license income starts to flow.

Under the "first-to-file-principle", the innovator will file his patent application as early as possible in the gestation period. Patent application fees and annual renewal fees required to keep the patent alive during the exploitation period are denoted by C_{P+R} . One of the major risks encountered by a successful innovator is that his product/process will be copied by competitors. When this happens, the entrepreneur will defend his patent, incurring litigation costs denoted by C_L .

Turning to the revenue side, the innovator earns a return either through net revenues from sales (net of production and marketing costs), denoted by U_N ; or by license fees and non-monetary returns collected from other firms that lease the innovation, denoted by U_F .

Pulling together these revenue and cost elements into a notational net revenue function F , one gets a simple form

$$V(R_N) = F(C_{R+D}, C_{M+M}, C_{P+R}, C_L, U_N, U_F, T).$$

$V(R_N)$ represents the discounted value of net revenue accruing from the innovation over its statutory exploitation period T . Obviously,

$$\frac{\delta F}{\delta C_{R+D}}, \frac{\delta F}{\delta C_{M+M}}, \frac{\delta F}{\delta C_{P+R}}, \frac{\delta F}{\delta C_L} < 0, \text{ and } \frac{\delta F}{\delta U_N}, \frac{\delta F}{\delta U_F} > 0.$$

Empirically, each stage of the innovation process, whether successive or parallel, involves progressive costs, often increasing in geometrical order: $C_{R+D} : C_{M+M} : C_{P+R} = 1 : 10 : 100$.

Provided a "good patent" is obtained and no infringement occurs, the appropriable revenues from its commercial exploitation will validate the total investment and return a proper profit.

However, even without infringement, revenue from a patented innovation will decline eventually, following the well-established life-cycle pattern of launching, growth, maturity, saturation, decline and obsolescence (fig. 1). Yet unlike traditional capital goods, the empirically observed pattern of "decay of appropriability" derives not from any decline in the physical productivity of knowledge, but from market-induced obsolescence.

Two distinct though related factors pertaining to the market evaluation of knowledge play a crucial role:

- Firstly, since the very use of new knowledge in any productive way will tend to spread and reveal it to other economic agents, as will the mobility of scientific personnel, it is difficult to maintain the ability to appropriate the benefits from knowledge encapsulated in an innovation. Moreover, knowledge as an economic commodity has low cost of reproduction, and it is difficult to exclude others from its use. These two features give knowledge the character of a public good.
- Secondly, over time, new innovations are being developed that partly or fully displace the original innovation. The observed pronounced shortening of the life-cycle of science-ware products in particular will increase the decay rate of appropriable revenues further.

To sum up, from an inventor's point of view, whether he works in a national laboratory or a private company, the economic justification for patent protection is that the IPR established by the patent lowers the rate of decay of appropriability of revenues.

The financial risks implied by an unforeseen or precipitous decay of appropriability are highlighted by empirical findings on success and failure rates of innovation/technology portfolios. According to some statistics, out of 60 new product concepts only one sees the light of day. In the agro-chemical industry for example, according to an industry source, to sell a single new product, one has to test 15 000 in the laboratories, and invest 60 million US\$, while probably half of the life of the underlying patent will have expired. Hence, the most successful innovations of a given portfolio will have to return a profit big enough to pay for all the innovations that fail. Empirical research has shown that about less than 10 per cent of the number of patents held in the portfolio of corporations, specific industrial sectors and venture capital companies, typically account for more than 60 to 70 per cent of total portfolio revenue (Scherer). Quantitative estimates have put the rate of decay of appropriability at a range of between 18 and 36 per cent per annum (Pakes/Schankerman).

As patents enhance the appropriability of innovation rents, patent policy together with other IPR instruments, should be viewed as an integral part of the technology management function of an enterprise, serving to maintain its technological competitiveness and to long-term viability. From the strategic point of view, high license fees for example, may induce rapid entry by potential competitors, impacting on long run appropriability. Thus, technically speaking, some elements of the net revenue function F , i.e. U_N and U_F , may not be independent except for the short run.

The next step is to demonstrate the commercial value of patent protection by transposing the now familiar net revenue curve U_N into the context of a freely competing market not protected by a patent (see figure 3).

Costs incurred by the innovator in the gestation and application periods are assumed to be identical, except for patent and renewal fees. While he maintains a first-mover advantage, the innovator now faces adverse appropriability conditions. He cannot build up a dominant market position because competitors K_1 and K_2 , uninhibited from copying his innovation, enter his market easily. Since they did not have to pay for research and development, they can afford to sell more cheaply than the innovator. To avoid losing customers the latter may have to reduce his sales price in turn which further will exacerbate his situation. Moreover, when economies of scale play a role, if the innovator's market share remains close to the minimum efficient plant size, the resultant higher production costs which will lower his net revenue U_N even further.

Had he instead granted licenses on the patented innovation to both would-be-competitors, as depicted in figure 2, the positive difference in total net appropriable revenue $V(R_N)$ would be even greater.

Now the infringement case is considered. Given the inherent risks involved in bringing an innovation to the market, infringement can transform a commercial success rapidly into a financial disaster (see figure 4). Since the infringer enjoys cost advantages relative to the innovator similar to those enjoyed by competitors in the freely competing market, he will set his sales price below that of the original product. This will take some market share from the primary innovator, as indicated by the curve B. To arrest the loss of customers, the innovator probably will react by reducing his sales price in turn. This reaction could induce further downward pressure on the market price. Hence, any infringement will add to the inescapable market-induced decay of appropriability of the economic rent derived from the patented innovation.

When infringement has occurred, it soon becomes evident whether the patent constitutes an effective means of launching a counter attack. For, as a dictum from the patent attorneys' trade runs: "A patent is only the ticket for admission to the court." Even if a "good" patent was obtained, it is only at the stage of legal proceedings that enforcement provisions will be tested for effectiveness. Under weak

enforcement conditions, real protection of the innovation will be ineffective, and the patent revealed as a "paper tiger".

Luckily, this is not the outcome in figure 4. Here, the court issues a solid verdict against the infringer, maybe even setting damage compensation. Temporary infringement ceases, revenue growth recovers, and the innovator will praise his patent attorneys and - maybe - the legal enforcement provisions stipulated by the IPR regime of his country.

Economy-wide effects

The shift of focus from firm level to the aggregate economy implies the consideration of the systemic impact of an IPR system on innovation and competition, two key forces that generate technical progress and ultimately economic growth.

Economic research has demonstrated that superior economic performance of an economy in the long run is significantly linked to a set of institutions that is conducive to a low level of transaction costs (Olson jr.). For the vast array of gains from specialisation and trade to be realised, institutions must exist that first make property rights secure, and secondly enforce contracts impartially. Otherwise gains from complex contracts that require impartial third-party enforcement, like those on the capital market and the technology transfer market, would be lost due to prohibitive transaction costs. Capital-intensive production and risk-prone applied research and technology development activities would remain underdeveloped.

Hence, in principle, a national IPR regime needs to be designed (or calibrated) with a view to reducing the level of transaction costs in the economy. In the preceding section it has been shown that there are a number of legal, enforcement-related, social and commercial factors which together determine the "economic security" of a patent, most importantly the appropriability of revenue drawn from it. In this perspective, exclusivity as conferred by the granting of a patent, is the "conditio sine qua non" for the eventual emergence of a socially optimal degree of appropriability.

This point will be understood intuitively, when a hypothetical country is considered where scientific results of government-funded R&D will be given away free of charge to private firms for commercial exploitation. Recalling the progressiveness of the costs involved in advancing from prototype to mass production, it is unlikely that there will be any bidders, unless some sort of official appropriability guarantee is given to safeguard the necessary investments and return a proper profit.

A fortiori, privately funded applied R&D needs the back-up of an effective IPR regime. In fact, the concept of a national innovation system as developed by innovation research, also encompasses a country's provisions for the protection and the enforcement of IPRs. Its key features including those of the IPR regime itself, together with the socio-economic framework conditions decide on the appropriability parameters operating in the aggregate economy.

For the innovator or a single firm, the appropriability of the benefits from an innovation - $V(R_N)$ - determines whether, subjectively, incentives are perceived as sufficiently strong to warrant engaging in innovative activities. The economy-wide impact of patent protection at the firm level is conditioned by the dynamics of competition. This issue is the classical dilemma of the theory of patent protection.

The notion of dynamic competition is based on the interaction of the innovator advancing and the imitator following. The dynamics result from a process of searching and learning which in turn is driven by competitive pressures and the continuous threat of losing the temporary exclusivity granted by

the patent (market-determined decay of appropriability). The patent right by itself only opens up an opportunity for exploitation. Ultimate success depends on the innovation proving itself commercially superior to alternative solutions offered by the competition. The time span it takes competitors on average to catch up with the innovators is usually termed imitation-lag. Economists consider its duration to be the decisive factor of competition in the economy-wide process of adjustment.

On the one hand, it decides how long - by effectively controlling market entry - innovators can draw "pioneer profits" (Schumpeter) from their innovations and, thus, how big the incentives are for innovation (as well as for market entry). On the other hand, the imitation-lag decides when the followers start to participate - via dissemination of technical know-how - in the benefits from the innovation.

It is important to note that the imitation-lag represents the temporal dimension of the economy-wide adjustment process, and that its duration in the aggregate is not exogeneously given, but is itself the result of entrepreneurial activity and economic policy.

When the imitation-lag gets shorter, mirroring faster market-induced decay of appropriability due to heightened competition, adjustment costs for the economy will rise. This reflects the accelerating obsolescence of part of the capital stock and technical knowledge; the need to relocate and new investments; displacement of labour and retraining; and other social costs. Yet overall, the economy will benefit from the growing productivity gains due to a more rapid diffusion of new technology.

However, stronger competition per se, though welcome for its salutary effects on the efficiency of the innovation process, does not necessarily and always translate into technological progress and welfare gains. To the extent that sharper competition substantially erodes the "pioneer profits" accruing to the innovator, it may well impede the dynamics of technical progress.

When the imitation-lag gets longer, short term adjustment costs will decrease as affected sectors have more time to adjust. Though appropriability conditions become more favourable as innovations are diffused more gradually, the incentives facing both, innovators and imitators alike, risk becoming biased against technical advances. Competitive pressures may slacken further and old technologies get locked in. Both developments entail a loss of potential productivity gains for the economy.

Taking the intensity of competition in the economy and other socio-economic factors as given in the short run, the patent system and the enforcement provisions move centerstage. For, technical progress is not assured by patenting per se; rather by the publication of the patent claim - in Europe 18 months after filing; in the USA - upon the granting of the patent. In this way publication triggers the so-called information function of the patent system. In market economies the subsequent exploitation and the effective diffusion of the patented know-how is effected through the freely transferable legal instruments of the technology transfer. These instruments underpin trade and investment (licensing, trade secrets, competition rules), both domestically and in international transactions.

In short, instead of secrecy, to protect industrial property is to make it public! In a broader sense, patenting renders technical knowledge marketable that otherwise would remain unsusceptible to market transactions, as shown by the hypothetical case above. The patent system does not prevent imitation. It only increases the immediate costs to the competitors of using an innovation. From the point of view of competition, the information function thus provides the "fuel" to the competitive ambitions of individual entrepreneurs/firms to "invent around" the patent and/or to improve upon the original innovation.

One of the economy-wide effects of filing an application is to ensure rapid and broad-ranging dissemination of information about technical knowledge. The inventor/innovator will not be granted

exclusive use unless he provides a full description which is made public. Publication of the innovation registered with the patent office gives each firm or inventor the chance to keep abreast of the latest technological progress, research trends, avenues being explored by rival firms. It thus offers access to a pool of information which prevents loss of time, money and effort in duplicating work already done elsewhere. Hence, patents form part of the technical documentation of an economy from which countries may derive information about their own industries such as state of the art, specialisation profiles, technological strengths and weaknesses, etc.

Without going into further detail, the economy-wide benefits generated by the conferment of exclusivity rights may be summarised by five main points (OECD). The effects of IPRs are to:

- encourage and safeguard intellectual and artistic creation of which the social and cultural benefits are very widely recognised, by inducing individuals (or firms) to undertake creative work;
- disseminate new ideas and technologies quickly and widely (an essential element in intellectual and industrial progress), by supplying a public database of innovations and descriptive elements, thus ensuring greater security and lower costs in transactions involving the transfer of technology;
- promote investment, by offering a guarantee against unauthorised copyists to those who accept the risk of advancing from the prototype stage to mass manufacture and marketing;
- provide consumers with the fruits of creation and invention, by the large-scale production and distribution of higher-performance goods the existence of which is made possible by IPRs;
- distribute these positive effects across all sectors of the economy, in a way which is, of course, proportionate to their level of economic, industrial and technological integration.

In the economy-wide perspective it has been shown that - other things being unchanged - the IPR regime and the attendant enforcement provisions play a crucial role in the innovation process. It is a dual role which interacts both ways, with the protection function - exclusivity - and the information function - fuelling competitive market pressures. In relation to the overall adjustment process, the innovation/exclusivity/competition-nexus thus influences the trade-off between static and dynamic efficiency of the economy.

The international dimension

To get an idea of the international implications of the protection of IPRs, suppose the innovator/entrepreneur decides to explore the prospects of exploiting his patent also abroad. He may consider several options including exporting from his home base, setting up a production facility abroad; or licensing his patented design to a foreign business for local production.

Assessing the alternatives he soon becomes aware of the coexistence of very divergent attitudes towards the protection of IPRs and IPR regimes across different countries. In particular, he finds out that:

- lack of adequate IPR protection would allow local producers to copy foreign technology rather than acquire a license and pay royalties. The lack of protection of certain IPRs in a

specific market may, in economic and trade terms, amount to a subsidy granted to producers to help them manufacture and export.

- the patent could be subjected to compulsory licensing procedures. Compulsory licensing of IPRs often is used as a means to favour domestic production over imports. Unrestrained use of this approach may be interpreted as appropriation of technology without adequate compensation.
- means of enforcing existing IPRs may prove inadequate, resulting in tolerating or even legally permitting appropriation of rights, which in other countries could be regarded as infringements.
- procedures imposed on foreigners filing an application for rights or attempting to obtain legal recognition of their rights may be complex and expensive. When applied non-discriminatorily these procedures may be equated with technical barriers to trade. When they become excessive, they may amount to a de facto-protection of national innovators from competition with foreign innovators. The resultant economic effects may be likened to that of an import prohibition or high import tariffs.

Given the numerous possibilities of non-market-determined threats to the appropriability of the benefits from his innovation, the entrepreneur may decide to reassess the risk premium he was going to ask for if he went ahead.

In technical terms, the net revenue function $V(R_N)$ needs to be adjusted by decomposing the litigation cost (C_L), net revenues (U_N) and fee income (U_F) into a domestic and a foreign component.

Concerns about the safety of IPRs in relation to international trade, foreign investment and transfer of technology between countries are as old as the patent system itself. However, due to a number of economic developments that emerged over the last two decades in the international economy, the need for solutions to the apparent deficiencies became more urgent:

- competition in traded goods increasingly containing a high degree of technological know-how or innovation intensified;
- transfer of technology and know-how, whether they be simple transfers (licenses) or linked with an investment, became more frequent;
- creative works such as books, films, pictures, or sound recordings, were distributed worldwide, more systematically and faster.
- piracy and counterfeiting has grown to the scale of fully-fledged industrial activity.

Moreover, the transformation of the industrialised countries towards the information society, in conjunction with the globalisation of economic activities including R&D, observed since the early 1990s tends to speed up these trends. The countries in transition to market economies increasingly share such experience.

Overall, the international exchange of goods, services, investment and technology has witnessed a significant growth of IPR/trade-linkages.

With the Agreement on trade-related aspects of intellectual property rights (TRIPS) the Members of the World Trade Organisation (WTO) have achieved a common approach to address the inadequacies stemming from the coexistence of unduly wide discrepancies between IPR protection systems in different countries.

The Agreement contains a comprehensive set of rules establishing minimum standards for the protection of IPRs, and - for the first time in an international accord relating to intellectual property - sets out performance-oriented obligations for the Members in respect of enforcement procedures. Moreover, contested issues are subjected to a multilateral disputes settlement procedure, in principle ending bilateral negotiations of such disputes.

As the material protection of IPRs is only as good as the effectiveness of practical enforcement, the TRIPS-Agreement does have the potential for truly reducing the uncertainty related to the appropriability of benefits from IPRs.

The Agreement is based on a number of guiding principles of which, from an economic point of view, three stand out:

- the Territoriality principle implies that the protection accorded follows the law of the country in which the application is filed;
- the National Treatment principle implies non-discrimination against foreign nationals;
- the application of the Most-Favoured-Nations clause implies that the "best" level of protection agreed on in bilateral deals with one country is automatically extended to all Members.

A common approach to all kinds of IPRs was facilitated by the growing economic similarities of the underlying different legal instruments, once these are the subject of trade. While the institutions linked to the framework of industrial property, of copyright, and of activities more directly related to trade and investment have different origins and developed separately, all of them become very similar when considered from the point of view of the user, and their inclusion in trade transactions. It becomes essential to identify ownership, scope, legal validity of each title and the minimum level of protection available in each instance. Succinct information on these points is of paramount importance to the entrepreneur/innovator, regarding those appropriability parameters of his foreign venture that are not determined by market valuation.

As regards patents, the legal instrument most relevant to the protection of industrial property, the TRIPS-Agreement represents a quantum leap for the international economy, as compared with the earlier situation. First, patentability has been extended to inventions in all fields of technology. This will benefit pharmaceutical and agri-chemical innovations in particular. Secondly, besides products, patentability now also covers processes for obtaining the product - for a long time a bone of contention for one group of developing countries. Thirdly, any discrimination as to the place of invention, the field of technology, and the production site (domestic versus import) is ruled out. Fourthly, the use of compulsory licensing is restricted to a narrow set of justifications, also providing for compensation. Finally, the statutory duration of the patent's life in general is fixed at 20 years, a marked improvement upon the various limits that prevailed in numerous countries.

Regrettably, in relation to the enforcement of patent rights, the new provisions remain deficient in one non-trivial respect: the obligation for Members to provide for criminal procedures covers neither

patent infringement nor industrial design and trade-mark infringement. To sum up, over time the Agreement will in particular:

- stimulate research, technological innovation and creativity, by allowing individuals and companies to enjoy the benefits of their creative efforts;
- make IPRs more secure internationally as well as domestically, in those countries where lower material standards had prevailed;
- contribute to lowering the cost of transactions related to trade, foreign direct-investment and technology and know-how transfer between countries;
- encourage foreign investments in the process industries of developing countries;
- foster the growth of science-based industries in industrialised countries.

From an international adjustment point of view, the TRIPS-Agreement can also be viewed as a novel and dependable framework to accommodate the growing intensity of world-wide competition as well as the increasing complexities of non-financial cross-border transactions. On the one hand, the free-rider position of those developing countries that pursue an imitation strategy of economic development is curtailed. On the other hand industrialised countries trying to maintain their technological leadership can now afford to back off from mercantilist weapons and targeting of industrial policies.

Figure 1. Life of an innovative product - market protected by a patent

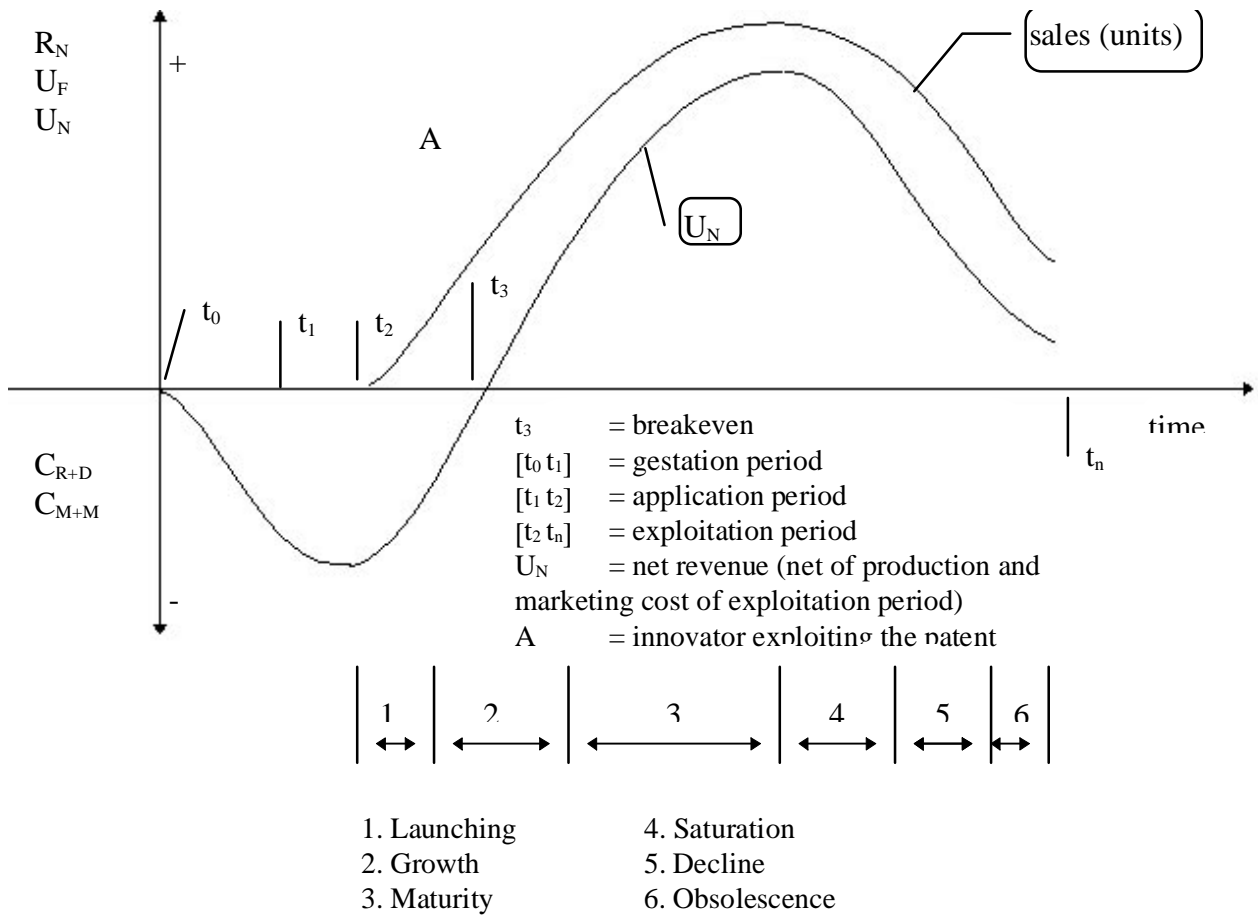


Figure 2. **Patented and licensed innovation**

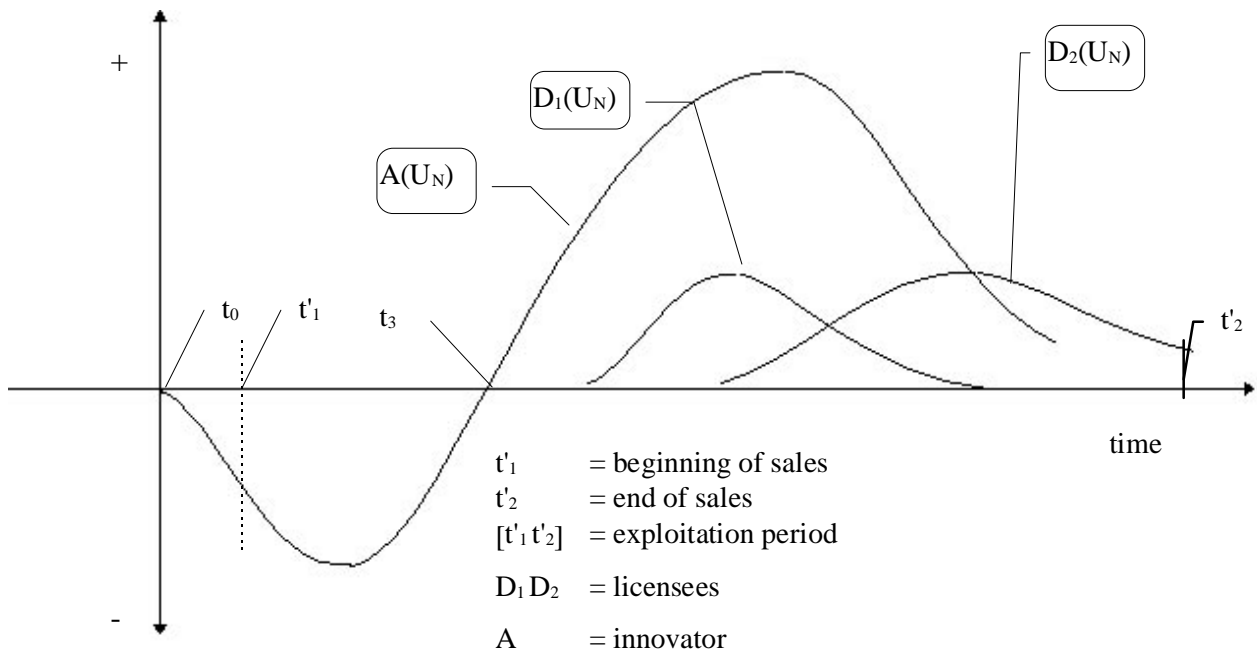


Figure 3. Freely competing market (without patents)

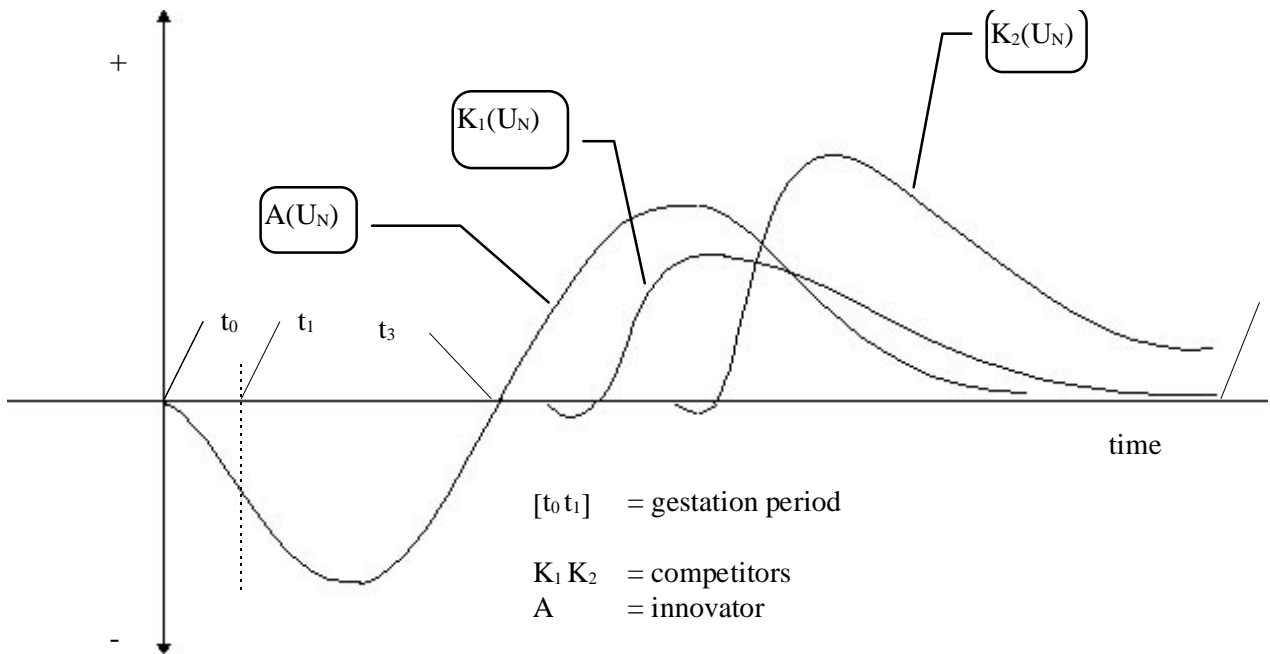
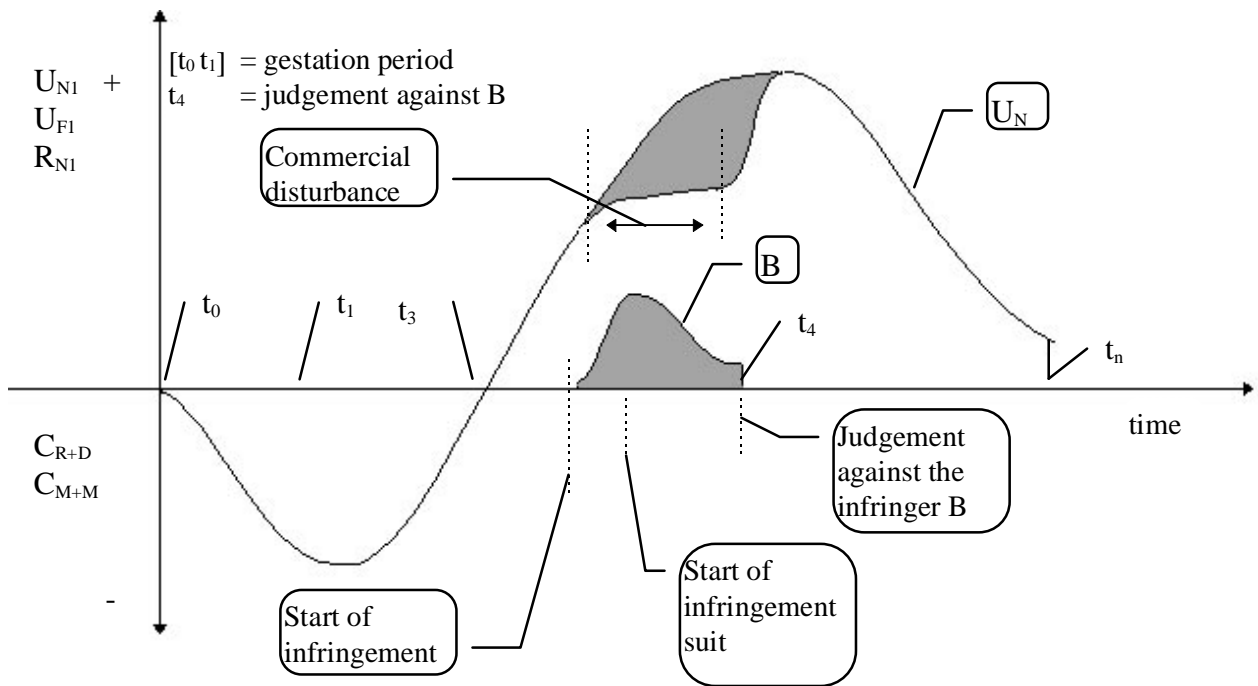


Figure 4. Patented product - infringement case



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