



The Ruđer Bošković Institute – Today and Tomorrow*

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»The Ruđer Bošković strategy 2010–2015«
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INTRODUCTION

The Ruđer Bošković Institute, by virtue of its size, scientific productivity, international recognition in research and the quality of its scientific personnel and research equipment, is the pivotal scientific institution in the Republic of Croatia in the natural sciences, biomedicine, marine research and ecology. The Institute was established as a scientific research organization on June 8, 1950. Since the Institutions Act (Official Gazette, No. 76/93) went into force, the RBI has operated as a public institution, over which the Republic of Croatia has acquired founding rights. Pursuant to the Scientific Research Activity Act (Official Gazette, No. 96/93) and the Scientific Activity and Higher Education Act (Official Gazette, No. 123/03), the Institute has continued operations as a public research institute under the ownership of the Republic of Croatia.

MISSION

The mission of the Ruđer Bošković Institute (RBI) is to gain new knowledge that will contribute to the development of the Republic of Croatia in a knowledge-based society.

The Institute fulfills this mission through the following:

- globally relevant basic scientific research,
- orientation toward research of strategic national importance,
- participation in higher education and
- transfer of knowledge in other areas of public and economic life.

By fundamental scientific research, we mean knowledge-driven research, while by oriented research we mean targeted basic research.

The primary task of the RBI is to conduct excellent basic research, with particular emphasis on complex interdisciplinary programs. Excellent basic research is a prerequisite for achieving the other tasks that the RBI has undertaken in the development of the Republic of Croatia. In addition to basic research, these include the development of innovative research, participation in higher education and knowledge transfer in the economy, with the goal of developing new high-tech products and increasing public awareness of the importance of knowledge and science in modern society. The RBI carries out these tasks in cooperation with universities, scientific institutes and other similar institutions in Croatia and other countries.

VISION

We see the RBI as a top research institution, which in the next 5–10 years will remain a leading national center of excellence and become a leading regional and recognized European center of excellence in re-



Aerial view of the Ruđer Bošković Institute.

search and postgraduate (doctoral) education in the basic natural sciences and related scientific areas within the Institute's scope.

Depending on the complexity of the tasks and the time necessary for fulfilling the individual strategic goals outlined in detail in Chapter 5, this basic vision is based upon several key goals that the RBI plans to accomplish in the next short-term period (2010–2015) or medium-term period (2010–2020).

- The RBI will become a multidisciplinary community of scientific institutes directed by excellent, internationally competitive research. The institutes within the RBI will be based on complex research programs, systematic international evaluation and the high level of autonomy and responsibility exercised by the directors of the institutes and programs.
- On the national level, the RBI will consolidate its position as the leading scientific research center, achieving this in synergy with other related scientific institutions (universities and institutes) and through high quality scientific work in the natural and related sciences in the Republic of Croatia.
- At the national level, the RBI will be an open institution. The equipment and scientific infrastructure of the Institute will be available to scientists from all the other public research institutes in Croatia, which in cooperation with the scientists of the RBI will ensure the maximum utilization of equipment for internationally competitive research.
- At the international level, the RBI will become the leading regional research institution that will affirm and improve its quality and international recognizability through institutional and project partnerships with leading foreign institutions and researchers.
- The RBI will improve the quality of its research personnel, particularly taking into account new researchers who will be recruited by the Institute during the implementation of the Strategy. The international experience and mobility of researchers, especially doctoral and postdoctoral candidates, and the establishment of an adequate system for the employment and advancement of the best young scientists (the equivalent of the tenure-track and start-up package concepts) will be key factors in development, and the RBI will become a more desirable and attractive institution for the recruitment of talented young scientists, including those returning from other countries and foreign researchers.
- The RBI will become a national and regional center for postgraduate education in various disciplines of the scientific activity of the Institute. The personnel and infrastructure resources of the Institute will focus on the establishment of international doctoral studies in the English language, with a leading role by the scientists of the RBI, as well as collaboration with colleagues from domestic and foreign universities and scientific institutes. In addition to its own studies, the RBI will participate as an equal partner at the univer-

sities in Croatia and other countries on joint undergraduate and doctoral studies.

- The RBI will be an institution that will intensify cooperation with the business sector. In doing so, the RBI will encourage and support the transfer of knowledge, innovations and technology, as well as the commercialization of the results of high quality research, thereby protecting the intellectual property of the Institute.
- The RBI will become an institution with good administrative support for research programs and clear and detailed computerized administrative procedures.
- The RBI will assume an important role at the national level in the popularization of science and raising awareness of the importance of knowledge and scientific research for the development of society.

ENVIRONMENT – SWOT ANALYSIS

The credibility of the precepts presented in this document and the feasibility of meeting the goals presented in the following chapters cannot be assessed without insight into the national, regional and international environment. Therefore, this document provides a summary of a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the RBI environment.

Strengths

- In terms of size, scientific productivity, internationally recognized research and the quality of the scientific personnel and research equipment, the RBI is the most significant scientific institution in the natural sciences, biomedicine and environmental research in the Republic of Croatia.
- The concentration of scientific personnel and equipment qualifies the RBI at the national level, and in some cases also at the regional level, as a competitive place for conducting demanding interdisciplinary and multidisciplinary research.
- Individual researchers and/or laboratories of the Institute have achieved significant international recognition through world-class scientific work.
- Owing to the large number of potential mentors and qualified researchers, as well as the relatively modern research equipment, the RBI is still an attractive place for the best students from Croatian universities to pursue doctorates, which continue to provide an influx of qualified doctoral candidates.
- The Institute is the leading and internationally most competitive national institution with respect to participation in international research projects (IAEA, EC FP5-7 programs of the European Commission, NATO, NSF, SNSF, DAAD and other international scientific foundations etc.). Following the example of the leading European institutions, the RBI has established the separate Office for International Projects.

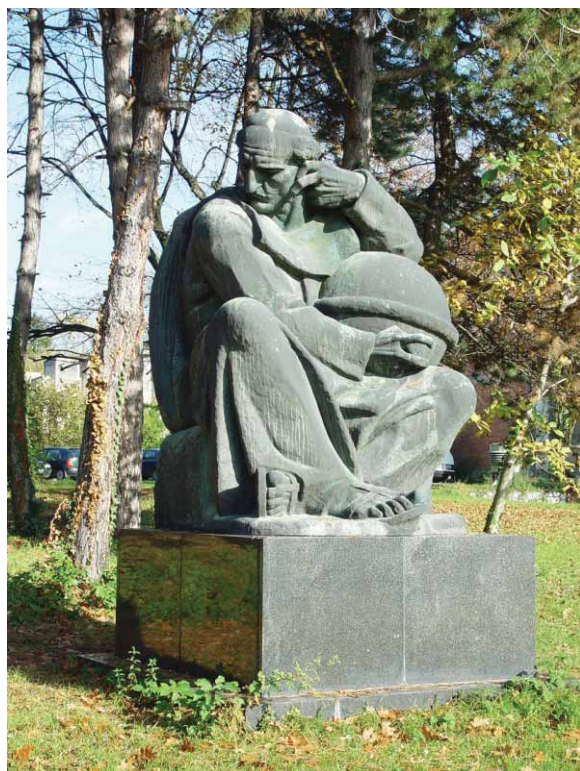
- The scientists of the RBI are chosen to fill scientific positions based on public competitions and criteria of excellence determined through peer review of the candidates, necessarily including the positive opinions of foreign reviewers. The RBI is still the only scientific institution in Croatia that requires the opinions of independent international reviewers for such positions.
- The Institute is the first in Croatia to have established a company for the commercialization of innovations (Rudjer Innovations Ltd.) and works systematically on the analysis of innovative potential.
- The Institute is the first among the scientific institutions in Croatia to have established a Public Relations Office. It traditionally organizes Open Days at the RBI and fosters active communication with the media.
- At the national level, the Institute provides unique support and technical expertise in certain high priority national tasks, for example:
 - research focused on healthcare,
 - research focused marine and environmental protection,
 - research in the sector of homeland and national security, and
 - the maintenance and use of the scientific core facilities and services of national reference laboratories.
 - The RBI has traditionally been the strongest center in Croatia for applied nuclear physics and chemistry, today largely with respect to the interdisciplinary applications of nuclear methods, dosimetry and protection from ionizing radiation.



Nikola Tesla statue in campus of the Institute.

Weaknesses

- The lack of ambitious and demanding, particularly interdisciplinary and multidisciplinary, research programs with which best to capitalize on the national and regional advantages of the RBI with respect to research personnel and equipment.
- The fragmentation of the organizational units and insufficient focus on research. Research at the RBI functions according to the project and not according to a programming principle, with very limited opportunities for directing and conducting research by leading researchers.
- The lack of periodical and independent international assessment of principal researchers, research projects and programs
- Despite national supremacy, the RBI is characterized by an insufficient number of international research projects in the majority of areas, which directly contributes to relatively low international recognizability and the RBI's insufficient institutional role in building the European Research Area.
- The modest number of visiting and employed foreign scientists and researchers and the low mobility of researchers of all ages. There are a small number of returnees, Croatian citizens who began their scientific careers or pursued advanced studies at prestigious foreign scientific institutions.



Ruđer Bošković statue in campus of the Institute.

- An excessive number of scientists employed in the highest positions, the poor age structure of the researchers and the hiring of scientists without experience in the international environment
- A lack of designated projects for fostering the independence and affirmation of the best young scientists, i.e., a start-up package
- Operational and financial dependence upon the Ministry of Science, Education and Sports. Although predominantly funded from the Government budget, the RBI cannot conduct an effective development policy within a system in which it does not control the key levers of development: the recruitment and selection of doctoral candidates (research assistants), the procurement and selection of research equipment and the employment dynamics of scientific positions within the framework of the approved structure.
- The modest percentage of extramural funds in the RBI budget
- The administrative system is outdated and inadequately computerized; procedures are often poorly defined, complex and slow. The lifelong education of administrative personnel is of low intensity and the organization of the administration in certain segments is very poor, directly contributing to low efficiency in the registration, procurement and administration of research and commercial projects.
- The lack of an efficient and objective mechanism for rewarding the performance of nonscientific personnel, such as high quality technical staff
- The poor state of the infrastructure at the Institute (obsolete buildings and installations, part of the scientific instrumentation is worn out or obsolete, the lack of space for experiments, poor work-safety conditions etc.) have a direct impact on the quality and international competitiveness of the research but also on the ability to obtain the appropriate accreditation and cooperation with the business sector.
- The insufficient number and training of scientists, as well as the lack of technical support, hamper scientific experimental advances in areas characterized by conducting complex development projects that include the construction of instrumentation.

Opportunities

- The ongoing restructuring of the RBI into an institution consisting of independent research institutes is based upon the principles of scientific excellence and independent international evaluations of the proposed research programs and principal researchers. This process offers the RBI a unique opportunity to create a system that will truly make possible the materialization of the aforementioned comparative advantages of the Institute in relation to the national and regional environment. The restructuring process provides an exceptional opportunity to establish partnership with leading research institutions and universities.

- The establishment of RBI foundations in countries with large Croatian diasporas represents a possibility for additional funding of the Institute's research and visits by RBI scientists to prestigious scientific institutions in other countries.
- The restructuring of the Institute opens possibilities for initiating a new research direction, for which there is real potential at the RBI.
- European Union funds frequently require the participation of scientific institutions from a large number of countries. The Institute has the possibility of presenting itself as a strategic international partner to a large number of European scientific institutions and increasing its contribution to international projects.
- The Croatian business sector and public administration are beginning to recognize the value of cooperation with scientific institutions, and a growing number of projects financed from the budget require the cooperation of science and the business sector. The Institute has the opportunity to become a strategic partner of a large number of economic agents. The accession of the Republic of Croatia to full membership in the EU and the availability of funding from the EU Structural Funds represent a great opportunity for the RBI. Through designing quality projects in cooperation with the Ministry of Science, Education and Sports; other ministries, government agencies, universities and other research institutions, local governments and/or enterprises, the RBI could significantly increase the space it has available, improve its infrastructure and increase energy efficiency.
- In progress are significant changes in the existing legal regulations concerning the areas of science and higher education, which open opportunities to the RBI for the affirmation of numerous solutions that are the foundation of the concept of restructuring the Institute: the concept of lump-sum financing; program, as opposed to project, research; advancement in scientific positions that are exclusively based upon the criteria of the institution, as opposed to national criteria; affirmation of a suitable system for recruitment and advancement (the equivalent of tenure-track and start-up package solutions); the greater autonomy and accountability of key organizational units and leading researchers; the establishment of doctoral studies etc.
- Inaugurating internationally competitive doctoral studies in the English language would open further opportunities to the RBI for international affirmation, the education of its own PhDs as well as PhDs from other domestic and foreign institutions, and partnerships with leading foreign universities, scientific institutions and scientists.
- The necessity of changing the organizational structure provides an opportunity for establishing clear pyramid structures for scientific positions in the next middle-term period with the quality selection of ju-

nior researchers and the eventual return of renowned Croatian scientists from other countries.

- There is the possibility for the greater inclusion of RBI researchers with proven international excellence in key national bodies and working groups that have a decisive influence upon the creation and management of national policies in science and higher education.

Threats

- The traditions of project financing, small groups and the limitations of existing conservative laboratory and institutional structures are deeply rooted. Any ill-advised and forcible changes without the proper argumentation and affirmative approach could lead to justified resistance that would directly threaten the entire process. The scientists of the RBI cannot be forced to achieve effective cooperation. It must ensue as a result of arguments and incentives.
- The large number of changes that should be implemented practically at the same time represent an exceptionally demanding task for the scientists, director and administration of the RBI.
- The main burden in the implementation of changes should naturally be borne by the scientific leaders, the middle generation, with the support of the leading senior scientists. However, there are too few leaders of the middle generation at the RBI, which would inevitably lead to the need to involve junior scientists in the process, although there is the danger that their scientific careers could be directly jeopardized.
- The restructuring of the RBI must necessarily rely upon the creativity and ambition of the leading researchers but their enthusiasm could be seriously compromised if the process is not conducted efficiently and transparently.
- Ineffective implementation of the process could lead to the highest quality personnel departing for other countries.
- Effective administrative of the programs of the future (sub)institutes will not be possible unless all the elements are clearly defined by a lump-sum model for financing the RBI, with the appropriate legislation.
- The planned improvement of the personnel structure will not be possible without establishing a suitable system for recruitment and advancement (the tenure-track and start-up package solution) or by retaining the existing system of mandatory advancement at work every 10 years, with the simultaneous limitation on advancement without 3 years of experience in a current position or with discrepancy between the academic title and position.
- The establishment of independent doctoral studies would not be possible without corresponding changes in the existing legislation that regulates the areas of science and higher education.

- Dependent upon national legislation in the areas of science and higher education, the RBI is often hostage to mediocrity and inadequate legal solutions tailored primarily to a part of the scientific system in Croatia.
- The tendency for reducing investment from the state budget, i.e., increasing extra-budgetary funds in the financing of the RBI, could lead to the commercialization of the activity of the Institute instead of the commercialization of innovative research results, i.e., the neglect of its primary mission – excellent basic and innovative developmental research.

In the end, as the most likely threat to the process, according to the educational structure of the population and investments in education, research and development, Croatia at this moment is undoubtedly not a »knowledge society«. It is very hard to believe that Croatia will be transformed in the near future into a modern society that directly invests specifically in education and science at a time of crisis. Moreover, during the current economic crisis, Croatia has already resorted to reducing funding for scientific research, which we see as the greatest threat to the goals set forth in the Strategy of the RBI.

STRATEGIC OBJECTIVES AND IMPLEMENTATION STRATEGIES

In order to achieve the vision of RBI development it will be necessary to accomplish the following strategic goals:

1. Raising the quality of basic research
2. Improving the structure of scientific and nonscientific personnel
3. Increasing the presence and influence of the RBI in the international scientific community
4. Cooperating with the business and public sectors, strengthening technology transfer, commercializing the results of research and protecting intellectual property
5. Improving the infrastructure
6. Systematically participating in higher education and establishing the RBI's own postgraduate (doctoral) studies
7. Raising the quality of resource management and administrative support
8. Increasing the RBI's influence on the determination of national strategic priorities and the corresponding legislation in the areas of science and higher education