
ABSTRACTS

O. A. Mekh

Issues of Support to Critical Technologies in Ukraine

Theoretical and practical aspects of the problem of critical technologies are analyzed. A review of approaches to interpretation of the concept “critical technologies” is made, information on the practices of their support, development, protection, forecasting procedures and compilation of their nomenclatures in various groups of countries is given. Evolution of the regulatory framework pertaining to critical technologies in Ukraine beginning with 90s of the past century is studied, which lays grounds for the conclusion that a consistency in the Ukrainian policies on critical technologies did exist, and the environment favorable for innovation-driven economic growth was really being built. Also, methodological discrepancies between Ukrainian regulatory acts regarding critical technologies are identified.

Keywords: *critical technologies, science and technology forecasting, innovation processes, regulatory framework.*

I. Yegorov

Foresight Studies in the Context of Innovation Policy of Ukraine in 2000s

Issues of science and technology forecasting in Ukraine are discussed in the broader context of innovation policy. A review of main tendencies in economic, R&D and innovation performance in the independent Ukraine is given. Contradictions of the State Innovation Policy in Ukraine are highlighted. Detailed review of the procedures involved in the two recent foresight programs in Ukraine (implemented in 2004 and in 2008–2011) is made. Main results of the recent foresight programs are summed up and the most important problems in foresight studies in Ukraine are outlined. It is emphasized that foresight activities in Ukraine were being implemented in conditions of very weak and incoherent innovation policy; responsibilities of the key actors were not well defined; they were used as a predominantly policy-informing tool; innovation policy building was based on normative considerations rather than on the analysis of future developments in technological and S&T areas.

Key words: *foresight-type programme, research and development, innovation, technopark.*

Z. O. Popovych

Coexistence of Market, Planning and Administrative Mechanisms in the Economic System of the USSR

A review of selected works by soviet and foreign authors is made to show that the private property never disappeared in the USSR, in spite of the assertions by soviet theoreticians about its total elimination, and that the soviet economic mechanism constituted a symbiosis of the planning and administrative system with the semi-legal market of resources and assets. The need for such a market arose from ill-conceived planning and imbalanced economic plans; had this market not existed, the soviet enterprises would have failed to implement the plans decreed on them. A key feature of this mechanism was the coalescence of the soviet bureaucracy with the so called “entrepreneurs” from the shadow sector of the soviet economy, to meet mercenary interests of both strata of the soviet society. The reasons behind growth of this entrepreneurial stratum in the soviet industry (the so called “pushers”) are elaborated in detail; their specific function at the soviet enterprises is shown; it is proved that the operation of “pushers” was central to compensate for the blunders involved in the planned distribution of resources and assets in times of the USSR.

Keywords: *market, plan, industrialization, “pusher”, bureaucracy, funds, entrepreneur, production program, barter, private capital.*

V. N. Shmarov, V. H. Bariyakhtar, I. V. Lehzenko

Can Ukraine Have Nuclear Weapons?

The historic background for creating nuclear weapons in the U.S. and the USSR is given, to show how the purposes of creating nuclear weapons by the two countries changed with passage of time. Although the primary purpose of creating nuclear weapons in the U. S. was fighting with fascism, once the fascist Germany was crashed mostly by the power of the USSR, the main purpose of nuclear weapons creation in the U. S. was fighting with communism and the USSR as the central communist country; the principal purpose of creating nuclear weapons in the USSR was to prevent the third world war. Data on the scopes of material and intellectual capacities exploited by the U. S. and the USSR for creating atomic and hydrogen bombs are shown. An extended analysis of the situation with the nuclear legacy in Ukraine after the collapse of the USSR is made. It is shown that the President of Ukraine and the Verkhovna Rada (Parliament) of Ukraine were implementing consistent policies to bring Ukraine to the non-nuclear status; that the top authorities and the Ukrainian Ministry of Defense were utilizing the resources received in exchange for confirmation to remove nuclear weapons from the Ukrainian territory to deal with urgent economic problems of Ukraine. Arguments are given about impossibility for Ukraine to gain the nuclear power status due to political, economic and technical reasons.

Keywords: *nuclear weapons, atomic project, atomic bomb, hydrogen bomb, intercontinental ballistic missile, rocket army, strategic nuclear forces, strategic bomber, strategic nuclear rocket forces.*

B. A. Malitsky

Science and Technology Potential of Ukraine from “Dobrov” Times till Today: Two Different Eras of Its Development

The contribution of G. M. Dobrov in establishing the Kyiv school of science of science studies in 60s of the past century and the role of Dobrov’s book “Science about Science” in establishing of science of science studies as a separated scientific discipline is shown. The essence and peculiar features of “Dobrov” era and its impact on the development of the national studies in science of science in the subsequent years are highlighted. Comparative analysis of the two eras in the development of science system in Ukraine is given: the “Dobrov” era, and the current era that began in 1990. Factors that caused different vectors in the development of national science system in these two areas are outlined. It is shown that in each era the science policy of the state is a central factor determining the performance of science system and the merit of research work. The most significant results produced by G. M. Dobrov Center for Science and Technology Potential and Science History Studies of the National Academy of Sciences Ukraine are given.

Keywords: *science system, science of science studies, “Science about Science”, “Dobrov” era, Academy of Sciences, state policy, financing of R&D.*

N. V. Novikov

Science of Science Studies and Science History: Most Important Segments of Scientific Support for the Innovation-Driven Development of Ukraine

The article contains the author’s vision of the ways of Ukraine’s recovering from the current crisis. The author reflects on possible solutions for the two most important objectives: utilization of the capacities accommodated in the National Academy of Sciences (NAS) of Ukraine and the Ukrainian science system on the whole for the benefit of the Ukrainian society; the rational reforming of the NAS of Ukraine. By giving extensive information on the performance of Ukrainian researchers in science and technology field, especially V. N. Bakul Institute for Super Hard Materials of the NAS of Ukraine, the author argues that the NAS of Ukraine has the capacities required for active contribution in the economic revival of Ukraine.

Keywords: *science, National Academy of Sciences of Ukraine, technology transfer, tradition, reforms, V. N. Bakul Institute for Super Hard Materials of the NAS of Ukraine.*

A. I. Dicusar, R. Kujba

Comparative Analysis of the Relationship between Science System and Socio-Economic Development in the EU and the CIS

The quantitative analysis of the relationship between socio-economic development (measured by Human Development Index) and R&D performance (measured by scientometric indicators based on the information model of R&D) at country level is made to show the existence of positive reverse correlation between the two indicators for the EU member states and for the Commonwealth of Independent States (CIS). The wide gap between the two groups of countries in the correlation strength and the R&D impact on the socio-economic performance is shown. Specific tendencies of R&D development in the groups of countries under study give evidence on a positive relationship between R&D and socio-economic performance in the EU countries and a negative relationship in the CIS. Tendencies specific to various scientific disciplines are analyzed globally and nationally, for countries like Ukraine, Moldova, Lithuania, and Romania.

Keywords: *Human Development Index, R&D performance, socio-economic performance, coefficient of R&D performance, H-factor, global information process, field of knowledge.*

A. G. Allakhverdyan

Dynamics of Research Personnel in Soviet and Post-Soviet Russia: A Comparative Statistical Analysis

The analysis of the dynamics of research personnel in Russia covers predominantly 1950–2010. Upward and downward tendencies in numbers of research personnel in the Russian R&D in the soviet and post-soviet periods are shown. The reasons, the scales and the phases of depopulation in the Russian R&D are outlined; it is argued that depopulation was a consequence of radical change in the political priorities regarding R&D personnel in the post-soviet Russia, entailing rapid decline in the numbers of researchers in the post-soviet period, with extremely negative effects for the development of the Russian R&D.

Ключевые слова: *soviet R&D, Russian R&D, science policy, dynamics of research personnel, phases in depopulation of the Russian R&D, scales of decline in researchers’ numbers.*

L. V. Ryzhko

Development of Advanced Technologies and Transformation of Ontological Categories

The author makes an attempt of rethinking the change in the world outlook of a contemporary human in the context of transformations in the key ontological categories: existence, nonexistence, space, time, development, causality, entity, object, nature, culture, good, evil etc. It is shown that the contemporary science and technology

has caused radical change not only in the human way of life, but also in the meaning of key concepts used for human reflection about the world, and that it has become a factor for numerous risks.

Keywords: *ontological categories, information and communication technologies, nanotechnology, biotechnology, hybrid reality.*

S. V. Krichevsky

Evolution of Technology and Technological Tenors in the “Green” Development and Global Future Paradigm

Methodological and practical aspects of the evolution of technology and technological tenors in the “green” development and global future paradigm are analyzed. Key definitions are given. The broader problem of technology evolution analysis is set; a new approach to the analysis is formulated. Proposed are: a technology for technology evolution control through controlling the spectrum of technologies; a new approach to analysis and evaluation to the ecological capacity of technologies; a new interpretation of technological tenors with consideration to their interactions with the environment. A new model of technology evolution is elaborated, which shows the process of the accelerated growth in the total number of technologies, 1st and 7th technological tenors as the ascending phases, non-linear transition to the advanced 7th “green” technological tenor with deep “green” reformatting of the whole integral technological tenor, which are “fitted” into the hyperbolic Snook–Panov curve showing acceleration of the evolution process on the Earth with the prediction of singularity \sim in 2045. New “pre-singular” and “post-singular” options of transition and global future are shown.

Key words: *global future, “green” development, model, environment, spectrum, techniques, technology, technological tenor, sustained development, technology evolution, enhancement of ecological capacity.*

R. A. Fando

Theoretical and Socio-Cultural Background for Studies of Human Hereditary Deceases: Historic Retrospective and Current Trends

The processes of conception and establishment of medical genetics are studied through analyzing cognitive and socio-cultural factors influencing the developments in this research field. Studies of hereditary deceases began long before the rediscovery of G. Mendel laws that laid the scientific ground for medical genetics. The contemporary medical genetics began to establish in earlier half of 20 century, once new hereditary deceases had been discovered and new methods and approaches to research of human heredity approbated. The great role in institutionalization of the new discipline was played by both individual distinguished scientists and academic schools dealing with the problems of human hereditary deceases. Scientific and socio-cultural background that determined the vectors of new fields in medical genetics research are analyzed.

Keywords: *medical genetics, inheritance, inherited anomaly, academic schools, molecular and genetic diagnostics.*

D. V. Zhernovy

Services Sector as a Source of Economic Growth in the Innovation-Based Economy

The process of expansion in the services sector (SS) of the Ukrainian economy in the context of global post-industrial trends is studied. Main approaches to modeling of structural change in the economy are outlined. Key factors and consequences of this change are defined. SS characteristics and classification criteria are considered. Peculiar features of the innovation activity in various categories of services are analyzed. Weakness and incorrectness of the interpretation of SS as a sector featuring homogeneity and asymptotic stagnation is shown.

Keywords: *services sector, structural change, innovation in services sector, innovation activity.*

K. Yu. Redko

Special Economic Zones: A Source for Recovery of the Ukrainian Economy

Implementation of the Special Economic Zones (SEZ) mechanism for recovery of the Ukrainian regions either afflicted by the warfare (Donetsk and Luhans regions) or annexed (the Crimean Autonomous Republic) is discussed. Results of questioning of officials from regional administrations in Ukraine where SEZ has been abrogated are given. It is shown that erroneous decisions of the Ukrainian government on abrogation of the privileged SEZ regime have led to disastrous consequences and destroyed the possibility for employing this powerful mechanism for rapid economic growth in Ukraine, which has been so effectively used across the world. The conclusion is made that the SEZ practice needs to be revived in Ukraine, but implemented with consistency and due consideration for the previous failures.

Keywords: *Special Economic Zones, mechanism, region, investment, privileges.*

O. A. Grachov, V. I. Khorevin

National Academies of Sciences in European Counties: A Scientific Analysis

A comparative scientific analysis of National Academies of Sciences in 48 European countries is made on the basis of information displayed on their web sites in 2014–2015. The analysis covers history of creation, pre-

sent status, structure, objectives, thematic priorities of National Academies of Sciences, membership in National Academies of Sciences, awards to members of National Academies of Sciences, participation of women in their work, recruitment of youth in National Academies of Sciences, position of National Academies of Sciences in scientific and education systems of European countries, associations of non-university research institutions in selected European countries, institutional peculiarities of and differences between National Academies of Sciences in the countries of Western and Eastern Europe. Numerous data and facts used for the analysis show that National Academies of Sciences accommodate the significant science and technology capacities, and that in spite of the above differences the successful action of National Academies of Sciences in all the groups of European countries is dependent upon its active standing as organizer and coordinator of scientific research.

Keywords: *Academy of Sciences, academic science, scientist, scientific society, European countries, research institution.*

T. V. Bessalova, V. I. Onopriyenko

Education in Nanotechnology Sector

Nanotechnology has become a factor for building up the innovation-driven economy and new opportunities allowing for passing the way towards the established new civilization with its specific values and ideals. Detailed statistical and descriptive information is given about tendencies in nanoscience and nanoeducation in various groups of countries, including the Commonwealth of Independent States and the Russian Federation in particular; about Ukrainian-Russian cooperation in the nanotechnology field; about the performance of nanotechnology research in Ukraine. One important problem in this priority industry is the inflow of various categories of human resources, which professional training, apart from heavy costs, requires methodological support. Problems related with recruitment of youth in the Ukrainian R&D are elaborated, with emphasis on nanotechnology disciplines. Selected results of sociological studies are used for the analysis purposes.

Keywords: *nanotechnology, education, education program, nanoindustry, nanoscience, nanotechnologist, personnel, science and education center, international cooperation.*

M. D. Donskaya

The Role of L. A. Kulsky in Developing Methods and Technologies for Purification of Water

Scientific, organizing, pedagogical and public work of L. A. Kulsky, a distinguished Ukrainian scientist in the field of colloid chemistry and purification of water, is discussed. Three main areas of his scientific work are outlined. The contribution of him and his successors in developing methods and facilities for purification and disinfection of water is analyzed by studying his works and interviewing his disciples. The economic significance of Kulsky's development is shown.

Keywords: *disinfection of water, purification of water, purification of natural waters, purification of industrial drains, water supply, classification of water admixtures.*

O. V. Heza

Key Phases in Computing Machines: A Basis for Rise and Development of Cybernetics

Computing machines rose from the fundamental scientific ideas, discoveries, intentions laying the basis for distinguishing the five key phases in their development: prehistory of computing machines (1930s); 1st phase (1941–1956) – the first generation of electronic computing machines (ECM); 2nd phase (1957–1963) – the second generations of ECM (central computers); 3d phase (1964–1973) – the third generation of ECM; 4th phase (1974–1990) – the fourth generation of ECM; 5th phase (1991 and on) – the fifth generation of ECM. The detailed review of the above phases is given: the contribution of national engineers in the global development of computing machines is shown.

Keywords: *computing machines, electronic computing machine, memory device, central computer, information, computer, personal computer.*