Tribute to the founder of the Bulgarian Academy of Sciences

Prof. Marin Drinov
(1838–1906)
The requirements of the European Commission concerning scientific research development are clearly stated: it is necessary that the EU strengthens its potentials in science and innovation and that it encourages both globalisation and mutual penetration of scientific activities in order to create European research realm which is to result in a knowledge based community and economy. Bulgaria, being a full member of the EU for more than two years now, is obliged to follow this requirement. Unfortunately, in our country the scientific studies are not viewed as a means to economic prosperity and little attention is paid to their funding policy revealing the state attitude to science. Bulgaria entered the Union as the country with the lowest percentage of gross domestic product dedicated to scientific research development and has not changed this yet. The European experience testifies that only a clear and definite support from the respective state government ensures serious funds both from the private sector and from other (European or worldwide) sources.

The constant strive of BAS to keep its research up-to-date manifested itself in 2007 also in the establishment of 15 problem-solving councils at the BAS Board of Directors. In 2008 these councils analysed the activities of the Academy in the respective research fields and outlined some development perspectives. On the basis of these analyses the BAS Board of Directors has reduced the number of the problem-solving councils and renamed them as follows:

1. *New materials, nanotechnologies and modern physics technologies*
2. *Information and communication technologies*
3. *Energy sources and energy effectiveness*
4. *Bioeconomics, biotechnologies and foods*
5. Ecology, biodiversity and bioresources
6. Medical and biological problems and quality of life
7. Natural resources, hazards and climate changes
8. Space sciences and technologies
9. Safety
10. Cultural and historic heritage and national identity
11. Knowledge based economy and community

As usual, BAS presented its annual report before the Bulgarian scientific community, the society and the state. This unceasing practice has been giving the opportunity to all the interested people for a quick and easy comparative analysis of the achievements of the scientists of BAS. Once again we are positive that the scarce resources granted by the state have been used well, provided the working conditions in which the Bulgarian scientists perform their research.
At the beginning of 2008 the Assembly of BAS Academicians and Associate Members (AAAM) comprised of 50 academicians (full members) and 83 associate (corresponding) members of BAS. 58 of them work at certain institutes of BAS, 26 are employed by other academic institutions, 4 stay abroad, 43 are retired and 2 are freelancers. The competitions for new members of BAS – academicians and associate members of the Academy – were announced in 2007 and took place in 2008. 21 persons were nominated for academicians (for 13 positions) and 133 – for associate members (for 43 positions). 13 new academicians and 19 associate members were elected. After these elections the number of the BAS academicians became 63 and of the corresponding members – 90.

AAAM members take part in the development of 252 research projects and topics (both domestic and joint with foreign scholarly institutions) being supervisors of 172 of these initiatives. The National Science Fund of Bulgaria (NSFB) and other Bulgarian organisations provide funds for 124 of the projects and topics; 93 projects are financed by foreign organisations.

AAAM members participate in 196 scientific councils: 135 of them are at the institutes of BAS, at universities and other scientific institutions; 50 are at the Scientific Council of the Higher Attestation Commission (SC of HAC). 24 of the AAAM members preside scientific councils, 17 from them preside the SC of HAC. More than 160 AAAM members participate in scientific commissions, expert councils etc. – 30 of them at BAS, 24 at HAC scientific commissions (where 5 are chairmen).

In 2008 160 AAAM members were involved in governing bodies of various institutions (both scientific and others). Among
these were such positions of trust as: the President of BAS, the President and Vice-President of the General Assembly (GA) of BAS, two Vice-Presidents, the General Scientific Secretary, a Scientific Secretary of BAS, the President of the Training Centre (TC) at BAS, two members of the BAS Board of Directors (BD), the President to the Expert Council for Publishing (ECP), the Director of the Academic Publishing House “Prof. Marin Drinov”, the Director of the National Centre of Infectious and Parasitic Diseases (NCIPD), directors of clinics, the president of AgroBioTech Park, the President of the Scientific Advisory Council to the Minister of Agriculture and Food, the Director of the Eyesight Centre and other positions in structures related to the scientific, industrial and cultural sphere. The HAC President, the Presidents of the Federation of the Scientific and Technical Unions in Bulgaria (FSTU) and of the Bulgarian Scientific and Technical Union of Civil Engineering (BSTUCE) are also AAAM members. A number of national committees, unions and companies are managed by certain AAAM members. In 2008 AAAM members led 13 institutes at BAS, 18 participated at the GA of BAS, 20 are in charge of sections and laboratories and over 10 chair departments and faculties.

AAAM members participate in the editorial boards of periodicals in Bulgaria (165 people) and abroad (116 people). They published 72 monographs, books and textbooks and 440 scientific publications (mainly in established international and foreign journals). Published are 108 popular scientific and more than 100 materials in periodicals. In 2008 AAAM members gave over 120 interviews before the central and local press, the national televisions and radio stations. They also gave 105 plenary talks and 264 presentations at various scientific conferences (prevailing international). AAAM members have been members of 85 organising and/or programme committees (over 55% abroad) and have also arranged and chaired 73 sections of scientific forums and discussions. Presidents of organising and programme committees were 22 people.

AAAM members gave more than 100 lecture courses (with 5,434 credit hours and 351 seminar and practical classes), led 35
seminars and 11 post-graduate qualification courses. Thus they played a major part in the university education and in improving its quality. The MA students supervised by AAAM members are 153, and the PhD students – 91 (4 MA students and 6 PhD students of those were abroad).

In 2008 the members of the Academic Body reviewed 195 competitions for scientific titles and educational and scientific degrees.

The members of the Department of Art and Art Studies organised a number of meetings with Bulgarian and foreign readers, 74 interviews and articles in the media. 10 exhibitions were carried out both in Bulgaria and abroad. In 2008 the author’s musical pieces as well as the orchestra conductor’s activities were 28 (in Bulgaria and abroad); the completed cinema and TV films were 3.

187 are the participations of AAAM members in Balkan, European and other foreign scientific organisations, including 60 memberships in international and foreign academies. Many are the leading positions of AAAM members at organisations like the International Agency for the Prevention of Blindness, UNESCO missions, the Balkan Mathematical Union, the Balkan Ecological Federation, the International Association of Colloid and Interface Scientists, the World Federation of National Mathematics Competitions etc.

The AAAM members’ scientific discoveries and participation in the cultural and social activities were highly appreciated. In 2008 some of them were awarded with most important Bulgarian medals.

Three of the AAAM members are also members of the Council of Intellectual Development to the President of Bulgaria. Many of the AAAM members take part in commissions and expert councils of the Ministry of Education and Science (MES), the Ministry of Health (MH), the Ministry of Agriculture and Foods (MAF), the Ministry of Environment and Waters (MEW), the Ministry of Defence (MD), the Ministry of Regional Development and Public Works (MRDPW), the Bulgarian National Bank (BNB), the Sts. Cyril and Methodius National Library etc.
Main Results of the Research Activity

In 2008 the various institutes and departments at BAS worked on 3,844 scientific and applied scientific projects, distributed in the following way: mathematics and informatics – 342; physical sciences – 462; chemical sciences – 452; biological sciences – 835; earth sciences – 618; engineering sciences – 256; humanities – 599; social sciences – 247 and others – 33 (see Figure 1). 2,662 of these projects received additional funding from: the National Science Fund – 725, ministries, administrations and companies in Bulgaria – 703 (compared to 493 in 2007), various organizations and companies abroad as well as from international collaboration – 1,234 (compared to 1,137 in 2007) – see Figure 2. The projects which were additionally funded are 514 (compared to 310 in 2007) and they were assigned by institutions in Bulgaria or abroad.

For the last eight years the share of the projects with additional funding has grown compared to the total number of the projects developed at BAS. In 2001 this share was 54% and in 2008 it was 69.3%. This shows a permanent growth at the institutes of BAS (see Figure 3).

Below are presented only the most important achievements of the respective institutes of BAS.

Mathematical sciences

Built were new and strongly localised nuclei in the terms of the Jacobi polynomials, the Hermite functions and the orthogonal polynomials on the sphere. The nuclei were used to construct multilayer frames by means of which the Besov and Tribel-Lizorkin spaces were fully characterised.

Within COSBICS (an EU FP6 supported international research project) mechanisms were studied responsible for the appearance of cancer cells. This was based on mathematical models of various signal paths. The quantity and quality analysis of the proposed modified model proved the crucial role of the inhibitor proteins as modulators of oscillations.

Principally new optimal results were received in the field
Number of projects developed in fields of Science

- Social Sciences 247
- Humanities 599
- Geosciences 618
- Biological Sciences 835
- Chemical Sciences 452
- Physical Sciences 462
- Mathematical Sciences 342
- Engineering Sciences 256
- Others 33

Additional funding of BAS projects and contracts for the period 2002-2008 (total number for 2008 is 2662)

- From the National Science Fund
  - 2002: 725
  - 2003: 703
  - 2004: 1234
  - 2005: 1234
  - 2006: 1234
  - 2007: 1234
  - 2008: 1234

- From Bulgaria
  - 2002: 725
  - 2003: 703
  - 2004: 1234
  - 2005: 1234
  - 2006: 1234
  - 2007: 1234
  - 2008: 1234

- From abroad
  - 2002: 725
  - 2003: 703
  - 2004: 1234
  - 2005: 1234
  - 2006: 1234
  - 2007: 1234
  - 2008: 1234
Additional funding of projects and contracts for the period 2002–2008 (in BGN)

Figure 3

of Monte Carlo methods for classes of functions with restricted derivatives in the tasks of multidimensional integration; simultaneously new quasi-Monte Carlo methods and algorithms were developed at the use of mixed sequences and absolutely evenly distributed sequences. A comparison was made between the new quasi-Monte Carlo algorithms with already known algorithms using sequences of Sobol and Holton. What was constructed within the GÉANT2 project was a Support Centre of the GÉANT European academic network.

New definitions were created of certain computer viruses used for extended cyclic transformations when describing group family features of attacking binary code; the study of the full life cycle is guaranteed with a view to excerpting stable signature sequences in virtual copies of network operational systems.

A mathematical and statistical procedure was also created for modelling and prognosis of 3D tectonic movements on the territory of the Hokkaido Island – certain daily values of GPS coordinates were used. A system was developed that organised online tests on each of the 7 modules for receiving the ECDL certificate.
An application for the test may be submitted online in any of the test centres in Bulgaria.

**Physical sciences**

New exact solutions of the Boson-Fermion dynamic symmetry were found. They were applied to the description of energies of various collective stripes for families of purely even, even-uneven and uneven-uneven nuclei from the sphere of rare earth elements with mass number $A \sim 130$, which are an object of interest from both theoretical and practical aspects.

As part of the LHC programme in CERN, a model-independent approach was developed towards determining the fragmentation functions in the processes of deep inelastic scattering which determines the probability for the conversion of quark into hadron.

At the transfer to extended fuel cycles an optimal exploitation was ensured of Kozloduy NPP’ block 5 and all the negative consequences of such transfer were avoided, of the type previously observed at foreign, namely US, power plants with PWR.

At the study of rarefied erythrocyte suspensions and vesicle suspensions, it was established that the minimal viscosity value of the suspension was obtained when the viscosity of the suspension environment was close to the value in which there was a change in the individual movement of each blood cell. It was foreseen that this could well find its application in the diagnosis of blood system disorders.

Data were also obtained which were related to the impact of a gold particle size and polarisation of falling radiation on the characteristics of the field around it. This allowed precise surface nanostructuring with resolution commensurable with diameter/3 of the used particle.

A hypothesis was proposed concerning the origination of structured stellar wind and a method was developed to discover and correct the dependence between the instrumental stellar values and the space distribution of stellar images on the CCD matrix during astronomical observations.

A technological process was developed for surface passivation of highly effective silicon photoelements. A solar element
was realised with multilayer heterostructure GaAs/GaAlAs.

Devices were developed for optical radiation output from separate or multi-element super luminescent light diodes: in the visible scale – for energy saving lighting, and in the UV scale – for water disinfection.

A mobile laboratory prototype was developed of a refractometer working in a wide spectral range for measuring the refraction indicator in the close infrared zone.

In July 2008, under the permanent supervision of IAEA, Euratom and NRA, ended the research reactor fuel return to Complex 2 of BAS, Sofia.

Successfully ended the dismantling and mantling of the optical elements of the 2-metre long telescope in NAO-Rozhen. The German company 4H-JENA Engineering refreshed the cover by a new reflecting layer.

Chemical sciences

Projects commissioned by Kozloduy NPP were accomplished in relation to the solving of corrosion problems in the steam generators of block 5 and 6.

Synthesised were new glasslike materials of which one could control their structure, corrosion resistance, electrical and optical qualities. Nano-sized effects of materials in lithium-ion batteries were studied by means of electronic paramagnetic resonance. New technologies were proposed for monocystal growth for nonlinear optical materials in the field of laser technique. A method was developed for excerpting Rhenium from the soils. New phenomena were discovered in the chemistry of gold nanoparticles helping the design of catalysts with ecological application.

New chiral compounds were synthesised with application in the asymmetric catalysis for obtaining biologically active substances. Mesoporous silicate materials were used to obtain nano-sized iron oxide particles as catalysts for the dissociation of methanol to hydrogen and carbon monoxide (alternative fuels). Organic substrates were synthesised for model ribosome reactions explaining the peptide bond in protein biosynthesis.

Opportunities were presented for using fast surface diffusion
for incorporating atoms into a crystal surface in the silicon molecular beam epitaxy. Some alloys were obtained whose amorphic structure was corrosion resistant and thermally stable, which is crucial for their application. A direct experimental check-up were done of the steric forces of interaction in emulsion films with differently modified polymer surfactants and it was shown that the results could well be used in cosmetics, pharmacy, nanotechnologies and biotechnologies.

Nano-sized gold catalysts were developed for exhaust gases purification as well as iron oxide catalysts for the full oxidation of organic pollutants to obtain hydrogen. A theoretical model was proposed of non-stationary critical phenomena in the heterogeneous catalysis. Effective catalyst additions were found to obtain of propylene.

A method was developed for the synthesis of hybrid block copolymers. New antibacterial nanostructured materials were obtained from polylactic acid and chitosan for application in medicine. New nanocomposite materials were created which were highly elastic fire resistant and thermally stable and applicable in various industrial and agricultural branches.

The effect was established of an electric field on the biochemical reduction of nitrate ions; it is applicable in the purification of wastewater and groundwater. A method was created to determine the parameters in chemical engineering models when modelling chemical technology and biotechnology processes. A model of steam gas turbine was developed and it was proven that it was possible to significantly increase the capacity of performance and reduction of greenhouse gas emissions.

A composite catalyst loading was optimised by means of approved methods. The atomic structure of glass was determined, which allowed the determination of coordination number, number of links per atom etc. Also developed was a method for obtaining some active material for lithium ion batteries based on nano-sized silica particles coated with carbon.

Thin chalcogenide layers with controlled composition were obtained through simultaneous evaporation of arsenic sulphide and indium sulphide. Optical constants were defined in relation to the development of solar energy converters.
Biological sciences

It was found that in the linker containing nucleosomes HMGB1 inhibits reparation synthesis. The effect decreases upon acetylation and disappears upon C-terminal deletion of the protein. The level of the N4 histone acetylation remained low in most of the G1 phase, increased by accession to the S phase and reached a maximum on the limit of G1/S. There were biologically inactive variants of the human gamma interferon with affinity to gamma interferon receptor, which were protected by patents.

In original barley lines with deletion of the nucleus promoter, the compensatory increase in transcription activity of ribosomal genes was associated with increase in the speed of transcript elongation. The effect was studied of certain stressful factors on the dynamics of the AC-homologous DNA sequences and retrotransposons BARE-1 and Wis-2. Then molecular markers were developed for varietal identification and for assessment of the temperature stress impact on wheat and triticale.

It was found that the accepted direction of a pseudo visual motion depends on the parameters of another pseudo movement, presented immediately prior to it. In this the preceding movement was recorded by the visual system as a comprehensive visual object moving in space. The data helped to optimise the information presented on video displays and monitors.

A new form carbohdrase, with a mass of 160 kDa, was isolated from chloroplasts of pea, soybean and poplar. It was located on the outer surface of thylakoid membranes.

A gene was identified coding membrane-localised receptor-like kinase ARABIDOPSIS CRINKLY4 (ACR4). The latter is a key factor in the cell division regulation in the sphere of the pericycle and the root apical meristem.

For the first time in our country, a detailed dermatoglyphic characteristic was prepared of 2,431 clinically healthy Bulgarians (from 116 settlements).

It was found that the levels of the serum GM3 gangliosides were reduced at the first attacks of the remittent/recurrent form of multiple sclerosis, which indicated that there was a correlation between the reduction of the serum GM3 and the destruction of KMB.
An original approach was developed to prevent the development of drug resistance to anti-enterovirus compounds. This approach allowed the creation of effective chemotherapy and chemoprophylactics of enterovirus infections. An immobilised system was created of organic polymer with entrapped fungal biomass, possessing high potential for heavy metal ions removing from mixed solutions.

Also created was a polycomponent starter culture for obtaining fermented milk of highly nutritional and physiological value, by means of including an effective producer of amino acids which helps lactic acid bacteria metabolism.

An EcoNetwork was developed which corresponded to the optimal parameters of Natura 2000 areas in Bulgaria. A habitat diversity map of Pomorie region was prepared. For the first time in South Eastern Europe, cross-border transfers of metals and toxic elements were assessed by means of mosses, especially in border areas.

New taxonomic, faunistic and environmental data were obtained for invertebrates in Europe (especially Bulgaria) and Asia Minor. These data included species which were new to the science and the fauna in Bulgaria. A correlation was found between the degree of lead ions pollution and the response of the genome of model rodent species.

A method was developed to prepare a long-term National programme to protect forest fund land from floods. The health condition of the main forest ecosystems in Bulgaria was assessed under the ICP Forest Programme and a database of regional climate change was created based on entomological, phytopathological and abiotic damage, forest soil chemism including toxic trace elements and their impact on wood, bushes and grass vegetation.

It was found that metal complexes, which were sources of trace elements Zn and Se, stimulated the growth of helminths invaded hosts by improving their antioxidant and trace element status; the host-parasite systems were described by mathematical models. The treatment of tumour cell lines with polysaccharides from red microalgae and streptomycetes (Antarctic strain) had a cytotoxic effect, caused apoptosis and could have anti-tumour action.

It was found that in infertility in men with cryptorchism, the anti-apoptotic protein Bcl-2 played the major role in overcoming...
the stress signal effects. An analysis was made of the DNA fragmentation in spermatozoa under conditions of cryoconservation, and *Aneksin V* was isolated. Also, a method was created for double staining of spermatozoa by fluorescent fluorochromes. It was shown that F1 crosses of Chios sheep breed and Bulgarian breeds successfully developed in Bulgaria.

It was found that the processing of proprioceptive information was impaired differently in patients with idiopathic Parkinson syndrome and in patients with multiple system atrophy. Also proved was the competition between cholesterol and ceramides in relation to the control of lipid-dependant signalling pathways in cells, which control was provided by sphingomyelinase and phospholipase A2. It was found that there were differences in the lateral organisation, asymmetry and phase behavior of lipids in plasma membranes of cells cultured in conventional monolayer and in a three measured matrix.

A method was developed for simultaneous suppression of tremor and network interference as well as for restoration of the amplitudes of chamber complexes in ECG algorithm for detecting and quality assessing of the visually undetectable changes in the T wave. A method was proposed for the assessment of Ca\(^{2+}\) concentration in skeletal muscle fibers in Duchenne dystrophy. Zones were detected where ligands bind in homology model of the P-glycoprotein mediating multidrug resistance.

Volumes 3 and 4 of the Red Book of Bulgaria were completed. Indicators were developed to assess the dynamics of the absolute maximum and minimum water levels and of the maximum rainfall, through which to evaluate the negative effects of climatic factors. 283 problematic road sections were identified in order to restore the ecological networks in Bulgaria and defragmentation solutions were proposed.

A catalogue was prepared which included both data for 750 Acari species from 2 superfamilies and information on their taxonomic status as well as on their synonyms and distribution by country. The world’s first catalogue was created focusing on 133 species and subspecies of the centipede diplopoda of the *Callipodida* order.

Two new fields of *Dactylorhiza kalopisii* were found and
two species Orchidaceae family, new for the country, were discovered. The collections of tropical and subtropical plants were enriched with 110 new samples.

Earth sciences

Priority studies were related to the territory of the state and to the services to the economy, state and society. Lithosphere studies were traditionally focused not only on seismicity, vertical and horizontal movements of different regions of the country, but also on the response of different structures to seismic effects. What continued was the specification of geological structure and its evolution together with the natural resources of Bulgaria. New facts were established concerning the structure of the Earth’s crust both in the region of the Balkan Peninsula and in other regions of the world. A new theory of Earth’s geo-dynamo was established. A network of permanent GPS-receivers was further modernised and transformed for precise determination of the ground surface movements. With its aid and by attracting seismological data, it became possible to determine the cause for a major earthquake in Western Peloponnesus. The geological and seismological risk maps were further refined and detailed. Research was made into natural and technogenic mineral systems of different ranks and new materials and mineral systems were modelled and synthesised.

A universal thermal climate index was developed and embedded in the operational activities of NIMH for assessing the thermal environment of man as part of the forecast for the subjective perception of weather conditions. The results of a research on the wind profile in the atmospheric boundary layer were implemented in the new version of the WASP package (internationally recognised software to evaluate the potential of wind as an alternative energy source). What was also undertaken was a comparative evaluation and analysis of the application of agro-climate indices and mathematical models used for research and in production practice.

Two systems were developed and implemented: a system for transmission, processing, visualisation and distribution of hydrometeorological data in real time for the basins of the rivers Maritsa, Tundzha and Arda; and a system for forecasting of floods in the Bulgarian-Turkish border region of Maritsa and Tundzha.
A method was developed for probabilistic assessment of water provision in the design and operation of water systems; conditions were defined for group modelling of time series of the flow in multiple posts located in a river basin. A model evaluation was made of the wind-wave climate in the western part of the Black Sea based on most recent data. Intelligent system was designed and developed to monitor marine environment parameters in the port areas and bays along the Bulgarian Black Sea coast.

Devices intended for various Earth satellites were further developed. The data were processed by local and foreign machines with a view to detecting various regularities in the structure of the highest layers of the atmosphere and of the near space, as well as models for the distribution of different ionospheric parameters. The already created miniature spectrometer for space radiation dose and solar UV radiation was mounted on the International Space Station. The Indian satellite Chandrayaan-1 successfully put in orbit around the moon the RADOM device, created at the Solar-Terrestrial Influences Laboratory (the first results of information processing are already available). A national geo-database was built on the basis not only of an archive of images of the standardised vegetation index from NASA satellite platforms, but also of phenological data from the NIMH network. Another factor examined was the impact of environmental parameters on the growth and development of higher plants in a space environment simulation. New techniques were developed to distinguish objects on the ground surface by means of texture analysis of satellite images.

**Engineering sciences**

Work continued on tasks related to NATO’s Defence against Terrorism Programme and more precisely on the following three: *Protection of Helicopters against RPG* – in it Bulgaria is a leading nation and our scientists are leading in the implementation of a new structure for protection against RPG – with 470 mm drilling capacity and weight of approximately 10 kg/m² – protected by patent; *Port Security against Terrorism* – as part of this task innovative tools were developed for monitoring, as 4 and 5 channel
sector sonars, 16-channel circular sonar, a system for commanding by means of hydroacoustic signals, and flight and non-flight equipment to deter violators; *Anti-Infantry Obstacles* – here an experimental model was developed of intelligent module based on the Man-in-the-Loop principle.

A prototype was created of the INTERACT Integrated Information and Communication Platform to provide interactive services by using satellite transmission medium on the basis of the DVB-S communication protocols. It included a specialised intermediate program layer for managing interactive services as an addition to the basic audio/video communication flow.

Automated systems were designed to recognise a person from a manuscript text by automatically assessing the similarity between the tested materials. Such a system allows experts to select from orthographical elements and their characteristics and has been implemented in the Research Institute of Forensic Science and Criminology and the Interior Ministry. Another system allows recognition of three-dimensional objects (including their reconstruction) in different application domains – archaeology, astronomy etc. – on the basis of the complete arrangement of objects in the multidimensional space of signs and characterised by simple self-training, high quick action and good noise resistance.

A new method was developed for consecutively measuring of the three components of the magnetic field vector with the same structure; the process is extended in time rather than space. This approach was experimentally demonstrated with a silicon 3-D prototype (registered as an invention) from which the full information was obtained about the value and direction of the magnetic field vector with applications in medicine, magnetometrics, national security and defence, atomic-power microscopy of materials with magnetic nanoparticles etc.

A numerical model of river flow and a flood scenario in the region of the island of Batin (Danube) used to develop preventive measures against natural disasters and accidents.

An adaptive device was designed to obtain energy from sea waves. It was based on a new method for energy conversion which used mainly horizontal movements of the sea surface caused by the waves. Some advantages of the new method and
device applied to the invention were: the large absorbing, the wide frequency spectrum and the ability to survive in storms.

An approach was developed for complex assessment of the condition of supporting reinforced concrete structures of buildings affected by fire. The method included a combined use of mechanical, indirect physical and direct physical methods as well as residual supporting capacity of the RC structure and determining the necessary efforts for a flawless operation in the future.

**Humanities**

In 2008 significant contributions were made to some hitherto unexplored aspects in the history of the modern Bulgarian literary language (19th – 20th centuries). A conceptual model and linguistic motivation were presented in the description of the language units of the Semantic and Syntactic Dictionary of the Bulgarian Language.

Important contributions were made to the study of the early history of Bulgaria, as well as to the discovery of the most significant archaeological and architectural monuments dating from the prehistoric era to the Middle Ages. Examined by BAS were 2/3 of the archaeological sites in Bulgaria developed at the moment. This led to exquisite results: e.g. the discovered in 2008 fortress wall from the period 4700–4600 BC near the village of Yunatsite reveals the oldest concept of a citadel in Europe; the family necropolis of the Roman era in Elhovo Region provided a fully preserved chariot and numerous vessels giving unusually rich data on the Thracian aristocracy.

Bulgaria was presented as the cradle of the Thracian civilization at the Thracian Treasures exhibition in Japan. Further contributions to the study of ancient Thrace were: the promulgation of historical sources previously unpublished in Bulgarian and the monography dedicated to Orpheus, the most famous Thracian symbol.

The emphasis in the scholarly production of the traditionally strong academic medieval studies was put this time on Istoriya na Balgarskata srednovekovna literatura (‘History of Medieval Bulgarian Literature’). The History studies the period between the 9th and
the 19th centuries and also presents the permanent dialog of the literature with the Byzantine and other European Orthodox literatures. 2008 saw also the oldest monuments of the Cyrillo-Methodian tradition including the most ancient and precious ones kept in the book storages of the Holy Land (Jerusalem). Some studies were dedicated to the projection of the European Middle Ages on nowadays Europe. Research was focused also on the clash between the pagan Scandinavian North and the Latin Christian West. Other issues of interest were the Bulgarian pagan culture and the song repertoire in Hilandar manuscripts related to the history of Bulgarian music. These studies found their way to the public also in the following exhibitions: Byzantium: 330–1453 – in the Royal Academy of Arts in London; Studies of Trapezitsa – in Veliko Tarnovo; Monuments of Ecclesiastical Art (14th–19th century) – in Sofia.

A number of studies were focused on the Bulgarian National Revival as the era setting the foundation of the Bulgarian society and presenting number of explanations for various historical phenomena and events. Especially interesting in the context of modernity were the studies revealing the role of other educational and religious institutions in the complex process of Bulgarian society modernisation – in all the spheres of culture and public relations as well as of architectural heritage of the Bulgarian Revival (seen in the light of buildings construction in the age between the medieval and the modern time).

The history of the modern Bulgarian state was represented by the projects, publications and exhibitions devoted to the 100th anniversary of the proclamation of Bulgaria’s Independence. For instance: the research on the Balkan crisis (1908–1909), the exhibition Spomen za vazkrasnaloto carstvo (‘Memory of the resurrected kingdom’) displayed at the National Museum of Military History and the exposition Simvol na balgarskata darzhavnost (‘Symbol of Bulgarian Statehood’) presented in Veliko Tarnovo and Sofia.

Important contributions to the study of humanities problems were based on research in the Bulgarian traditional culture as well as in the culture of various ethnic groups inhabiting our land. An anthropological dictionary was created representing the human body according to the folklore point of view. Besides, the old folk music was presented as related to the modern times. The oral tradition of the
Bulgarian Muslims were analysed and the traditional culture of the Gagauzes in Bulgaria was studied during a field trip. It is worth mentioning here also the photographic exhibition Terenni dnevunci ot Bessarabija (‘Field Diaries from Bessarabia’) presented in Sofia and the ethnographic exhibition Pisani iaitsa (‘Painted Easter Eggs’) showed in Skopje. An essential element of the work in this direction was the development of practices related to the intangible cultural heritage and the scientific activities ensuring its preservation. Various areas were examined exhibiting certain functional interaction between oral expression and literacy as fundamental channels for the creation and acquisition, storage and reproduction of culture.

**Social sciences**

The studies were devoted to solving new priority special and interdisciplinary problems related to the Bulgarian society development in the context of global change:

– *Reduction of the population, infertility, childhood, marriage dynamics and birth dynamics, health, psychological well-being and personal self-contentment, personal values and identity*: A comprehensive research was done into the marriage dynamics and birth dynamics as well as in their relationship and dependence in the 20th and the beginning of the 21st century; remarriage, lonely and celibate people were also studied; a new approach was applied for a realistic assessment of deaths and mortality; certain trends were determined in the infertility and in the lack of children in our country; an alarming trend was detected towards increasing psychosomatic complaints and risk behaviour of the 13–15-year-old Bulgarian adolescents; methods were developed and approbated for identifying the emotional state of primary school children having certain disorders in the ability to learn. It was proved that the Bulgarian individual value system was relatively stable for the period 1995–2005. Positive trends were identified in the self-consciousness and personal growth. Some alarming phenomena were overcome – e.g. nihilism, uncontrolled “experimenting” with drugs, crisis of identity and spirituality. *The peculiarity of the personal profile of the Bulgarian students* was defined as prevalence of practicality, realism, objectivity and systematic approach to problems, combined with priority of the
following value orientations – Collectivism and Great Power Distance – and with significant need for Full Self-Realisation as a key objective in labour. *Ethnic models of national identity* were determined in the development in the context of European identity formation; a value perspective was revealed as a precaution against the decline of ethnic and national culture. It was demonstrated that in our country the necessary economic, cultural, legal and institutional prerequisites and personal motivation for promoting lifelong learning were still not present as a widespread and effective practice.

– *Growth, employment and competitiveness: changing determinants of economic growth* were defined based on interstate models while special emphasis was placed on intangible assets. *Low creditworthy demand for new knowledge* was explained as a major problem for the competitive development of Bulgarian economics as a knowledge-based economics; its sectoral, regional, institutional, legal, social, national and European dimensions were characterised. *Negative trends* were identified in the education, science and culture in Bulgaria. Changes were systematised in the minimum wage against the background of the common wage dynamics and macroeconomic indicators in an enlarged Europe.

– *New forms of participation in the public sphere and new entrants*: a database for study of standards and codes on corporate governance in Bulgaria was created. Uniform standards were proposed by groups of municipalities to ensure minimal staff security of the delegated by state activity Municipal Administration. A conceptual model was proposed for a functional link between the social capital and the corporate culture in the integration of business thesis – the maturity.

– *Integration processes and regional differences*: the European and regional dimensions were determined. A relationship was proved between the formation of groups of countries with similar sectoral structure and similar level of economic development within the EU. The Russian-Bulgarian economic relations were characterised in the context of integration processes in the EU and CIS, meanwhile specific areas of institutional and operational problems and risks in bilateral cooperation were revealed.
– Rights and obligations of citizens: a Concept was developed of the penalty policy of the Republic of Bulgaria; religious rights and freedoms in Bulgaria were characterised in terms of a broader interdisciplinary context of the rights and freedoms of persons belonging to minorities, the statistics from the last census in 2001, the international obligations assumed by the state and of international standard on human rights; regarding the recognition and enforcement of foreign judgments, a criterion was defined concerning when there can be a conflict with the norms of public order. A comprehensive survey was undertaken by the Institute of Patent Infringement in Bulgaria.

– Security: a basic model was created of the identification conflicts which predetermine social insecurity in the Balkans. As a risk factor for the national security were characterised the Protestant sects, already popular in Bulgaria, and the Islamic sects that are gaining popularity in our country.

– Science Studies: their current problems and approaches were characterised, a methodology was developed for the construction of a system monitoring the National research programmes.
Publications

The number of the BAS scientists’ publications is 11,632 for 2008 in total, i.e. a bit more than in 2007 – 11,352. Their distribution according to the respective field is shown on Figure 4. The publications in the field of humanities are most numerous, followed by the biological sciences, earth sciences and physical sciences. For 2008 the average publication activity of a BAS scientist or scholar is 3.19 publications, while in 2007 it was 3.05. Figure 5 shows the distribution of publications according to the respective type of edition.

Innovation Activity

At the end of 2007 the Centre for Innovation created a Classification of Applied Innovation Research which was adopted by the Board of BAS. In addition, the reports of the BAS institutes and departments for 2007 and 2008 mention some identified innovative developments. This makes it possible to recognise and to show before the public a wide range of innovative activities.
through the dissemination and analysis of applied scientific developments according to their innovation status.

The total number of innovative developments in 2008 (distributed according to the respective scientific field) is presented in the following Table 1.

<table>
<thead>
<tr>
<th>Scientific field</th>
<th>Number of i-developments</th>
<th>Number of institutes with i-developments (compared to all institutes)</th>
<th>Average number of i-developments per institute with i-report</th>
<th>Additional financing in thousands (BGN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mathematics</td>
<td>21</td>
<td>3/5</td>
<td>7</td>
<td>5 385</td>
</tr>
<tr>
<td>2 Physics</td>
<td>304</td>
<td>6/7</td>
<td>51</td>
<td>14 117</td>
</tr>
<tr>
<td>3 Chemistry</td>
<td>355</td>
<td>8/8</td>
<td>44</td>
<td>8 529</td>
</tr>
<tr>
<td>4 Biology</td>
<td>637</td>
<td>12/15</td>
<td>53</td>
<td>6 596</td>
</tr>
<tr>
<td>5 Geosciences</td>
<td>227</td>
<td>9/11</td>
<td>25</td>
<td>7 592</td>
</tr>
<tr>
<td>6 Engin. sciences</td>
<td>210</td>
<td>7/7</td>
<td>30</td>
<td>7 594</td>
</tr>
<tr>
<td>7 Humanities</td>
<td>64</td>
<td>1/11</td>
<td>64</td>
<td>3 428</td>
</tr>
<tr>
<td>8 Social Sciences</td>
<td>44</td>
<td>4/7</td>
<td>11</td>
<td>1 621</td>
</tr>
<tr>
<td><strong>In total for BAS</strong></td>
<td><strong>1862 – 2008</strong></td>
<td><strong>5/71</strong></td>
<td><strong>37</strong></td>
<td><strong>55 153</strong></td>
</tr>
</tbody>
</table>

|                           | (1333 for 2007)          |                                                   |                                                                | (incl. institutes & departments) |

In comparison to the 2007 reports, 2008 witness some changes:

- Almost all the departments of BAS (71) reported innovative activity for 2008. For 2007 only 44 did this.
- The total number of reported i-developments was 1,333 for 2007 and 1,862 for 2008. The observed increase may be due to the fact that this type of report was taken more seriously in 2008.
- The changes in the incomes from additional funding (quoted according to Annex 2 to the BAS reports for 2007 and 2008):
  - additional funding: 32 million BGN for 2007 and 55 million BGN for 2008 (or an increase of 1.7 times!);
  - in 2007 6 departments had an income of over 1 million BGN and 11 – an income between 400 thousand and 1 million (17 departments altogether);
  - in 2008 13 departments had an income of over 1 million BGN and 17 – an income between 400 thousand and 1 million (30 departments altogether).
The review of the patent-licensing activity shows an increase in the number of those scientific results protected by the Law which were announced by BAS institutes (54 such patents were supported). Yet the ratio between them and those announced solely by the teams who invented them (84 such patents were supported), on their own or together with certain companies, continues to be in favour of the latter. This is a peculiarity of the BAS inventive activity in the recent years.

Nationwide and Operational Activities Serving the State

In line with its main function the Centre for Research on National Security and Defence at BAS maintains and updates the database related to the national potential for research and development of security and defence. The Centre participates as a partner in an international consortium project – SEREN. It is a network of national contact persons within the Security Thematic Priority of the EU FP7.

Specialists from the Institute for Parallel Processing (IPP) manage and maintain the basic supporting unit of the Bulgarian Research and Education Network Association (BREN). Their activity is related to the construction and development of broadband communications and network infrastructure, which includes the BAS institutes, universities and schools in Bulgaria. In 2008, a Support Centre of the GÉANT European academic network was constructed in the Institute within the project GÉANT2, implemented by BREN. A new cluster BG03-NGCC was constructed in addition to the existing at the Institute Grid clusters (the National Grid Infrastructure). The National Laboratory of Computer Virology implemented various activities related to protection, detection, analysis and evaluation of computer viruses.

The Institute for Nuclear Research and Nuclear Energy together with the Institute of Metal Science, the Institute of Mechanics, the Institute of Physical Chemistry and the Institute of Organic Chemistry implemented activities related both to analy-
sis and provision of safety for Kozloduy NPP and to the efficient use of nuclear fuel when operating energy reactors. These institutes actively participate in the general and specialised training of nuclear power personnel and in the implementation of various scientific and applied scientific studies.

The Institute of Electrochemistry and Energy Systems is a basic organisation of the TC64 Technical Committee for Standardisation of Electrochemical Power Sources and a member of the TC42 Technical Committee on Corrosion and Corrosion Protection of the Bulgarian Institute for Standardization.

Scientists from the Institute of Microbiology are involved in analysis and evaluation of the bio-security system and of the potential risk to people in crisis situations. The Director of the Institute is a member of the National Pandemic Committee, which is to prepare the country for a possible influenza pandemic, at the Council of Ministers. He is also the Chairman of the National Council for Control over the Safe Laboratory Containment of Wild Polioviruses. The Institute of Zoology is the base organisation of the draft Red Book of Bulgaria, Volume 2. Animals together with the National Museum of Natural History and the Central Laboratory of General Ecology (CLGE) which are the social base for Volume 3. Habitats, Volume 4. Electronic edition. Experts from the Institute of Zoology along with scientists from the Institute of Botany and CLGE actively participate in the improvement of the European Ecological Network NATURA 2000 in Bulgaria.

The activities of the National Institute of Meteorology and Hydrology (NIMH) combine scientific and applied scientific research related to monitoring of atmospheric processes, agrometeorology and hydrology. NIMH provides the country’s economics and society as a whole with expert operational meteorological, agrometeorological, hydrological and climate information by means of forecasts, analysis and assessment of hydrometeorological processes and phenomena. The Institute provides safety to the citizens of the Republic of Bulgaria through the disclosures and warnings on hazardous hydrometeorological phenomena. In conformity with the current legislation, NIMH assists certain public authorities such as: the Ministry of Defence, the Ministry of Agriculture and Forestry, the Ministry of
Environment and Waters, the Ministry of Emergency Situations, the Ministry of Transport and Communications etc. NIMH provides specialised forecasts, data and expertise to the bodies of legislative, executive, judicial and municipal authorities. Part of the Institute is the Regional Telecommunications Centre in Sofia, which is an important unit of the WMO Global Telecommunications System.

In 2008 the activities of the Geophysical Institute were traditionally associated nationwide with the quality functioning of the four operational and scientific offices of the Institute, all unique to our country: the National Seismological Office, the Geomagnetic Service, the Ionosphere Service and the Network for Ground-Based Measurements of Biologically Active Solar UV Radiation.

The Geological Institute is evaluating and studying hazardous geological processes in Bulgaria and in the Balkans. One of its objectives is to ensure safe construction and sustainable economic development in our country (including routes of gas pipelines, railroads, dams, etc.).

The Institute of Oceanology prepared a Wind-Wave Atlas of the Western Part of the Black Sea assessing the vulnerable coastal areas of wind energy’s impact and of flooding in extreme storm events. This project was commissioned by the Ministry of Environment and Water (MEW). Certain hydro and hydrometamical studies were done in the aquatic environment of the Varna coastal area; more precisely, the research focused on the interaction between the planned hydro facilities ashore and the underwater coastal slope. These activities were undertaken to satisfy the needs of the Regional Administration of Varna and the Ministry of Regional Development.

The Central Laboratory of Higher Geodesy is the centre for processing and analysis of GPS measurement for precise applications on a national scale. The main activity of the Centre is related to the new National GPS Network of Bulgaria.

The Central Laboratory of Seismic Mechanics and Earthquake Engineering is involved mainly in the management, maintenance and servicing of the National System for Strong Ground Movements.
The Institute of Metal Science (IMS) performs tasks related to the NATO Programme Fight against Terrorism under contracts with the Ministry of Defence. Bulgaria is a leading nation, and the IMS is a leading contractor in the development of Protection of Helicopters against RPG. In addition, the Institute takes part in the development of Port Security against Terrorism. Performed also is the task Anti-Infantry Obstacles as part of the long-term NATO programmes.

The Institute of Information Technology has developed an automated system for recognising a person from a manuscript text by automatically assessing the similarity between the tested materials. This system allows the expert to select from orthographical elements and their characteristics. The project has been developed for the needs of the Research Institute of Forensic Science and Criminology and the Interior Ministry.

The National Archaeological Institute with Museum (NAIM) is a national centre and also a coordinator of all the archaeological field studies in Bulgaria. It conducts scientific and methodological supervision over these studies. The National Field Board attached to the institute issues permits for field and archaeological studies in the country. The automated information system Archaeological Map of Bulgaria is based at NAIM.

International Activity

The International activity of BAS has always aimed both at notable and effective presence of our scholars in the European and world research area and at participation of individual scientists and teams in bilateral and multilateral international research projects. 2008 was not an exception. Certain progress was made with the membership of BAS representatives in the Standing Committees of the European Science Foundation. We have permanent representatives in the committees of engineering and physical sciences, medical sciences, social sciences, humanities and life sciences.

In 2008 BAS continued the tradition of awarding prominent scholars and foreign institutions. As foreign members of BAS were selected two foreign scholars and 5 other foreign scholars were awarded with the Honorary Insignia of BAS.
The main form of international cooperation, financially maintained by BAS, are the projects under bilateral agreements with foreign academies of sciences and national research centres. We have some very beneficial agreements with the German Research Council (GRS – Deutsche Forschungsgemeinschaft), the Research Centre Dresden – Rossendorf (FDR – Forschungszentrum Dresden-Rossendorf), the National Centre for Scientific Research, France (CNRS – Centre National de la Recherche Scientifique), the University of Artois (Arras, France), the General commissariat for International Relations (CGRI), the National Fund for Scientific Research (FNRS – Fonds National de Recherche Scientifique) of the French society and the Flemish Fund for Scientific Research; with the Academies of Sciences of the Czech Republic, Slovakia, Austria, Russia, Ukraine, Belarus, Estonia, Latvia, Lithuania, Hungary, Poland, Serbia, Romania, Slovenia, Croatia, Turkey, Macedonia, Montenegro; with the National Councils for Scientific and Technological Research of Italy, Spain and Turkey; with the Aristotle University of Thessaloniki, with the V. N. Karazin Kharkov National University; with the Royal Society and the British Academy, with the Royal Swedish Academy of Literature, History and Antiquities.

Not less intensive is our cooperation with scientific institutions from outside Europe: the US National Science Foundation, the University of Pittsburgh, the Israeli Academy of Sciences and the Ben Gurion University, the Egypt Academy of Sciences, the Chinese Academy of Sciences and Chinese Academy of Social Sciences and Humanities, the University of Tokyo and the Mongolian Academy of Sciences. Continue also the opportunities for cooperation related to the National Academy of Sciences programmes COBASE and TWINNINGS according to which Bulgarian scientists may be accepted at the US if proposed by American scientists. The scientific cooperation between Bulgaria and India is realised in the framework of an intergovernmental agreement signed between the Bulgarian Ministry of Education and Science and the Indian Ministry of Education and Technology.

Extremely beneficially developed are the contacts between some Bulgarian scientists and researchers from Taiwanese academic institutions.
Particularly active is the participation of BAS scientists in the construction of European Research Area together with the rest EU Member States, mainly because of the broader and more successful involvement of BAS scholars in the FP7 competitions for research and technological development of the EU. And while the results of their participation in the first year of the programme (2007) particularly with regard to the realised success – could be considered quite modest (from the submitted 200 projects only 25 were approved and received funding of a bit more than 1 million Euro), only an year later – at the end of 2008 – the picture radically changed and became encouraging for the next years until the end of FP7 in 2013. The submitted by the BAS research institutes and departments information for 2007 and 2008 showed not only an increase in the submission of projects (over 300 for two years), but also a significant (almost three times) increase in the number of the successful projects (a total of 74 for two years) amounting to almost 7 million Euro incomes from European subsidies. In comparison, the number of all the approved by the EU FP7 Bulgarian projects for the same period was 187. The share of BAS in the participation of Bulgaria in the EU Framework Programmes is between 40-50% which was confirmed also during the first two years of FP7. A significant number of the BAS institutes continue implementing projects financed by NATO. Our scientists are involved in projects of INTAS and in projects funded by UNESCO and other organisations.

The President of BAS, Nikola Sabotinov is an active member of the executive boards of three most authoritative European academic organizations – ALLEA, EASAC (the European Academic Advisory Board) and ESF.

Involvement of BAS in the Training of PhD Students and Experts

641 PhD students were trained at BAS in 2008: 313 full-time, 192 part-time and 136 self-funded. From those 155 were newly accepted PhD students: 72 full-time, 45 part-time and 38 self-funded. 82 of the PhD students defended their doctoral theses in time,
6 – after the deadline and 181 PhD students were discharged. So at the end of 2008 there were altogether 616 PhD students, 275 of whom full-time, 201 part-time and 140 self-funded.

*Table 2* presents summarised information concerning the involvement of BAS scholars in the training of experts in the last 10 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lectures, courses At universities</th>
<th>Seminars At universities</th>
<th>Graduates</th>
<th>Post-graduate certificates specialisations</th>
<th>Schools and others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>topics number</td>
<td>lecturers number</td>
<td>hours total</td>
<td>topics number</td>
<td>lecturers number</td>
</tr>
<tr>
<td>1998</td>
<td>1164</td>
<td>698</td>
<td>78581</td>
<td>426</td>
<td>357</td>
</tr>
<tr>
<td>2000</td>
<td>1204</td>
<td>672</td>
<td>90285</td>
<td>451</td>
<td>341</td>
</tr>
<tr>
<td>2001</td>
<td>1231</td>
<td>627</td>
<td>81636</td>
<td>384</td>
<td>307</td>
</tr>
<tr>
<td>2002</td>
<td>1245</td>
<td>623</td>
<td>86046</td>
<td>407</td>
<td>285</td>
</tr>
<tr>
<td>2003</td>
<td>1250</td>
<td>650</td>
<td>80653</td>
<td>397</td>
<td>305</td>
</tr>
<tr>
<td>2004</td>
<td>1284</td>
<td>625</td>
<td>82481</td>
<td>452</td>
<td>320</td>
</tr>
<tr>
<td>2005</td>
<td>1197</td>
<td>598</td>
<td>83843</td>
<td>457</td>
<td>340</td>
</tr>
<tr>
<td>2006</td>
<td>1285</td>
<td>587</td>
<td>71471</td>
<td>451</td>
<td>306</td>
</tr>
<tr>
<td>2007</td>
<td>1289</td>
<td>680</td>
<td>74589</td>
<td>499</td>
<td>362</td>
</tr>
<tr>
<td>2008</td>
<td>1374</td>
<td>631</td>
<td>80302</td>
<td>563</td>
<td>390</td>
</tr>
</tbody>
</table>

p – PhD students at other organisations but with supervisors in BAS, s – post-graduate students

**Publishing and Information Activity**

In 2008 the Expert Council on Publishing accepted 7 books for press. For the funding of both the institutional and the common for the Academy periodicals was granted a budget subsidy by a decision of the BAS Board. It was distributed according to how often each
periodical was issued and how much it was disseminated.

An international editorial council was created for the journal Dokladi na BAN (‘Papers of BAS’).

In 2008 “Prof. Marin Drinov” Academic Publishing House (APH) printed 86 volumes – books and monographs with total number of quires 1,980 – in 32,294 copies. In comparison to 2007, the number of published titles increased by 11%, and the number of the quires – by 30%.

After a marketing research and analysis of the tendency toward poorer realisation of books on the market, the total number of the copies of certain editions was restricted. The main emphasis in publishing activity was put on the literature dedicated to 130th anniversary from the Liberation of Bulgaria and the 170th anniversary from the birth of Prof. Marin Drinov – the patron of the publishing house and the first president of the Bulgarian Learned Society. Many national and international conference proceedings and collections of papers were printed.

Special care was dedicated to popularising the Publishing house and to selling the printing production. 24 presentations of books were organised in Sofia (Jewish Culture Hall, Sofia University “Sveti Kliment Ohridski,” National Academy of Theatre and Film Arts, Architects’ Hall, CA of BAS etc.), Stara Zagora, Nova Zagora, Pana-giurishte, Blagoevgrad, Plovdiv, Ohrid etc. A BAS bookstore was open in Plovdiv. The Publishing house takes part in the international book fairs in Sofia, Moscow and Frankfurt. The APH participation on the Book Lounge (Varna), the Sofia International Book Fair, the Fifth Bulgarian Book Gathering (Earth and Man National Museum) and in the Plovdiv Reads Days, contributes to the popularisation of the publishing activity of BAS and of the book production of the Publishing house. The editions of BAS were advertised not only in Spisanie na BAN (‘BAS Journal’), Informatsionen Biuletin na BAN (‘BAS Newsletter’), but also in many other magazines and newspapers, including some outside the capital. Moreover they were presented in interviews, on radio stations and electronic media. All this helped that the books sale in 2008 remained on the level of those in 2007 with total sales amounting to 129,786 BGN.

APH continues its tradition of donating books to schools, community centres, museums and libraries (in 2008 the donations
were 11), so it actively participates in the movement of book donations. The APH management continues its efforts to find funding for the book publishing and to attract sponsors. In 2008 APH was once again awarded with an Amethyst Rose for stable book publishing development.

It is known that Dokladi na BAN (‘Papers of BAS’) is a multidisciplinary journal, but, thanks to the strict selection of articles by the editorial board, it received a well-deserved prestige: it was cited in Zentralblatt für Mathematik, SCOPUS and Journal Citation Reports, Philadelphia, USA. From 2007 onwards it has Impact factor 0.106.

In 2008 were published 214 articles. 36 of them were written in co-authorship by Bulgarian and foreign scholars and 8 were solely by foreign authors. The rest were written by individual authors and panels of authors from and outside Sofia. By means of book exchange Dokladi na BAN is circulated in 54 states and in 15 states it is sent to private subscribers by various companies. The journal is issued in 340 copies.

The oldest Bulgarian journal, Spisanie na BAN (‘BAS Journal’), continued the mission of its predecessor Periodichesko spisanie (‘Periodical Journal’) of the Bulgarian Learned Society to inform the Bulgarian society and the readers abroad about the life and the activities of the Academy and of its institutes. The policy of its editorial board has always been to present on its pages (in Nauchen dial (the ‘Science Part’)) the BAS institutes and their research, characteristic for Bulgaria and the region. In 2008 guests of Nauchen dial were those institutes which had their anniversaries: the Institute of History (60th jubilee), the Institute of Astronomy (50th jubilee).

12 issues of the Novosti newsletter for science and technologies were printed in 2008. They comprised altogether 27 papers from 22 BAS institutes. During the year the Institute of Astronomy, the National Museum of Natural History, the Centre for Population Studies, the Institute of Hydro- and Aerodynamics (Varna), the Institute of Balkan Studies and the Central Laboratory of Solar Energy and New Energy Sources published 2 papers each. Unfortunately there are still institutes and scientific departments whose collaborators still do not comprehend the goals of the newsletter properly and so are not active enough in the publishing of their achievements.
Informatsionen Biuletin na BAN (the ‘BAS Newsletter’) and the weekly newsletter for the forthcoming scientific and other events at the Academy are issued regularly in time and enjoy a growing interest on the part of the authors.

The research and applied scientific activities of the Central Library (CL) of BAS were aimed at the development of 16 projects (BAS, Equivalent Non-Currency Exchange, EU) in the fields of library studies, bibliography, Bulgarian studies and towards solving of problems related to research, constructing and management of the Academic Library Fund. There is an ongoing digitisation of rare and valuable library items (literature of the Bulgarian Revival, microfilms of Old Bulgarian/Old Church Slavonic manuscripts and Bulgarian periodicals up to 1944) in order to ensure the preservation and conservation of certain library items and to grant free access to them.

The integrated library system ALEPH500 functions successfully and is gradually developed. The information capabilities of the electronic catalogue are also being increased. It comprises 110,274 records of library items kept in CL and in the libraries at the respective institutes of BAS. 16,941 of those records were made in 2008.

The Central Library is an OCLC member. It submits and exchanges bibliographic records to the WorldCat as the only library using records in transliterated Cyrillic alphabet.

On 31/12/2008 the Academic Library Fund comprised 1,956,465 library items, 1,037,468 of which books, 890,889 periodicals and 28,108 special editions. The annual growth amounts to 32,695 items, including 7,962 books, 24,393 periodicals and 340 special editions. The Library Fund was enriched with 625 volumes – encyclopaedias, reference books and monographs in the fields of the humanities and the social sciences. There is an active international publication exchange. The number of the exchange partners is 1,178 libraries, museums, archives, foundations and other institutions located in more than 69 countries. CL has sent to them 14,117 library items of academic publications. Most active are the exchange relations with certain scientific organisations in the USA, Germany, Russia, France, Ukraine and the UK.

In 2008 the Bulgarian Encyclopaedia Scientific Information Centre worked on the following editions: *Physico-matematicheska i techicheska enciklopediiia* (‘Physical, Mathematical and
Technical Encyclopaedia’) 3rd vol., *the encyclopedia Geroi na svetovnata literatura* (‘Characters of the World Literature’), *Balgarska dzhobna enciklopediia* (‘Bulgarian Pocket encyclopaedia’), Encyclopaedia Bulgaria, the online edition *Balgarska enciklopediia A–IA* (‘Bulgarian Encyclopaedia from A to Z’), *Chuzhdestranna Balgaristika na XX vek* (‘20th-Century Bulgarian Studies Abroad’).

The Scientific Archives of BAS participates in the international activity of the Academy with three projects: Russia and Bulgaria: Historical, Scientific and Cultural Relations on the Basis of Primary Sources in Academic Archives – a joint project with the Archive of the Russian Academy of Sciences; Scientific and Cultural Relations between the Romanian and the Bulgarian Intellectuals of the 19th and the 20th Century – a joint project with the Library and the Manuscript Department at the Rumanian Academy of Sciences; Sources Related to the History of Ukraine and the History of Bulgaria Kept in the Scientific Archive of BAS and the Ukrainian Archives (19th – 20th century) – a joint project with the S. M. Hrushevskyi Institute of Ukrainian Archeography and Source Studies at the Ukrainian Academy of Sciences. In 2008 the Scientific Archive accepted for storage some private papers of Jacque Nathan and of Vladislav Topalov, Senior Research Associate 2nd degree. Accepted was also declassified documents of the Institute of Metal Science. The collection of photographs and documents related to the history of the Bulgarian Orthodox Church is still being enriched together with the Digital Collection. A number of exhibitions have been prepared independently or with other institutions.

**Organisational Structure of the Scientific Activity**

In 2008 no major structural changes were made at BAS. 20 posts of institute directors were open for competition. 19 scientists won the respective competitions. Two competitions were organised for one institute, because the first one ended with no result.

In 2008 there were some general changes in the personnel structure of BAS. The share of the scientists remained the same.
(48.5% of the staff). The share of the experts with university education decreased to 24.6% and of those with high school diploma decreased to 16.9%.

Table 3 shows the structure of the scientists at BAS. The data for 2008 are slightly different when comparing the scholars with an academic rank to those without such. The professors and the senior research associates are 21.1% of the total number of scholars with academic ranks.

Table 3  **BAS SCIENTISTS AND SCHOLARS (TOTAL)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Scientists and Scholars</th>
<th>With an academic rank</th>
<th>Without an academic rank</th>
<th>Distribution of the scholars with academic rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
<td>%</td>
<td>number</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Academic rank</td>
<td>Corresponding members</td>
<td>Professors</td>
<td>Senior Research Associates 1st degree</td>
</tr>
<tr>
<td>1990</td>
<td>5039</td>
<td>1753</td>
<td>3286</td>
<td>65.2%</td>
</tr>
<tr>
<td>2000</td>
<td>3664</td>
<td>1800</td>
<td>1864</td>
<td>50.9%</td>
</tr>
<tr>
<td>2001</td>
<td>3635</td>
<td>1859</td>
<td>1776</td>
<td>48.8%</td>
</tr>
<tr>
<td>2002</td>
<td>3585</td>
<td>1842</td>
<td>1743</td>
<td>48.6%</td>
</tr>
<tr>
<td>2003</td>
<td>3551</td>
<td>1869</td>
<td>1682</td>
<td>47.4%</td>
</tr>
<tr>
<td>2004</td>
<td>3612</td>
<td>1893</td>
<td>1719</td>
<td>47.6%</td>
</tr>
<tr>
<td>2005</td>
<td>3625</td>
<td>1881</td>
<td>1744</td>
<td>48.1%</td>
</tr>
<tr>
<td>2006</td>
<td>3719</td>
<td>1886</td>
<td>1833</td>
<td>49.3%</td>
</tr>
<tr>
<td>2007</td>
<td>3719</td>
<td>1905</td>
<td>1814</td>
<td>48.8%</td>
</tr>
<tr>
<td>2008</td>
<td>3638</td>
<td>1883</td>
<td>1755</td>
<td>48.3%</td>
</tr>
</tbody>
</table>

Financial Activities

The Republic of Bulgaria 2008 State Budget Act confirmed a subsidy of 82,141,400 BGN from the state budget. This subsidy was enlarged three times by Decrees of the Council of Ministers – with further 1,292,488 BGN the first time, then with 367,520 BGN and finally with 1,338,140 BGN – so that BAS takes part in the John Atanasoff joint award fund with the Iowa State University.

The total sum of the subsidy after the three corrections was 85,139,548 BGN.
In 2008 the amount of the BAS institutes’ own incomes was considerably higher than in the previous year. The earnings from contracts related to international programmes and agreements were over 17 million BGN in 2008, which means with about 10 million BGN more than in 2007. In addition, while accomplishing contracts with ministries and organisations, the BAS institutes received revenues, shown as transfers in the annual reports. The amount of the transfers is 21,117,590 BGN, which, in comparison with the previous year (5,939,465 BGN) mark an increase of over 15 million BGN. The total sum of the incomes is 55,152,949 BGN.

In 2008 the relative share of salaries and of social security and welfare allowance expenses was 78% from the budget subsidy. The salaries were increased with 10% as of 01/03/2008 and with further 10% as of 01/07/2008. The additional monthly payments for a PhD or a doctor of sciences were increased respectively from 40 to 60 BGN and from 70 to 100 BGN as of 01/03/2008.

With Decree of the Council of Ministers No. 130 dated 06/06/2008 the monthly scholarship per PhD student was increased from 250 to 450 BGN. The total sum provided for scholarships was 1,157,274 BGN.

The budget expenses of the Bulgarian Academy of Sciences for 2008 were made in a situation requiring economy measures, one with shortage of expenses covered by the Budget, in which the scientific and research activity fully depended on contracts for scientific developments and products as well as on the incomes earned from them. The budget subsidy covered the payment for the priority expenses only: salaries and social security and welfare allowance; scholarships; compensations stipulated by the Labour Code; free safety food for those who work in unhealthy environment; special work clothing and personal safety equipment; procedures of SC of HAC; membership fees in international organisations; water, fuels, electricity costs; mission trips; museums security, repairs; mobilisation and defence preparation. The expenses for water, heat and electricity have been fixed, besides with shortages, which results in economy measurements, which does not positively affect the work.

With a decision of the General Assembly of BAS in the Budget for 2008 provided money for capital expenses and routine repairs in the amount of 17,221,338 BGN, including
323,090 BGN for the non-budget dependent institutes. This sum included examining, planning and repairing work on the material and technical basis as well as acquiring material and durable intangible assets.

Conclusion

The scholars at BAS can proudly state that in 2008 they achieved remarkable results and that they managed to overcome a number of financial hardships. Once again they proved their professionalism and competence. Competitiveness and permanent comparison with the foreign standards on the European and world scale have always been extremely important for them. This is why BAS has started a procedure for independent international assessment which will be performed in 2009 by experts of the European Science Foundation and the European Federation of National Academies of Sciences (ALLEA) We expect that after the assessment we will be able to update and improve the spheres of our scientific research and to adequately restructure our institutes.

Last but not least, I would like to thank: all my colleagues whose labour is mentioned in this report, the Scientific Secretaries of the respective institutes who generalised the achievements of their colleagues, the employees at the Central Administration of BAS who helped to cover the general academic activities. It would not be possible for me to list the names of all of them, and yet I should mention Mr Sabin Tekev and his great contribution for the preparation of the Annual Report of BAS.

This report was presented by Stefan Hadzhitodorov, Senior Research Associate 1st Degree, Doctor of Technical Sciences before the General Assembly of BAS and was accepted at its meeting on May 11th 2009.
BG03-NGCC Grid Cluster
Institute for Parallel Processing

Portable Seismic Station (its purchase was funded by NATO)
Central Laboratory for Seismic Mechanics and Earthquake Engineering
A team of experts from INRNE, working on the cabling of the detection systems of CMS, CERN Institute for Nuclear Research and Nuclear Energy

One of the Telescopes in NAO–Rozhen Institute of Astronomy

Holograms donated to the National Museum in Karlovo Central Laboratory of Optical Storage and Processing of Information

Bulgarian Academy of Sciences
Handbook of the Birds of the World –
a Bulgarian zoologist is among the autors

Gobies from the Danube
Institute of Zoology
Green lizard
(fauna study)

Participation in The Man and Biosphere – a UNESCO Programm

Action for Nature preservation

National Museum of Natural History

Bulgarian Academy of Sciences
Deviation from the average temperature in Bulgaria for the period 1901–2007

National Institute of Meteorology and Hydrology (NIMH)
Amethyst geode from Dzhurkovo

Chalcopyrite crystals with quartz and sphalerite

Calcite geode from Laki

From the collection of the Central Laboratory of Mineralogy and Crystalography

Bulgarian Academy of Sciences
Installation for low energy simulated deposition of organic layers

Central laboratory of Photoprocesses

Zooplankton monitoring (Black Sea)

Institute of Oceanology (Varna)

Model tests of bulkcarrier

Flow velocity field simulation of a river port structure

Institute of Hydro and Aerodynamics – Varna
Ruins of dwellings at the fortress wall of Trapezitsa (Veliko Tarnovo)

Part of the treasure found at the Chirch of St. Ivan Rilski (Veliko Tarnovo)

Family necropolis (Borisovo)

National Institute of Archeology and Museum

The 100th anniversary from architect Liuben Tonev, ass. Member, PhD and founder of the Centre (an exhibition)

Centre of Architectural Studies

Academician Liubomir Krastanov 100th anniversary

Geophysical Institute

Bulgarian Academy of Sciences
Some editions in 2008