

VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY

Annual Report 2010

Hanoi –2010

Preface

This brochure is the annual report 2010 of the Vietnam Academy of Science and Technology (henceforth abbreviated to VAST). It presents main activities and distinguished achievements of VAST and provides the readers with an overview of VAST in the year 2010.

The editorial board thanks scientists, staff and subordinate institutions of VAST for their help and support during the preparation of this brochure. Any comments or feedback is welcome.

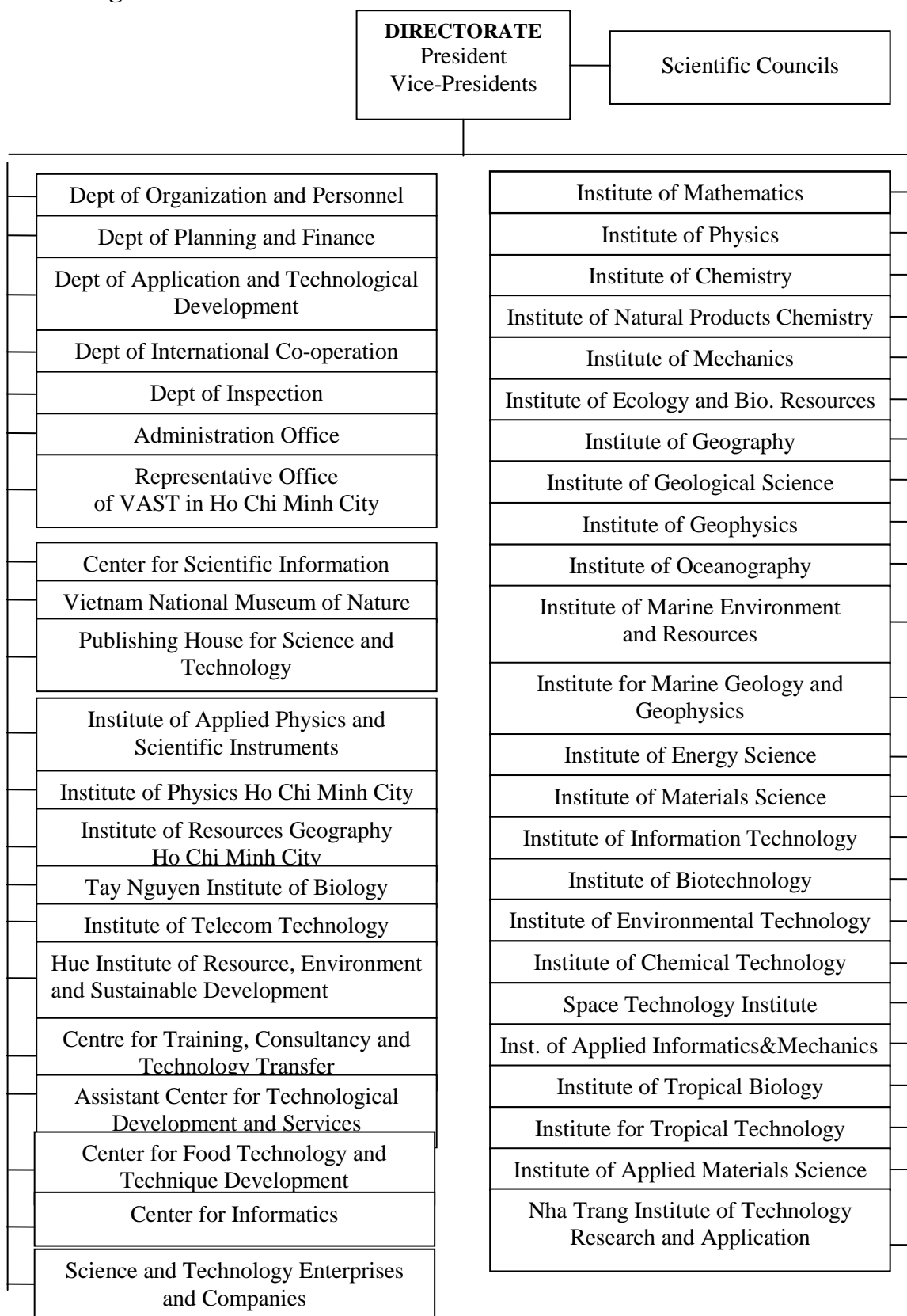
Table of content

| | |
|---|----|
| 1. About Vietnam Academy of Science and Technology (VAST)..... | 5 |
| 1.1 Organization of VAST..... | 5 |
| 1.2 Function and mission of VAST | 6 |
| 1.3 Directorate of VAST | 6 |
| 1.4 Particular situation during the year 2010..... | 6 |
| 2. Research activities in the year 2010..... | 7 |
| 2.1. Fundamental research | 7 |
| 2.2. Biotechnology..... | 11 |
| 2.3 Materials Science..... | 13 |
| 2.5 Electronics – Mechatronics – Space Technology | 19 |
| 2.6. Chemistry and Natural Products Chemistry | 24 |
| 2.7. Marine research and Marine engineering | 27 |
| 2.8. Earth Sciences..... | 30 |
| 2.9. Ecology and biological resources | 31 |
| 2.10. Environment technology..... | 35 |
| 2.11. Space Science and Technology | 36 |
| 2.11.1. Introduction | 36 |
| 2.11.2. Some results | 37 |
| 3. Technology applications and deployment | 39 |
| 3.1. Scientific – technological tasks: | 39 |
| 3.2. Promotion of technology applications and development | 42 |
| 4. Education and training activities..... | 44 |
| 5. International co-operation activities | 45 |
| 6. Infrastructure and facilities | 48 |
| 6.1. Infrastructure and facilities of VAST | 48 |
| 6.2. Investment in infrastructure and facilities in 2010 | 48 |
| 7. Operation of Key Laboratories at VAST | 52 |
| 8. Other activities | 56 |
| 8.1. Science Information dissemination and publishing..... | 56 |
| 8.2. Museum activities in 2010..... | 59 |

| | |
|--|----|
| 9. Some important statistics | 65 |
| 9.1 Statistics on human resources | 65 |
| 9.2 Statistics on Finance, Scientific Publications and Education | 67 |
| 9. Highlights of the plan for the year 2011 | 72 |

1. About Vietnam Academy of Science and Technology (VAST)

1.1 Organization of VAST



1.2 Function and mission of VAST

According to the Decree No. 62/2008/ND-CP signed on May 12, 2008 by the Prime Minister, VAST is an organization directly belonging to the Government. VAST carries out fundamental research in natural sciences and performs technology development with the focus on national priority targets, with the aim of providing scientific basis for the management of science and technology, and for the making of socio-economic policy, strategy, planning, and the training of human resources of high scientific and technological qualifications according to the laws.

1.3 Directorate of VAST

- President:
 - Prof. Chau Van Minh
- Vice-Presidents:
 - Prof. Nguyen Dinh Cong
 - Prof. uong Ngoc Hai

1.4 Particular situation during the year 2010

- In 2010 there have been many implications for the Vietnam Academy of Science and Technology, the first is the last year of the five-year plan (2006-2010) and the second is the last year that VAST carried out plans of developing VAST to 2010 approved by the government in 1998. In 2010, VAST has focused on building "the master plan to develop VAST to 2020, with a vision to 2030" reported to the Prime Minister for approval. In 2010, VAST established achievements to welcome the country's big days, welcome Congress of the 11th Vietnamese Communist Party. Specifically, the year 2010 left a bold mark that VAST has been awarded the Ho Chi Minh medal - an honour given by the State, expressing the recognition of efforts of the VAST's Party and the staff on the occasion of 35th year anniversary of its foundation.
- In 2010, The Institute of Marine Biochemistry was established by the Government, bringing the total number of VAST's research Institutes to 31. Currently, VAST has 2563 permanent staff, including 45 Professors, 195 Associate Professors, 721 PhD's and Doctors of Science, with over 700 Masters of Science. Calculated according to turnover research, the Academy consists of 117 senior researchers, 416 major researchers and specialists, approximately 1800 researchers and nearly 1200 non-permanent researchers.

2. Research activities in the year 2010

2.1. Fundamental research

Fundamental research in Mathematics

In 2010 members of the Institute of Mathematics published 10 monographs and 89 research papers, among them 58 in ISI listed journals. Significant results have been obtained in the fields of Algebra, Mathematical Analysis, Optimization and Control Theory, Scientific Computing and Numerical Analysis. There are currently 28 research projects supported by the National Foundation for Science and Technology Development led by members of the institute:

- Qualitative properties of nonlinear control systems under perturbations and their applications;
- Harmonic, wavelet and p-adic analysis;
- Singularity theory and geometry of polynomials;
- Arithmetic, geometry and cohomology of algebraic groups and related questions;
- Nonsmooth constrained multi-objective optimization problems;
- Theory of vector multi-objective optimizations and applications in economics;
- Structure of commutative Noetherian local rings and applications;
- Tanaka duality and applications in algebraic geometry and non-commutative geometry;
- Methods for nonconvex equilibrium problems and applications;
- Selected research problems in topology and geometry;
- Nevanlinna theory and related topics;
- Stability analysis of functional differential equations and applications in control theory;
- Stable methods for inverse and ill-posed problems for parabolic and elliptic equations;
- Regularity of solutions for some classes of differential equations;
- Noncommutative geometry, topology and quantum computing;
- p-Adic analysis and applications;
- Langlands programme;
- A study of properties of functions concerning their spectrum;
- Computational complexity in commutative algebra;

- Generalized dc optimization and applications;
- Rough analysis and scientific computing;
- Ideal powers and related topics;
- Applications of probability and mathematical statistics;
- First-order and second-order sub differentials with applications in optimization theory;
- Complex systems: modeling and simulation;
- Graphs, combinatory on words and their applications.

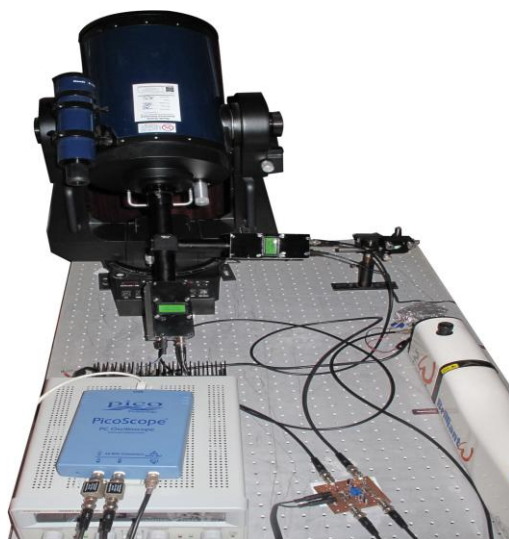
Fundamental research in Physics

As announced by the Vietnam National Foundation for Science and Technology Development (NAFOSTED), among 117 scientific projects in Physics that have been assessed and funded by NAFOSTED since 2009, there are about 50 projects directed by the physicists of VAST. In 2010, they published more 250 referred papers (about 80 publications in international journals) and a few patents were issued. The main achievements in physical research at VAST in 2010, are retained as follows:

- Researches in theoretical physics oriented towards selected subjects and mainly carried out at the Centre for Theoretical Physics, Institute of Physics (IOP) and the IOP in Ho Chi Minh City. Besides traditional directions of research such as quantum field theory, high energy physics and solid-state physics, some new directions of research appear such as quantum information, computational physics biophysics and medical physics. Recently, the Institute of Physics (IOP) has established its Centre of Computational Physics which would be organized and equipped for hosting not only Vietnamese physicists but also young scientists abroad.

Regarding the research in nuclear Physics, there are various research programmes in fundamental nuclear physics, as well as in applied nuclear physics. Particularly, among 4 scientific projects in nuclear physics funded by NAFOSTED, there are 3 projects directed by the physicists of the Institute of Physics, VAST.

In addition, the physicists collaborated well with international nuclear physics centres, such as Dubna (Russia), GANIL, ORSAY (French), POHANG (R. Korea), RIKEN, CNS - the University of Tokyo (Japan). As a result, the researches in nuclear physics have been focused on nuclear structure and nuclear reaction dynamics induced by both stable and unstable nuclei. The applied nuclear physics programs are being done including nuclear power engineering, development and application of nuclear spectroscopy methods, nuclear and radiation protection, radiation measurements, environment radioactivity, non-destructive analysis and non-destructive testing, etc. In 2010, they published more than 25 refereed papers (about 10 publications in international journals).



LIDAR system developed at IOP, VAST for investigating physical properties of atmosphere.

Regarding the research in quantum electronics, optics, photonics and spectroscopy, almost all experiments are carried out at the Center for Quantum Electronics, IOP and Division of Optics and Spectroscopy, Institute of Materials Science (IMS). Many so-called key projects of fundamental and applied research are going on. Some new directions in research such as light detection and ranging (LIDAR) and laser scanning confocal microscope (LSCM), fluorescence imaging microscope (FLIM) and nano-photonics techniques, modern laser spectroscopy, physics and technology of coherent light sources, interaction between laser light and materials, biophysics and medical physics are being developed. In 2010, the researchers in quantum electronics, optics, photonics and spectroscopy have published more 50 refereed papers (about 20 publications in international journals) and a few new patents

were issued. It must be noted in 2010, the building of the Laboratory for Quantum Electronics, IOP comes into use, in addition, a VAST project for equipping this laboratory commences.

Regarding the research in materials physics, the researches in nano-materials physics have been strongly developed since 1998, besides the traditional research of semiconductor physics and solid-state optics. The Institute of Materials Sciences (IMS), VAST based on the National key Laboratory of Electronic Materials and Devices are taking a leading role in problems of nano-materials physical research. Among 83 scientific projects in Physics funded by NAFOSTED since 2009, there were almost 30 projects directed by the physicists of VAST.

It must be noted that the Ministry of Science and Technology (MOST) has selected and funded, for the first time, basic research projects of potential application (in materials sciences). This has created more opportunities to the research in material physics and, in particular, in nano-materials physics. Therefore, publications in the materials physical research by the physicists of VAST increased substantially.

Besides the achievements in basic science, the physicists have spent their efforts in organization of implementation, application and transfer of their research results to the different areas of scientific research, economy and life. For example, the laser based-LIDAR system and the autocorrelator developed at IOP for investigating atmosphere physics and measuring ultra short laser pulses, respectively. Some different instruments for medicine have been designed, manufactured at IOP and used in hospitals such as the sterilization devices based on ozone technology for disinfecting water and air environment, hospital instruments, high-power diode lasers for operation, laser scanning confocal microscopes and laser projection microscopes.

In addition to the achievements in physical research, in 2010 the physicists of VAST organized 15 national and international scientific meetings such as The International Conference on Frustrated Spin System, cold atoms and Nano materials (14-16 July 2010); The 6th international Conference on Photonics and Applications (ICPA-6, 9-12 November 2010); The 5th International Workshop on Advanced Materials Science and Nanotechnology (IWAMSN-2010, 9-12 Nov. 2010); The 7th Asia Nano Forum Summit Meeting

(7th ANFoS); The 5th Korea-Vietnam Joint Symposium on Quantum Photonics and Nanotechnology (5th K-V); EU-South East Asia Workshop on Materials Research for Environmental and Health Applications (PCM); The 9th Asian Pacific Workshop on Materials Physics (APWMP-9, 12-15 Dec. 2010); The 1st Academic Conference on Natural Science for Masters' and PhD students from Cambodia, Laos and Vietnam (CLV-2010). These meetings received more than a thousand participants, including around 250 international participants.



IR, VIS and UV picosecond laser developed at IOP, VAST

In 2010, new international collaborations have been established between the physicists of VAST with international scientific institutions of Russia, France, American, Germany, Italy, Japan, S. Korea, Ukraine, and Belarus. This international cooperation includes advanced training, participation in various international scientific conferences, joint organization of international schools and research programmes. There are nearly 200 international scientists and technologists visiting at VAST.

2.2. Biotechnology

The major objectives of the plan for ten years of development of biotechnology in the Vietnam Academy of Science and Technology (VAST) in the period from 2001 to 2010 were established as key technologies and the professionalism in scientific research and laboratories. Development of key technologies proposed to support VAST institutions to take the leading role in the advanced and modern science and technology R&D areas. Also, the enhancing of professionalization by the formation of expert groups with high

expertise will ensure the implementing synchronization and effectiveness of scientific technological missions that the country required. The year 2010 is the last year of period 2001-2010; Biotechnology fields have attained achievements as follows:

- Expression of recombinant coagulation factors in animal cell cultures.
- Research and identification of the enzyme lignin peroxidase (Lip), manganese peroxidase (MnP) and laccase from microbial decomposition of organic compounds sustainable (POP) and the aromatic nature of pollution. Isolate selected micro-organisms (filamentous fungi, and actinomycete bacteria).
- Application of RNAi technology to create transgenic cotton resistant to blue dwarf virus.
- Determination of the level of gene transcription supporting a diagnosis of breast cancer using the technique RT-PCR real time multi gen.
- Study on the antigen expression, specificity of prostate cancer (EPCA) to create a diagnostic kit.
- Study on the process of transformation of androstenedion phytosterols in biological systems-liter fermentation scale of 5-10.
- Generation of the antigen -Staphylococcal recombinant enterotoxin B (SEB) for rapid detection kit for food poisoning caused by golden staphylococcus toxin.
- Creation of the kit for ELISA quantitative determination of Alpha-fetoprotein (AFP) in serum to support the diagnosis of hepatocellular carcinoma (HCC) in humans.
- Production of bacterial enzyme uricase as raw materials for production of uric acid treatment increased the blood.



The Spectrometry equipment – Biotechnology Institute

2.3 Materials Science

After many years of gradual development since the beginning of the present century, nanotechnology has achieved significant progress in the year 2010 with the formation of six mixed research groups: Institute of Materials Science, Institute of Physics, Institute of Chemistry, Institute of Chemical Technology and Institute of Biotechnology. They are working in the following multidisciplinary scientific fields:

- Magnetic and polymer nanoparticles for biomedical applications.
- Nanophotonic materials for the applications in medicine and agriculture.
- Luminescent nanoparticles containing rare earth elements for the biomedical applications.
- Biomedical applications of nanooptics.
- Synthesis and biomedical applications of PAMAM Dendrimer/Pt complex.
- Fabrication and application of carbon nanotube.

Nanoparticles (NPs) of maganite $\text{La}_{0.7}\text{Sr}_{1-x}\text{Ca}_x\text{MnO}_3$ and magnetite Fe_3O_4 (MNP), were synthesized by various methods: co-precipitation, sol-gel, oxidation/reduction and high energy ball milling. Two amphiphilic copolymers composed of: Poly (lactide) (PLA) with d-a-tocopheryl polyethylene glycol 1000 succinate – Vitamin E (TPGS) and Polyacid acrylic (PAA) with polystyrene (PST) were synthesized. Chitosan (CS) was additionally used to encapsulate the MNPs. Magnetic heating effect was thoroughly investigated for both naked and polymer capped magnetic NPs concentrations. Starch-capped magnetite ferrofluids were chosen for performing in-vitro hyperthermia of cancer cells. Curcumin (Cur) was used as a model drug to adsorb on nanocarriers such as: PLA-TPGS/Cur, MNP/CS/Cur and oleic acid (OL) capped NPs MNP/OL/Cur. Phagocytosis of the two latter ferrofluids by human and mouse macrophages were observed by photo-luminescence microscope and magnetization measurements. Some results of immobilization of HBsAb on the PAA-PST capped MNPs as well as that of preliminary in-vivo MRI researches on intravascular administration and focusing of MNPs to the tumor region will also be reported.



*The opening of Vietnam Nanotechnology Company -Vinanotech
(Institute for Materials Science)*

In the time period mentioned, some high-luminescent-nanophosphors (NP)- containing rare earth ions Euro (III) and Tb (III) have been successfully prepared, using the controlling nanosynthesis method. The NPs have sizes from 10 nm to 40nm with core/shell structures and reliability. Among them $\text{YVO}_4\text{:Eu(III)@SiO}_2\text{-X(OH)X}$; $\text{CePO}_4\text{:Tb@LaPO}_4$; and EuNTA.TOPO@PVP or $\text{SiO}_2\text{-X(OH)X}$ have for the first time been fabricated by sol gel processing. The fluorescence intensity and stability of the core/shell structured NPs mentioned have shown considerable increase. Furthermore, we have functionized the above NPs with biocompatible groups such as OH; NH_2 ; and SCN etc. and the functionized NPs have linked uncovalently with a typical biomolecular agent Biotin. By using accupating protocol with some virus measles or rota in the Centre Poluvac of the Ministry of Health, we have investigated to use the obtained NP- conjugater applicable for fluorescent label immunoassay analysis.

The water mono-dispersed colloidal gold nanoparticles (NPs), which is of 15 – 40 nm size and OD ~ 1-4, were fabricated by the Tourkevich method. The gold NPs were bioconjugated and functionalized by Bovin Serum Albumine (Au@BSA) and Polyethylene Glycole (Au@PEG) capping. The PEG capping have the function groups like COO^- , NH_3^+ or thiol capable to bind to the biomolecules. The Au@BSA and Au@PEG NPs were successfully

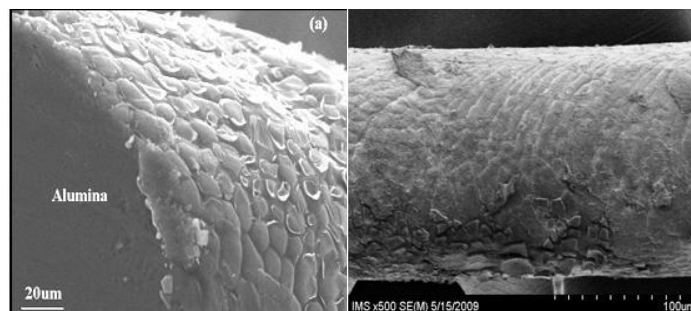
conjugated with anti HER2 and CD33 phage display antibodies (Abs) (provided by the Institute of Biotechnology, VAST). The bioactivities of the complex Au@BSA – Ab and Au@PEG-Ab were examined by the ELISA test. The toxicity of the Au@BSA and Au@PEG nanoparticles was carried out in mice. The results show that at injected concentration of 5.84mg/kg, both the Au@BSA and Au@PEG NPs are not toxic for mice. These premised results are necessary for further application of the fabricated nanogolds in biomedicine.

The aqueous organically modified silicate (ORMOSIL) nanoparticles (NPs) doped with Rhodamine B (RB), Rhodamine 6G (R6G), Coumarine 54 (Cu54) and Pyrromethene 567 (PM567) dyes were synthesized by the Stöber method from methyltriethoxysilane $\text{CH}_3\text{Si}(\text{OCH}_3)_3$ precursor (MTEOS). The NPs are surface functionalized by different groups such as amine, carboxyl, thiol....The nanoparticles are also capped by Bovine Albumine Serum (BSA) and Polyethylene Glycol (PEG). The capping improves the nanoparticle's water monodispersion and bioconjugation capability. The RB doped nanoparticles were successfully conjugated with the anti E.Coli 0157:H7 specific antibodies (Abs) to form the complex NP-Ab. This complex was used to label the bacteria E.Coli 0157:H7. The number of bacteria has been counted up using the fluorescent spectra and microscope images of labelled bacteria. The results show the ability of NPs as a label in biosensor.

Two poly (amidoamin) dendrimer/ Pt^{2+} complexes were synthesized by using poly (amidoamin) dendrimer second and third-generation with core ethylendiamine (EDA) and potassium tetrachloroplatinate (II) (K_2PtCl_4). The products were characterized by UV-vis, IR, Raman spectroscopy and ICP-AES (Inductively coupled plasma atomic emission spectroscopy). The results of antiproliferative activity testing on NCI-H460 cell line show that G2.0-Pt and G3.0-Pt complexes have much stronger activity than G2.0, G3.0 and K_2PtCl_4 .

Singled wall CNTs (SWCNTs) with a few nanometers diameter and multi-material wall CNTs (MWCNTs) material with output of 200-500 grams per day, purity of 90% were successfully synthesized using the Chemical Vapor Deposition (CVD) technique. The equipment configuration and manufacturing technology have been patented. Vertically aligned CNTs on the Si, Cu substrates; CNTs on W tips and diamond material for several applications were studied in detail. The properties of CNTs materials such as crystal structure, morphology, thermal dissipation and characteristics of

electronic field emission have been studied through measurements like FESEM, Raman scattering, AFM, TEM, etc., Some applications using CNTs materials were examined with many interesting results as application of CNTs for the manufacture of electronic emission, STM probe; applications of CNTs for the material composite base metal (metal coating Cr, Ni, alloy Cu/ CNTs) have high hardness, abrasion resistance; CNTs in thermal dissipation materials for high power electronic devices (CPU, LED).



Al₂O₃ before and after impregnation of the T_iO₂

In the study on materials for organic solar cells, two novel ruthenium complexes *cis*-[Ru(H₂dc bpy)(L)(NCS)₂], where H₂dc bpy is 4,4'-dicarboxy-2,2'-bipyridine and L is 4,4'-bis-(4-di-p-hexyloxyphenylamino)-styryl-2,2'-bipyridine (HMP-9) and 4,4'-bis-(4-(N-carbazolyl)-phenyl-2-vinyl)-2,2'-bipyridine (HMP-11) have been synthesized and characterized. The influence of differently conjugated bipyridine ligands on these complexes was studied using UV-Vis spectroscopy and cyclic voltammetry. These heteroleptic complexes show appreciably broad adsorption ranges and quite high extinction co-efficients. These new dyes were used as photosensitizers in nanocrystalline ZnO dye-sensitized solar cells. It was found that the difference in light-harvesting property between HMP-9 and HMP-11 is associated mainly with dye absorptivity and the alignment of the HOMO-LUMO energy levels. The power conversion efficiencies of solar cells based on HMP-11 is 7.09% while the HMP-9 delivered a lower efficiency of 5.34% under the same device fabrication and measuring conditions.



Device of cleaning the air on TiO_2 photocatalytic principle



TiO_2 -Air Filter

The research on catalysts for green energies has achieved interesting results. Rice straw, a waste agro-hyproduct, which is abundant lignocellulose products from rice production, is a renewable energy source in Vietnam. Bio-oil from rice straw is produced by thermal and catalytic pyrolysis using a fixed-bed reactor with heating rate $15^{\circ}\text{C}/\text{min}$, nitrogen as sweeping gas with flow rate $120\text{ml}/\text{min}$. Final temperatures of the pyrolysis reaction has a significant influence on product yield. The gas yield increased Liquid yield decreased as the pyrolysis temperature increased from 400°C to 600°C . The bio-oil yield reached a maximum of 48.3% at the pyrolysis temperature of 550°C . Mesoporous Al-SBA-15 was used as acid catalyst in pyrolysis, of rice straw. The obtained results showed that, in the presence of catalyst, yield of gas

products increased, whereas liquid yield decreased and the solid product remained the same as compared to the non-catalytic experiments. The effect of nanostructured catalysts on the product yields and distribution was investigated.

Catalysts on the basis of cobalt oxide supported on γ -Al₂O₃ modification by ammonia and ammonium nitrate have been prepared from cobalt acetate and studied in the reaction of synthesis of liquid hydrocarbons from carbon monoxide. The optimal contents of cobalt in catalysts prepared from cobalt acetate have been shown to be 20 wt.%, while the optimal content of cobalt in catalysts prepared from cobalt nitrate has been found to be 15 wt.%. The liquid hydrocarbon yield obtained on the sample with 20 wt.% of Co from cobalt acetate precursor was higher than that from nitrate.

Some nano catalysts such as Co₃O₄/ZrO₂, La_{1-x}Sr_xMn_{1-y}Zn_y, La_{1-x}(Na/K/Li)_xMnO₃ were synthesized.

2.4 Information Technology

Accomplishing construction of the text – translation system from English to Vietnamese by statistical methods:

Having tested English - Vietnamese translation with translation system core is open source software Moeses, building automated tools to collect linguistic data for English – Vietnamese from the Internet. Collecting linguistic data for the language translation system (in Vietnamese and English-Vietnamese bilingual); Building and computing models of Vietnamese components; Improving and adapting translation models based on fundamental research on language specification; Building linguistic data warehouse and minimal language resources for machine translation problems; Building first Vietnamese - English version based on the statistical approach and installed on Web 2.0.

A model has been built using virtual reality technology for simulating the effects and simulated a number of fundamental effects in popular lectures.

Accomplishing research methods of epidemic warning and deployed a number of existing software tools; initially designed as warning systems and built software systems to support epidemic warnings.

Developing LBS services as a guide for automobiles in the city for using mobile handheld devices, were tested in the inner city (Hanoi city) for tourism.

Also studied the application of data assimilation methods for correcting coefficient for the pollution problem (surface) and Kalman filter method for correcting results of two-dimensional problems.

Studies have been made for the the application of newest mathematical methods of digitally signal processing technology to build some tools to recover image data quality (CINE TOOL): recovering colour on discoloured footage, recovering the contrast of the decline, process stability shake image in video images caused by mechanical deformation. Cine tool has been implemented on a trial at the Vietnam Film Institute, Ministry of Culture and achieved good results.

Accomplishing research on reporting systems to support management in information systems management: Identify generally flexible report format; Some database management systems, on how to organize relevant information to create generally flexible reports; Having developed the database format conversion module from common standardized database format to support; building modules to export generally flexible reports according to researched forms.

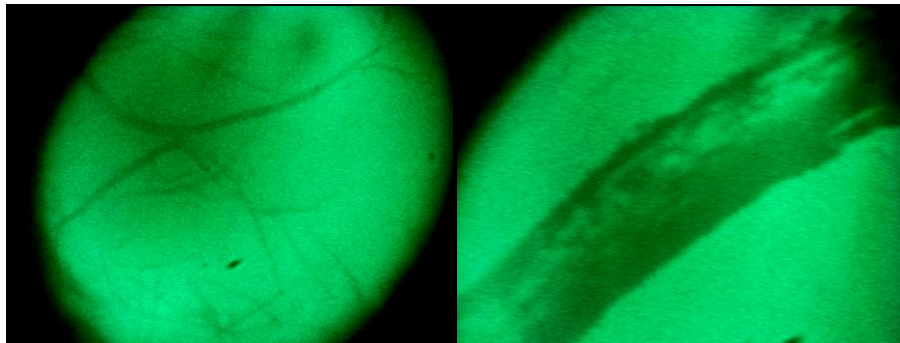
2.5 Electronics – Mechatronics – Space Technology

2.5.1. Electronics

- A system of LIDAR (Light Detection and Ranging) has been developed successfully for the first time in Vietnam, at the Institute of Physics in order to investigate with high temporal and spatial resolution the distribution and physical properties of the atmosphere. Polarization components were used to determine the depolarization ratio of the LIDAR signal. The LIDAR system can be detected at 532 nm, 1064 nm (Backscattering), 607 nm (Raman of Nitrogen gas) and 660 nm (Raman vapor water). Initial measurements with the LIDAR system indicate a good performance and sensitivity; it can measure the distribution of aerosol up to over 20km. Such a multi-wavelength, compact and flexible LIDAR system is very attractive to various applications and reproduction.



Laser-based projection microscope



Bio-tissues were observed by Laser Projection Microscope

- A Laser-based Projection Microscope has been developed successfully, for the first time in Vietnam, at the Institute of Physics using a cooper-vapor laser. Besides an imaging magnification of 10^4 , the Laser Projection Microscope has several important advantages, in comparison with conventional optical microscopes, in measuring bio-medicine in-vivo samples, large-dimension or hardly-positioned samples...Therefore, it is very useful to application & research in biology and medicine.
- A high power semi-conductor lasers guided with optical fiber for medical applications has been developed successfully by the research and integration of commercialized optical and laser components and modules. In collaboration with the Military Hospital 108, the laser has been used in first test surgery action on rabbit skin, cockscomb etc.,
- Design and develop a magnetic assay with different energy levels used for development of the cells crop plants; Manufacture a magnetic activated water equipment for growth-stimulation of the young plants in the experimental sites.
- Research, design and manufacturing the equipment for automatic process of the blood filter for patients after hemodialysis treatment.

- Design and manufacture the device for measurement of the luminescent lifetime based on the single photon correlation time measuring technique.
- Develop an ozonic system to sterilize the hospital environment. Trial applications are on-going at Hanoi Friendship Hospital and Military Hospital 108.
- Research and manufacture the coupler-divider using Bragg photo-detector and its applications for increasing the optical channel of the bidirectional WDM networks with a speed of 2.5 Gbit/s on a wavelength, separate optical wavelength information in the wavelength 1530 – 1580 nm.

2.5.2. Mechatronics

VAST continued to serve as the focal point for mechatronics technology's research and development activities. The most significant results are the two products: Oscillation measuring, recording and analyzing equipment for rotor balancing, BalDaq-E, developed by Vibration and Noise Control Technology Laboratory, and the in-field rotor balancing software, BalanceX3-IS, which has won VIFOTEC's third-place award in 2010. The product has been transferred to VIHEM Corporation, Dong Anh, Ha Noi.

Additionally, the Institute of Mechanics has also completed the VAST level research project "Research, design, integration of three-dimensional oscillation automatically measuring and recording devices for the science service station project – DKI. The products of this project are the research results achieved for the first time in Vietnam, and important tools to manage and estimate the technical status of the marine construction projects similar to the DKI, installed in Truong SA islands, providing important information for maintenance and repair.

VAST continued to act as a standing body of the Vietnam Association of Mechatronics in activities of research and development of Mechatronics in Vietnam. VAST has successfully organized the 5th National Conference of Mechatronics VCM2010 in Ho Chi Minh City.

2.5.3. Space technology

Space technology development

In 2010, VAST continued to preside over the implementation of the Government's Science and Technology Programme of Space Technology research and application with the following goals:

- In technology and equipment: Research the design principles, rocket manufacturing technology, rocket engines; LEO orbited satellite altitude determination, monitoring and control method, low resolution optical payload; GPS receivers, nanomaterials used in space conditions, etc.
- In application: Study and master the design, operate and efficiently utilize the satellite image receiving station, construct and utilize the national remote sensing shared database; implement GPS technology, develop remote sensing pictures processing software, conduct experiments in a state of weightlessness, etc.

Some results:

- Research & applications of the satellite data for estimation of the sea water level rise under consequence of the climate change, through that to estimate their impacts over a coastal basin of Vietnam. Establish the simulation map scale 1:25,000 according to sea level rise hypothesis using satellite image processing technology in 3D.
- Research, design and manufacture an airborne spectrometer in the vision and infrared wavelength applied for remote sensing of natural objects.
- Application of the microwave radiometers for measurement and monitoring of the environment's parameters such as: soil moisture, water content. Measure the natural emission of rice fields on their evolution cycle, enabling forecast of the rice yields.
- Research, investigate and propose the method of using the high precision GPS receivers to estimate the movement of the construction buildings on coast zone, apply the method in the case of Cam Pha cement plant, Quang Ninh province.
- Fundamental research of the effect of the space environment on characteristics of nano-materials used for building spacecrafts, satellites. Conduct experiments on some kinds of nano-material in the high radiated energy conditions. Modelization and simulation of the change of structure and photo-characteristics of nano-material under specific space environment conditions.
- Research of the scientific basis for constituting the Vietnam legal framework on the use of Outer Space for peaceful purpose.



Experimental ADCS



*Image of Vietnam VNREDSat-1
Thua Thien – Hue coastal zone*

The Space Technology projects

The project “Vietnam’s small satellite monitoring natural resources, environment and natural disasters” (VNREDSat-1) was approved by the government in 2009, and in 2010 the process of bidding and contract negotiations, contract development announcement has been completed.

The project of the Vietnam Space Centre construction at Hoa Lac Hi-Tech Park has been officially requested to Japan for ODA loans by the Prime Minister. Currently a group of Japanese consultants are working with VAST to establish the feasibility report for the project from August 2010 to February 2011.

International cooperation

In terms of international cooperation, VAST continued to work with Japan Aerospace Exploration Agency (JAXA) in the implementation of the project "Manufacture the flying model, test and launch the pico satellite into orbit". Along with JAXA and other foreign partners, VAST has participated in the design, manufacture, launching and operation of MicroSTAR satellite.

Space Technology Institute (STI) has begun the scientific cooperation and exchange of research students with the University of Viro, Spain via the small satellite constellation project Humsat.

VAST also attended the summit "Head of Space Agencies Summit" in Washington DC, and discussed the issues of common interest such as utilizing space technology in prevention of natural disasters and global climate change.

Furthermore, VAST has always actively been seeking and promoting international cooperation with the large space agencies in the world such as JAXA, NASA and ESA.

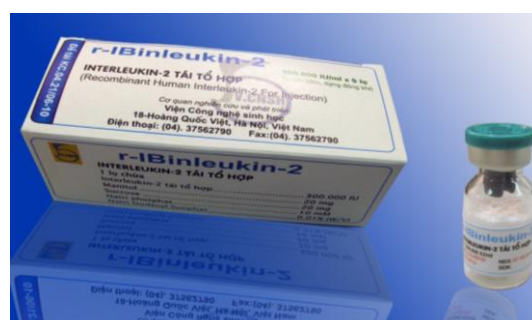
2.6. Chemistry and Natural Products Chemistry

2.6.1. Research in screening and developing of biologically active substances from natural resources (plants, animals, micro-organisms, marine organisms etc.,)

- The herbal antidrug medication Heantos 4 used in treatment of heroin addiction symptoms has been passed the clinical study phase III on 251 test patients, done in 3 clinics (Central Psychiatric Hospital No.1, Thuong Tin, Hanoi; Center for Labor and Society No.1, Ba Vi, Hanoi; Psychiatric Hospital of Bac Ninh Province). The scientific and the ethic committee of MOH have approved the results of the clinical trial as "good". This medication is now waiting for the permission to go into production and thus allowing nation-wide use.
- The state-level project KC 02.09/06-10 "Study on preparation of nanochitosan material and use in pharmacy and agriculture: Prepared the rice growth product containing nanochitosan in liquid and powder form. Prepared nanochitosan-silver paste for the wound healing; study of pharmacology and toxicity of nanochitosan-silver medicament.



*ELISA kit and DOTBLOT kit
diagnosing HIV-1 virus*



Recombinant product Interleukin-2

- The state-level project KC 10-20/06-10: Study on screening of some medical materials for isolation of new natural substances having the killing-activity to cancer cell lines: Two strongly active substances have been isolated in large amounts for their toxicity study. Improvement of isolation procedure for 3 new

compounds (30 gram/compound) for pharmacological study including the *in vivo* study.

- The field of study on marine organism gathered many good results. The project KC09.09/06-10 "Study on screening of bioactive substances as antibiotics, cytotoxics and antioxidants from marine organism for preparation of pharmaceutical products: From sponge *Xestospongia testudinaria* one fatty acid containing Brom and 3 -C≡C-bonds with strong activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Fusarium oxysporum* has been isolated. This finding opened up the possibility to use this compound for treatment of infection diseases. This substance and its biological activity is the subject of the Vietnamese patent No. 8852.

The project "Study to develop the technical procedure for production of products for treatment of rheumatism and use as functional foods starting from marine organism": Has improved the technology for preparation of Omegaka from anchovy with a scale of 200kg raw material/ batch. 25 kg Omegaka have been prepared for clinical study.

The project "Study to develop a technical procedure for production of charantin from fruit of *Momordica charantia* for medical use" belongs to the national programme "Development of pharmaceutical-chemical industry in Vietnam" has developed a spray drying procedure with a scale of 100kg raw material/batch. The obtained product contains more than 1% charantin. The produre will be improved for increasing the charantin contents to 10%.

2.6.2. Synthesis and Application

In the synthesis of generic drugs there are some projects going on, for example: synthesis of anticancer agents vinblastine and vincristine; the antibiotica of floroquinolone groups (chiral synthesis of levofloxacin); propanolol hydrochloride for treatment of heart diseases; nanocalcium hydroxyapatite for treatment of osteoporosis and functional foods (the commercial product CAOTOT); the antimalaria agent amodiaquine.

In the field of application there are two projects as examples:

"Study on technology and equipment for production of UV-absorbing, light-filtering and climate stable polymer for agricultural production" (KC 07.23/06-10);

"Study on production and application of **micro-organism products** for treatment of ice-ice diseases of Vietnamese algae".



UV-absorbing, light-filtering and climate stable polymer for agricultural production



Vietnamese patent No. 8852



Functional food COT THOAI VUONG

2.7. Marine research and Marine engineering

2.7.1. The scientific projects

Scientists of VAST have fulfilled numerous scientific projects from different ranges, here are some examples:

- 12 projects at State level in Programme “Marine Science and Technology for sustainable developments of Economy and Society”, coding KC09/06-10.
- Several projects in the Programme “Eastern Seas and Islands”.
- Two projects in programme 47, project “Position resources in Viet Nam” and project “International cooperation in marine Science and Technology”.

In the field of marine physics and marine dynamics: One project was completed, checked & taken over by VAST. That is the project called “Withdrawal current research”. These currents were identified by geomorphologic features of sea bottoms and beaches; processing remote sensed images by special software. The results of this study were checked out at Nha Trang and Cam Ranh beaches and can be implicated for the whole of the Vietnam shore line for safety of local people and foreign tourists .

One project is being implemented which is “To develop and improve predict model of storm waves, sea-level rises and tides of Vietnam sea”, which

started from the beginning of 2010, with testing Model WST and software for calculation of storm waves, sea-level rise and tides.

In the field of marine geology and geophysics:

- A Project on research of natural and environmental conditions of coastal expanded mud flats around Ca Mau peninsula has been studying a process of recent sedimentation, change of coastal line, mud flat development. The maps of paleo-geography of the study area were conducted. Additionally, a model of erosion of different versions was also conducted.

- A project of research, comparison of tectonic-geodynamics and paleo-geomorphology of basins on the continental shelf of Viet Nam has been clarifying an evolution of Cũu Long and Nam Con Son basins in Cenozoic time. These results may be useful for oil and gas exploration at the basins.

In the field of marine biology: a project on influence of climate change on the coral ecological system of the Viet Nam sea has been carried out.

In the field of marine environment: 4 projects have been implemented.

- A project “Assessment of protection objects on the environment at river mouths and coastal zones of the Southern part of Central Viet Nam” has been using a complex of data and methods and has reached certain results.

- A project of research on supervising and prevention of pollution at Van Phong bay has been supplying a confident data of background environmental details (2009) of this bay for assessment of environment degradation in case the industry objects, will be implemented.

- A project of an accumulation of organic materials (PAH_s, PCB_s) in water, sediments and organisms has been conducting a study on Bach Dang river mouth. The results of this project have shown that we need to know the capability of the environment on pollution and control the level of such pollution and take appropriate measures in time in order to protect the environment at river mouth areas.

In the field of natural resources: 2 projects of soil/land resource.

- A Completed project on mud flats areas has provided indexes of sustainable development and 30 criteria of environments for sustainable development, including criteria of sustainable development of mangrove forest ecology, sustainable development of coral ecology, sustainable development of beach ecology, and sustainable development of mud flats ecology. Additionally,

a summary index of sustainable development of mud flats was proposed, combining ecology status, environment and human effort.

An on-going project: “Research and assessment of accretion and expansion of coastal mud flats in the Red River delta” in the environment of climate change.

In the new field of economic assessment of resources for the ecological systems, one project has chosen approaches for an appropriate economic assessment of resources for the eco-systems of coral, sea grasses and mangrove forests. Numismatic judgment of value of the eco-systems, including direct and indirect practical values, potential values. The Results of the project have been applied in some areas of Hai Phong province with total 700,000, 000 VND of economical contracts.

In the field of Marine Technology: 3 projects are being implemented using remote sensing data of high resolution and GIS for studying river mouth areas, marine objects. Other subjects for marine technology is the problem of metal erosion. This must be promoted in the near future.

When some of the Ministerial level projects (VAST level) after implementation can be applied to practical life, others are for testing and can be developed into state level projects.

The 12 among 28 State projects of the State programme on marine science and technology, coding KC-09/06-10, stem from the VAST level projects of previous periods.

2.7.2. Other activities

In 2010 VAST has organized a Scientific Conference on the occasion of 35th Anniversary of VAST. The Session of Marine Science and Technology was successful with 47 reports, including 10 reports on geology, 17 – on biology, 9 – on environment and marine management, and other reports on marine objects and marine technology.

In 2010 VAST has issued an Atlas of Natural Conditions of the Vietnam Sea and adjacent area, it contains 63 maps, including 15 maps on geology and geophysics; 35 maps on marine meteorology and hydrography; 13 maps on the environment and ecology. This atlas has presented the results of scientific researches by Vietnam scientists on marine science and technology in 5 State programmes, from Thuận Hải – Minh Hải programme (1976-1980) to

Programme KC.09 (2001-2005). The Atlas was presented in Vietnamese and in the English language.

2.8. Earth Sciences

In 2010, research activities in Earth Sciences have been deployed in three main directions: disaster prevention, rational use of natural resources and environmental protection, in which research issues related to natural disaster prevention and mitigation is an important key research field of the VAST. Participation in this field were the scientists of the Institute of Geological Sciences, Institute of Geography, Institute of Geophysics, Institute of Geography and Resource at HCM (the study of Institute of Marine Resource and Environment, Nha Trang Institute of Oceanography, Institute of Marine Geology and is presented in the report on the activities of Sea and Marine Technology Branch).

The study of the three directions mentioned above are implemented in: 13 National Scientific projects, a number of state-level and ministerial independent projects, state authorized fundamental research projects, etc., as well as co-operative projects by Protocols with the Russian Federation, Ukraine, Denmark and Belgium. In addition, the VAST's institutions has been conducting many co-operative projects between VAST with ministries and provinces.

The studies under the disaster prevention field focus on the following issues: (1) Neotectonic activity, modern tectonics and geodynamics of the Eastern Sea as a basis for disaster forecasting and proposed preventive measures, (2) Model structure of the deep crust in Vietnam's territory and territorial waters by applying deep seismic investigation and other geophysical data to improve the confidence in the research field as well as in disaster forecasting, (3) Assessment of earthquake and tsunami risks on coastal areas and islands and suggest preventive measures; risk assessment and damage estimates due to earthquakes for the big cities; (4) Other types of natural disasters: drought (and desertification), floods, thunderstorms or incidents of oil spill (due to natural causes); (5) issues related to global climate change and sea level rise as well as their impact to the natural conditions and economic society in our country especially for the coastal provinces.

The research direction of rational use of natural resources focus on the following issues: (1) To identify and establish new forms of geological resources (raw materials and new application areas), proposing navigated applicable solutions in exploitation and processing technology to improve the efficiency of resource use and environmental protection, (2) regional resource assessment, particularly the coastal and marine islands, contributing to planning for social-economic development, (3) to build up models of natural resource management and environment for specific ecological zones.

The urgent environmental issues and environmental protection research focuses on: (1) mechanism of heavy metal and toxic waste emissions in exploiting and processing metal minerals, proposing applicable pollution treatment technology, (2) Developing new application of natural materials to produce friendly environmental material for handling water and land pollution by heavy metals and other toxic wastes due to different causes, (3) Prepare reports on strategic environmental assessment for provincial, regional planning for socio-economic development.

2.9. Ecology and biological resources

The Institute of Ecology and Biological Resources (IEBR) is the leading institutions, carrying out research on ecology and bio-resources in Vietnam. Annually IEBR implements many different scale scientific projects on fauna and flora, biodiversity, ecology, bio-resources and environment in Vietnam.

In 2010 IEBR implemented one state level project on Fauna and Flora of Vietnam, 2 projects on the field of environmental protection, many state level sub projects, 6 VAST-level projects, 12 basic science projects with funding source funded by the NAFOSTED, 17 institutional level projects. Besides IEBR also implemented many projects in co-operation with international partners in different provinces of Vietnam and joining with other organizations and agencies. All the projects received a lot of achievements in the following fields:

2.9.1. Scientific research

The state programme in the period of 2008-2010 is continuing the programmes on Fauna and Flora of Vietnam with the objective of writing and completing Fauna and Flora in order to form an inventory and assess the biological

resources of the country for socio-economic development, science and natural protection in the era of industrialization and modernization. All the publications of the programme are important documents in compliance with international criteria and having high value for cite within and outside the country. In 2010 the project had compiled 16 tomes, among them 6 tomes on Fauna and 10 tomes on Flora for publication.

All the ministerial projects belong to 9 priority fields under IEBR's implementation are concentrated on the inventory and assessment of biological resources of the country, their used value, national utilization and protection. based on the results of the projects many recommendations have been made as establishment of some areas for protection of rare, precious and high value gene pools of the country, procedures of producing bio-active compounds, having high value in economic development and evaluation of biological resource potential of the regions.

In 2010, IEBR established an evaluation committee for all 12 institutional projects, which was implemented for keeping alive all departments and institutional directions. The results of the projects are experimental studies and exploration of new potential study directions in order to develop larger scale projects and to apply into practice. The study results were published in many national and international journals and proceedings of sectoral workshops.

The scientists of IEBR have compiled many different **books** and monographs on ecology and bio-resources in different fields of study, such as:

Plant resources: IEBR is one of the first scientific institutions in the exploration, using and planting of some high economic value plant species for important consumer goods in the country. In the meantime this led to successful extraction of bio-active compound production from genus *Dalbergia* in Vietnam as *D. tonkinensis* Prain, *D. cochinchinensis* Pierre, *D. oliveri* Gamble ex Prain and some other potential species. The studies on distribution of these species were carried out in some provinces such as Nghe An, Quang Tri, Dac Lac and Ninh Thuan. The specimens were collected for extraction of bio-active compounds and recommendation of some conservation measures for high scientific and practical value species.



Transgenic Papaya in a greenhouse, Camp Co Nhue Biology experimental farm

Some scientists are studying medicinal plant species concentrating on genus ginseng (*Panax*). The survey and evaluation on genetic population diversity of some species in genus ginseng were carried out for basic scientific recommendations of plans and conservation for sustainable development measures. The collection for genetic study of some selective populations of ginseng in Vietnam was made. The evolution tree based on genetic study, sequencing data of ginseng species in Vietnam, also the genetic relationship between species and population were build up.

The survey and evaluation on planting possibilities of some essential oil species in Vietnam were carried out for development of biological fuel resources for industry. Also study on increasing plant diversity by planting some precious tree species in Me Linh station for scientific study, training and education and eco-tourism. All these activities contribute to the conservation of some rare and precious plant species-typical gene pool in the verse of extinction in Vietnam.

Animal resources: The study on biology and ecology of some rare, precious and high scientific value mammal species in some protected areas in Vietnam was carried out and some recommendations on development and conservation measures for these species was made, for example study and evaluation of the status of Sao la (*Pseudoryx nghetinhensis*) and lanscapes in south-west part of Quang Binh province was carried out and recommended planning of Sao la conservation landscape area based on scientific research covering habitat, population status, forest status, landscape and other important biodiversity values.



The Integrated research Station of multi-disciplinary resources and environment Central environment

2.9.2. Applying scientific research results into practice

Public Health: IEBR carried out many studies and researches on the medicinal plants, high bio-active plants, plants used for bio-control, essential oil plants etc, making the recommendations for conservation and sustainable use of these resources, and implementing research on planting and development of resources for health food and medicine for treatment of some diseases such as: diabetes, obesity from konjac (*Amorphophallus konjac* C. Koch) and other species in Vietnam. The surveys on traditional knowledge for using medicinal plants of ethnic minority group Dao in the northern part of the country were carried out, preliminary building database on traditional knowledge on the use of medicinal plants by Dao people for bathing, diabetes, preventing pregnancy and liver treatment was made.

Agriculture: The important issues such as the study on the model: Host-Parasite, Prey-Carnivore, ecological balance in the field can be served as ecological basics for the bio-control in particular, environmental protection and disease management in general.

IEBR carried out the study on biological basics for bio-control in the agricultural ecosystem such as studying breeding techniques of two insect species (*Sycanus falleni* & *Sycanus croceovittatus*), trying use them to prevent harmful worms and insects in vegetables, soya beans and corn in some provinces and its preliminary successful application is in practice.

Environment: IEBR carried out studies on and building the scientific basics and regeneration process of the damaged ecosystems such as bare hills, sand areas, limestone areas; sustainable agricultural ecosystems. In 2010 IEBR

took part in the assessment of biodiversity, effecting the process of desertification in the south-central part of Vietnam, and their relationship to the environment. All the results clearly point to the changing of biodiversity based on the socio-economic development planning effects to the desertification process in the dry South-Central part of Vietnam.

2.10. Environment technology

▪ Activities of Environmental Technology in 2010

In 2010, the environmental technology branch under VAST, implemented 7 scientific and technological themes (continuing from 2009) in two directions as follows:

- Analyzing, assessing environmental pollution: 3 themes;
- Researching on technology, manufacturing materials and equipment: Four themes.

Some typical results of scientific research and technological application in the environmental technology branch achieved results as follows:

- Researching process and manufacturing volatile compound adsorbing equipment in air environment and their applications to assess level of air pollution made by volatile compounds. On the basis of the research, models of air pollution monitoring have been established in urban areas of our country.
- Researching the possibility of formation and methods for determining Trihalometan compound in domestic water when disinfecting water by Chlorine and identifying safe water disinfecting technology.
- Researching, establishing process of analysis of residuary antibiotics (restricted or prohibited) in aquaculture water and products. The results are likely to apply and serve assessment of pollution in aquaculture water.
- Researching, establishing synthetic process and manufacturing race earth – manganese adsorbing materials and the container of ammonium, arsenic, iron, manganese simultaneously adsorbing materials to treat ground water pollution for domestic water of households in rural areas. The devices have been applied to treat contaminated ground water in rural areas in the Red River Delta and Southern regions. Treated water complied with the

National Standards (QCVN 09:2008/BTNMT) is used for domestic purposes.

- Researching, establishing CO₂ recovery technology and building process of biomass production from CO₂ recovery, coal combustion emissions and burning coal.
- Defining the parameters of carbon technology, building processes in pilot scale for treatment and assessing effectiveness of treatment on residuary herbicides in order to mitigate environmental pollution.
- Researching complex filtering system “anaerobic - aerobic” at laboratory scale to mitigate/eliminate organic compounds and nitrogen compounds in wastewater in concentrated farms.



SEM picture of LaMnO₃ material



ECAWA equipment produce anolit

In October 2010, a Sub-committee on Environment and Energy edited about 60 reports for the Scientific Conference on 35th anniversary of the foundation of Vietnam Academy of Science and Technology and Proceedings are published.

2.11. Space Science and Technology

2.11.1. Introduction

Research Strategy and application of Vietnamese space technology to 2020 approved by the Prime Minister on June 14, 2006 is an important legislation for our country so far for research and application of space science and technology achievements in developing the Vietnamese economy and society. Being the largest centre of scientific research and the institution built the Strategy and reported it to the Prime Minister for approval, the Academy has been assigned one of the important tasks which is to build and carry out the research programme on Space Science and Technology, with the aim of contributing to empower research and application of Vietnamese space science and technology.

After three years of implementation, the current programme has implemented 19 projects, with a total cost of 30,840 million VND, of which funding granted to the end of 2010 was 28,820 million VND.



The signing ceremony of projects implementation

2.11.2. Some results

On satellite technology

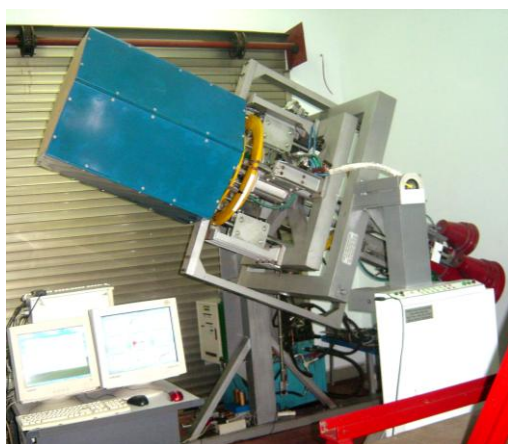
- Researching and building algorithms and software for controlling posture of small satellites by three axes using inertial wheels and power bars on Matlab-Simulink environment.
- Researching the properties of soft magnetic materials shaped thin strip based on Fe and Co and parameters effects of magnetostrictive-piezoelectric material depends on frequency, magnetic field, the shape of the sample size, developing

a number of modular components such as low noise amplifier and mixer signals in different bands.

About technology of launch media

- Building simulation software and simulation devices of the motion of the rocket; designing, fabricating and testing successfully a system of devices of physical models to simulate the control of thrust vector; building the software of controlling system under real-time;

Completing some of the content of mission of designing rocket boosters and engines using liquid fuel such as: calculating demand of fuel to put satellites into orbit, studying and designing dynamic systems (combustion chambers, injection speakers, system of fuel mixing and supply, cooling system...



The propulsion-simulating device



High-precision

GPS monitoring landmark in Cam Pha

Researching methods and building software to calculate kinetic and dynamics parameters of missiles and simulating missile control systems, aims to develop rapid prototyping technology to design and manufacture rocket.

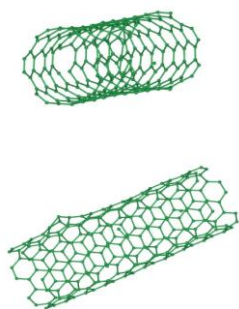
About space technology application

- Having designed and manufactured a number of GPS receivers (based on the SiRF chipset and chipset eMD1000k starIII) and built a network of data transmission between the mobile GPS receiver and the monitoring Centre with high quality and reliability;

- Having developed some new software tools for processing remote sensing image using open source, especially open source software GRASS allowing analysis of multi-resolution image; developing software modular to classify image based on C-Fuzzy and can be applied to identify objects with a small slope or curvature.

Regarding fundamental research

- Researching the application of Space Technology (GPS, LIDAR) about atmospheric monitoring and evaluating the impact of the ionosphere and atmosphere to the transmission of satellite signals in Vietnam .
- Researching the properties of materials and medical-biological characteristics of living organisms in space environment.



The structure of carbon nanotubes before and after irradiation



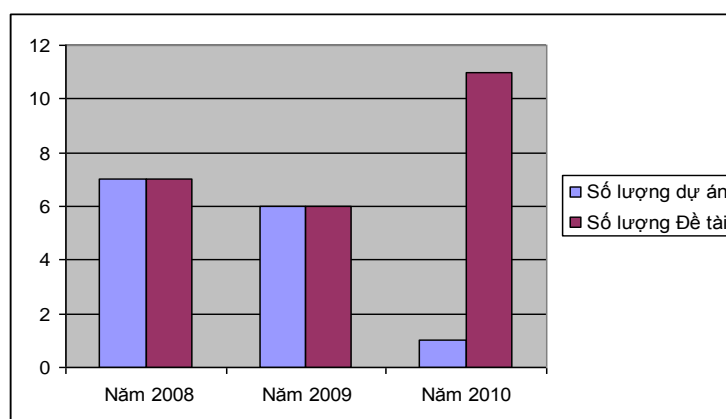
Centrifuge which experiments with mice in a state of weightlessness

3. Technology applications and deployment

3.1. Scientific – technological tasks:

3.1.1. VAST cooperative projects with ministries, industries, provinces and pilot production projects:

- In 2010, VAST has approved 1 new and 6 other projects performing the second year with a total budget of 1,020 millions VND. Besides that, based on the S&T cooperation agreements with 19 ministries, industries, provinces, VAST has approved 11 cooperative projects with a total budget of 4,115 millions VND.



The number of S&T tasks for the last 3 years

** Overall assessments:*

- Most of the projects implemented in accordance to the schedules and contents. There are now two projects with Ben-Tre province: "Assessment of the overall exploitation of freshwater resources for production and economic development in the coastal areas of Ba-Tri district, Ben-Tre province" and with Tra-Vinh province "The overall assessment of the natural conditions and environment for exploiting mollusks (clams, oysters) to develop the economy in coastal areas of Tra-Vinh province" due to objective factors both projects are proposed to extend the execution time.
- The pilot production project implemented by the Institute for Materials Science Applications "Improving the production technology urea fertilizer superphosphate (USP) for agriculture" has produced 687 tons of fertilizer products USP with a total value of 4,728 millions. Due to a large social demand in USP, the result will be transferred to enterprises for large amount production.



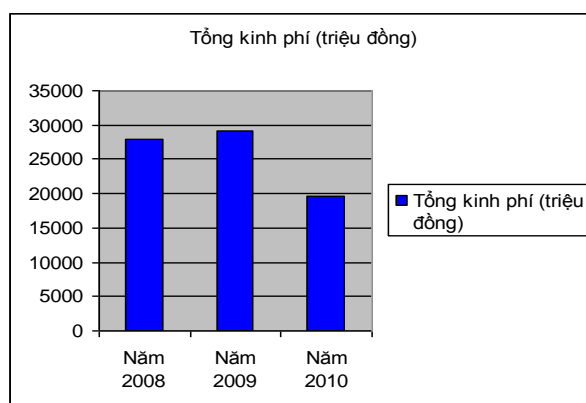
Chitosan products of the pilot production project

(Institute for Materials Science Applications)

- Some of the cooperative projects with provinces achieved good results and were highly accepted by the Provinces, such as the projects with Hai-Phong city implemented by the Institute of Chemistry "Research on manufacturing and application of blend rubber materials of high features applied for a number of key economic areas in Haiphong", has produced export products.
- The project "Applied research of manufacturing methods and instrumentation examination, diagnostic techniques used in the production of high-efficiency fluorescent light" in cooperation with Rang-Dong JSC has been appreciated. The results of the project have helped the company to produce and export 10 million bulbs to Brazil.

3.1.2. The projects of ministries, industries, provinces:

- In 2010, there were 64 S&T tasks with a total budget of 19,672 million VND by the institutes of VAST received through the bidding of the projects from ministries, industries and localities.



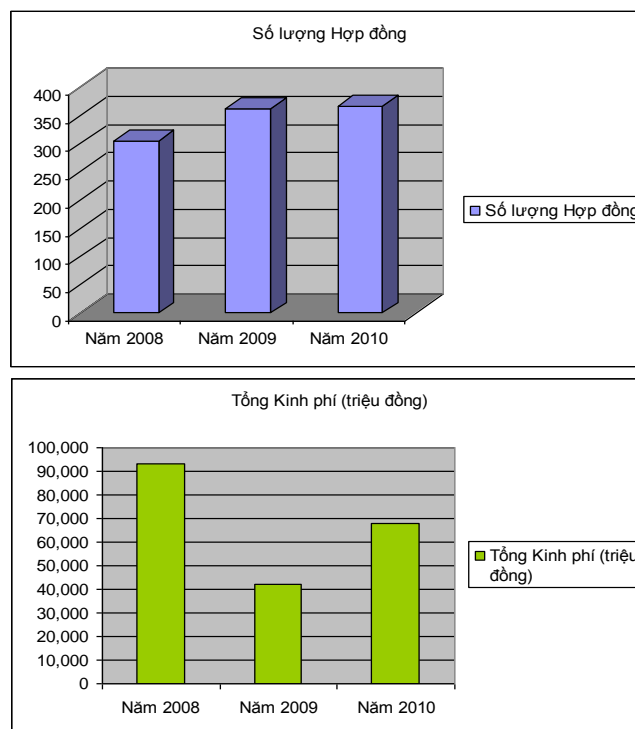
The total funding in 2008-2010

3.1.3. The pilot production projects of state level

Five projects were granted to the institutes: Institute of Biotechnology, Institute of Marine Biochemistry and Institute of Chemistry, Institute of Mechanics, Nha Trang Institute of Research and Application of Technology with a total grant of 15,404 million VND for 4 projects.

3.1.4. The S&T contracts (no state budget):

- In 2010, the institutes of VAST had signed 365 S&T contracts with a total budget of 66,290 million VND and 88,550 \$USD.



Funding by science - technical contracts in 2008-2010

3.2. Promotion of technology applications and development

3.2.1. Intellectual properties:

- In 2010, VAST has nine products registered for Intellectual Property and Copyright, including 6 granted by patents, utility solutions and 3 accepted.

Some of them are:

+ "Circuit passifs à composants d'un dispositif de pilotage ultrarapide optoelectronique" authors: Phi Hoa Binh, Xavier MARIE, Perre RENUCCI Viet Truong Giang, patent No. FR0905792 by the National Institute of Industrial Property - France.

+ "The compound 3 - [(6-O-Protocatechoyl-beta-D-glucopyranosyl-oxygen) methyl]-furanon (CIBOTIUMBAROSIDE A) and methods compound extracted from Cibotium barometz " authors: Chau Van Minh, Phan Van Kiem, Hoang Thanh Huong, Nguyen Xuan Cuong, Do Thi Thao, Ninh Khac Ban, Pham Quoc Long, patent No. 8834 dated 26/10/2010 by the Intellectual Property Department, Vietnam.

3.2.2. The scientific conferences:

Three conferences on applications of Science and Technology are organized, namely:

- Conference on the theme "Application of science - technology in the north-western mountainous provinces".
- The conference for 5-years (2005-2010) Anniversary of Science & Technology cooperation between VAST and Thua Thien-Hue province.

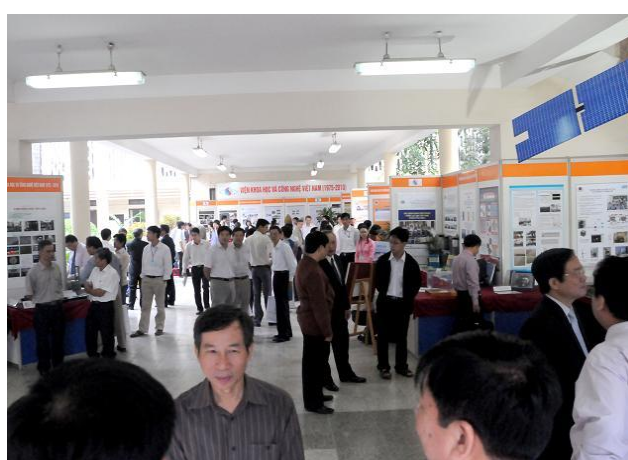


*Conference on the five-year anniversary S&T co-operation
with Thua Thien-Hue province*

- The 4th scientific and technological conference on the theme: "Application of science and technology for socio-economic development of Tay-Nguyen provinces".
- Workshop on "Rearranging the State enterprises and converting the units 35" by decree 35/HDBT.

3.2.3. Techmarts:

- VAST has participated in an exhibition of socio-economic achievements on the occasion of Thang Long - Hanoi 1000th anniversary in October, 2010. Six (06) units are selected to participate in the exhibition in the Science – Technology area.
- The exhibition "The achievements in environmental protection" under the National Conference on Environment protection was held successfully with the achievements of three outstanding units presented by VAST.



Exhibition on the occasion of the 35th Anniversary of VAST

4. Education and training activities

Eighteen Institutes under VAST are engaged in postgraduate training and maintaining and further improving the quality of postgraduate training under the new regulations. All of the teaching staff are very enthusiastic in guiding the PhD training. To implement the new regulations of the state, the institute has developed and promulgated regulations on training doctors, under the guidance in Circular No.: 10/TT-BGDDT dated 05/07/2009 of Ministry of Education and Training held a series of measures and management training institutes have been set up. The main purpose of these measures is to ensure the quantity and quality of students allowed to enter the Institute specializing in training doctors up to international standards.

There is a total of 304 PhD's and 215 graduate students, including 84 PhD's who have successfully defended their doctoral thesis and 85 graduate

students defended their Master thesis. The number of PhD and graduate students is increasing every year, in 2011 it is expected that 335 PhD's will train plus 383 graduate students. In 2010 twenty-two (22) textbooks were written and twenty-nine (29) in 2011 are proposed for the curriculum.

Besides, the Master's programme affiliated with the Universities: University of Natural Sciences – National University of Ho Chi Minh City, Thai Nguyen University, the Institute also Ministry of Education and Training for implementation of the scheme Master's degree International (322).

Overall, the application of the Regulations and Procedures training of VAST issued on enrollment has brought the issue to success in choosing the candidates selection. However, this is the first year of implementation so the new selection criteria are also gradually to be completed as early as possible in the admissions process, regulations of compulsory subjects, the time course study (subjects case studies, thematic studies, workshops etc.,) and procedures for the output of PhD's.

5. International co-operation activities

In 2010, the international cooperation activities obtained remarkable results, not only in the view of quantity but also in the quality. They were carried out to promote VAST's mission, to attract more foreign funding resources, to receive the advanced science and technology and to develop cooperation activities. All this made VAST become more equal with partners. In 2010, there have been many delegations from academies, scientific institutions and international scientific centres to VAST. Around twenty delegations from China, Japan, Korea, Australia, New Zealand, Russia, Iran, Germany, France, Egypt and U.S., have been received to work in the areas of environment, energy, biotechnology, ecology, biodiversity, information technology, space technology, material science, chemistry, physics and mathematics. In 2010, there were also 18 delegations led by the President and Vice-President with leaders of specialized institutes to China, Japan, Korea, Russia, France, Germany, England, Belgium, United States, Brazil, and Costa Rica. These visits aimed to sign Cooperation Agreements, to discuss cooperation opportunities, to study models of technological organization and

management, to enhance and develop cooperation activities between existing partners as well as seek new partners. The most important visit is the delegation of VAST's president to CNRS (France) with the objectives of enhancing and developing cooperation between the two countries on Marine Sciences, mathematics, corrosion and material protection, and chemistry. The visit of the delegation of the Vice-President to Asian, European, America scientific institutions not only to develop cooperation on science and technology, but also to study and draw lessons from partners S & T strategy to build up the "General Master Plan for the Development of VAST to 2020 with the vision of 2030". Moreover, 21 delegations of functional departments, directors of specialized institutes and specialized scientific councils, scientists were assigned to go abroad to work with international organizations in Asia, Europe, Australia, and America. The total number of foreign delegations to VAST is 1,291, the total of VAST delegations going abroad is 1,089 (20.5% for study, 27.5% for meetings, 43.5% for scientific exchange, and 8.5% for other purposes). In 2010, sixteen international cooperation activities have been accomplished and 21 activities were slated for approval. VAST approved the list of 50 new proposals to be discussed with partners and selected activities for the period 2011-2012. The collaboration with Minister of Science and Technology to implement protocol projects is actively promoted by VAST. Up to December 2010, VAST has carried out 22 protocol projects with Russia, Belarus, Germany, France, United States, Belgium, Denmark etc, of which, there are 16 new projects for the period 2010-2011. VAST has taken opportunity to get help from foreign scientific organizations and NGO representatives in Vietnam to carry out scientific research themes, projects, and scholarships for young scientists, to strengthen infrastructure, facilities and equipment for research Institutes. In 2010, there were 10 ODA projects at VAST level. According to Decision No. 21/TTg-HTQT, on 6th January 2009 from the Vietnam Government, VAST will be responsible for overall implementation of the project "Vietnam Small Satellites Observing Natural Resources, Environment and Natural Disasters – VNREDSat-1". In 2010, discussions have accomplished the implementation of the project, staff recruitment and the ceremony of implementation of the contract number 1 and 5 joint with ASTRIUM SAS and VEGA Technology Company. The Programme no.19 (relevant to Project 47) "International cooperation on investigation, exploration of natural resources and the environment of East Sea between Vietnam and other countries" has taken place.

The project has organized One marine investigation by the OPARIN ship (Russia) in Vietnam coastal and two (2) marine investigations by the Vietnam Ship with the cooperation of German and Belgian partners.

In 2010, VAST renewed four MOUs and Agreements on S & T with the Czech Academy of Science, the CNRS in France, the National Institute of Advanced Industrial Science and Technology (AIST) of Japan, the New York Botanical Garden and signed three MOUs with Joint Nuclear Research Institute (DUBNA), Rensselaer Polytechnic Institute, Perugia University of Italy. In addition, VAST has discussed with two partners Lincei Academy of Science (Italy) and the National Museum of Natural History (Paris) and drafted two Agreements that will be signed in 2011. The signing of new agreements demonstrated that VAST leaders are interested in expanding directions with new partners in developed countries such as the U.Ss, Italy, Russia, and France). It is mentioned in the draft of “General Master Plan for the Development of VAST to 2020 with vision of 2030”.

In 2010, VAST organized a number of international conferences, seminars and workshops, noteworthy meetings were the seminar between VAST and the Spanish Council for Scientific Research (CSIC), seminar on introduction of post graduate scholarships from DAAD, DFG Federal Republic of Germany, 12th Do Son school on Toxic pollution in Water Environment held by CNRS and VAST. In total, there were 68 events organized by VAST. Through these international conferences, workshops and seminars, scientists of VAST have opportunities to contact with foreign experts to enhance their capacity as well as to be trained at higher levels.

In order to encourage and to thank foreign scientists, researchers, international scientific organizations for their important contributions in research and training activities of VAST, in 2010, the State Committee of Overseas Vietnamese awarded a certificate of merit to one Czech scientist. The President of VAST offered two commending letters, six medals and six Doctor Honoris Causa to American, Russian, German, Hungarian, Swiss and Italian scientists and researchers.

6. Infrastructure and facilities

6.1. Infrastructure and facilities of VAST

To the end of 2010, total properties of VAST (value of land not included) are approximately 936 Billion VND, whereas:

- Housing: 336 Billion VND
- Transport vehicles: 37 Billion VND
- Equipment: 490 Billion VND
- Other fixed assets: 73 Billion VND

VAST currently has in its possession approximately 2.4 million square meters of *land area*, of which

- Land area for research: 509,000 sq. m.
- Land area for technology development: 53,000 sq. m.
- Land area for field experiments, bases and stations: 1,850,000 sq. m.

The *building surface area* of VAST is about 150.000 sq.m. of which:

- Building surface area for research: 125,000 sq.m,
- Building surface area for technology development: 15,000 sq.m,
- Building surface area for experimental bases and stations: 10,000 sq.m.

VAST has:

+ 04 National key laboratories :

- Gene Technology (Institute of Biotechnology),
- Multimedia and Networking Technology (Institute of Information Technology),
- Electronic Materials and Devices (Institute of Materials Sciences),
- Plant Cells Technology, in the South (Institute of Tropical Biology);

+ 1 Centre for high performance scientific computing (Centre for Information Infrastructure Development);

+ Many advanced scientific equipment for measurement, analysis and the field of physics, chemistry, mechanics, etc.

+ 71 cars.

6.2. Investment in infrastructure and facilities in 2010

In 2010, Vietnam Academy of Science and Technology (VAST)'s issued capital construction plan is 64.000 million VNDs, of which 62.000

millions for the project implementation and 2.000 million for investment preparation. The early year was allocated as follows:

1. Preparation for investment of five (5) projects: Project of Vietnam National Museum of Nature; Oceanographic Museum and research facilities of the Institute of maritime environment and resources located in Do Son, Hai Phong; research-development zone in Co Nhue, Tu Liem, Ha Noi; research-development unit in Thanh Loc, Ho Chi Minh City; research facilities of the Institute of resources, environment and sustainable development located in Hue city; research-development zone for oceanography technology, Institute of Oceanography in Nha Trang.

2. Investment implementation of 10 projects, including:

- Capital payment for three projects finished in 2008 (5.315 million VNDs): Quantum-electronics Laboratory (Institute of Physics); Headquarters of Institute of environment technology and Headquarters of Institute of natural products chemistry.

- Capital for five transition projects (38.200 million VND): Central building (Administrative Office); phase 1 of the Earthquake observation and tsunami warning network (Institute of Geophysics); Cell and micro-organism technology laboratory (Institute of Biotechnology); research facilities of Institute of Tropical Technology; VAST's key laboratory for marine pharmaceuticals (Institute of natural products chemistry).

- Starting five (5) projects (18.485 million VND): Ground infrastructure for the Vietnam natural resources, environment and disaster monitoring small satellite project - VNREDSat-1 (counter capital); research facilities of Tay Nguyen Institute of Biology; Observatory for study of geography and environment in the Red River Delta located in Con Vanh, Thai Binh (Institute of Geography); Construction and installation of 3rd storey of the Buildings 2A, 2C and elevator for the workshop of the Nghia Do Technology Zone (Center for technology development assistance and service); Infrastructure for research and development zone in Thach Loc (Representative in Ho Chi Minh city).

In 7/2010, in order to speed up implementation and disbursement, VAST held a check and reviewed the implementation of all projects with budgets allocated in 2010. Based on the results of the review and the actual

disbursement capability of the project, the President of VAST has made timely adjustments to the plan of capital construction investment in 2010: phase 1 in early 09/2010 and phase 2 in mid 11/2010. Specifically, the R&D infrastructure project in Thach Loc has been stopped because land has not yet been allocated by Ho Chi Minh city; payment for the project of Quantum-electronics laboratory has also been stopped due to insufficient documentation for acceptance and payment finalization; decrease of planned investment capital for the project Vietnam National Museum of Nature because land has not been allocated... 100% of the exceeded budget has been transferred to the projects which fulfilled the planned work volume with sufficient documentation for payment such as the Central Building project, 3rd storey construction and installation of the building 2A, 2C and elevator for the workshop in the Nghia Do Technology Zone and the VNREDSat-1 project. It can be said that, the timely adjustment of the plan helped to attain 100% fulfillment of disbursement plan.

Some specific results achieved:



268A Nam Ky Khoi Nghia

Cell and micro-organism
technology laboratory



Research-development facilities for environment technology
in Da Nang

04 projects completed, handed over and put into use, they are: Cell and micro-organism technology laboratory, Institute of Biotechnology (~5200 m² permanent building), completed 5 months earlier than the plan; research facilities in 268A Nam Ky Khoi Nghia, Institute of tropical biology (more than 900 m² permanent building); research-development facilities for environmental technology in Da Nang, Institute of environment technology including one (1) 2-storey working building (1000 m²) and the completed infrastructure for the whole zone; VAST's key laboratory for marine pharmaceuticals with research equipment valued at ~16.000 million VND. Total value of fixed assets increased from completed capital construction projects in 2010 is over 70,000 million.

Bidding, contract negotiation and signing of VNREDSat-1 project with total value of 55.8 million Euros has been completed and approved by both Vietnam and French governments, the ceremony of its implementation was held on 26/11/2010 in Hanoi.



Ceremony of VNREDSat-1 project implementation

Land: VAST has been allocated 11ha in Do Son, Hai Phong city (Expansion Project of Oceanographic museum and research facility, Institute of marine environment and resources; and more than 4 ha. in Viet Tri city to build VAST's research facilities in the Northwest, Vietnam .

7. Operation of Key Laboratories at VAST

After the investment period (2004-2008), from the year 2009, four National Key Laboratories standing at the Vietnam Academy of Science and Technology: Gene Technology, Material and Electronic Devices, Net and Multimedia, Plant Cell Biotechnology in the Southern region were going to officially operate with monetary support from the Ministry of Science and Technology for regular duties upon functional usage of each Key Laboratory.

During the year 2010, four (4) Specialized Councils of the key laboratory for consulting the scientific directions and tasks of the key laboratory were established by Decisions of the Ministry of Science and Technology. The members of Specialized Councils are qualified scientists from different scientific organizations, universities, institutions.

The Staff of key laboratories is included in the form of part-time work and regular contract work at the key laboratory.

The key laboratory meets the demand for the equipment of the internal and external research staff under the open mode of activity for studying many topics at various levels including State-level topics, the VAST's topics, the topics of the Department of Science and Technology of many provinces.

Hundreds of articles have been published together with presided institutes in/out-country scientific journals/books, as well as many contributions on scientific research and technology's deployment, basic research orienting application by Government's investment of modern equipment of key laboratories.

- **Some typical results of the key laboratory of genes:**

Analysed 22 Single-nucleotide polymorphism's indicators belonging to 8 big groups and single groups arising from these groups of Y chromosomes of a total of 300 individuals of Kinh ethnic groups living in the North of Vietnam. Among these 22 SNPs indicators, 15 were detected as polymorphism in Kinh people. Those indicators belong to single groups of C, D, O, N and R*. The

remaining 7 indicators have no polymorphism among studied Kinh people and belong to single groups of G, J, P, R1a and R1b1; Frequency distribution of indicators M38, M216 and M217 representing the haploid group C2*(M38), C*(M216) and C3*(M217) are respectively 2.85%, 2.16% and 10.7% of the total 248 analyzed Kinh people; The samples of the Kinh ethnic group are mainly of haploid O group with the total frequency distribution of group O and the branches from this group was 81.4%. In particular, distribution frequency of the group O*-M175/P186/P191/P196, O1a*-M119 and O2b*-JST 022454 were 10.1%, 62.9% and 8.47%, respectively on Study on Single-nucleotide polymorphism of Y chromosome in Vietnamese people. Characterized D-LOOP sequences in more than 300 individuals of ethnics: Kinh, Tay, Muong and Katu in Vietnam; Ongoing analysis of polymorphisms of D-LOOP sequence among Vietnamese ethnic groups in comparison to other ethnic groups living in Southeast Asia and East Asia on Study of polymorphism of D-LOOP sequence of mtDNA in Vietnamese people and preparation of manuscripts for SCI journals are results on “*Study on Single-nucleotide polymorphism of haploid genome (mitochondrial DNA and Y chromosome)*”, 2009-2010, head: Ass. Prof. Dr Nông Văn Hải.

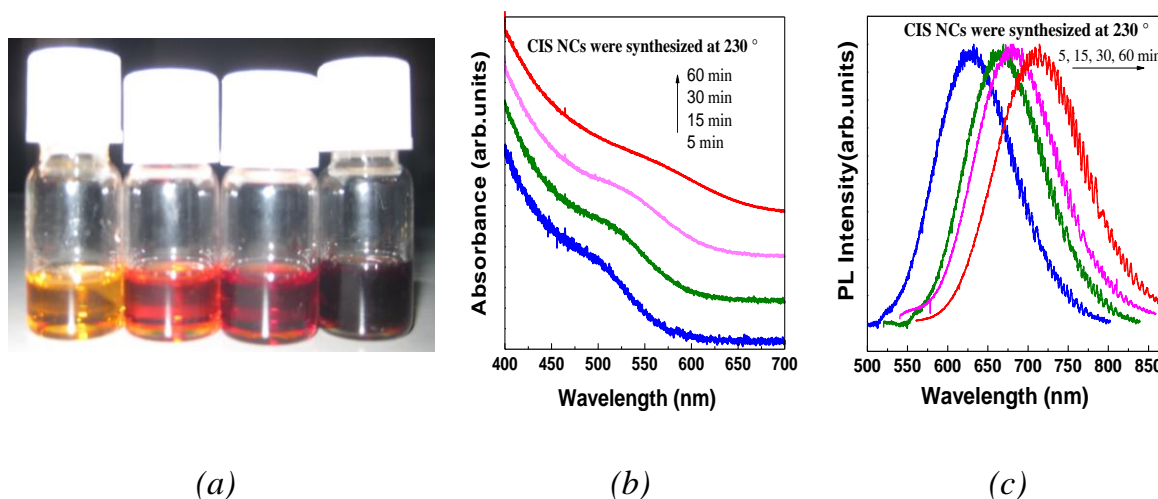
There are clear differences among cells before and after induction of all study strains: wild-type (control), strain over expressing IL-2 (IL-2) and strain over expressing Amylase (Amy); at the times of 24 hrs. and 48 hrs., after induction, hundreds of genes showed differential expression patterns. This observation is consistent in all studied strains; Only 6 significant differences were identified at transcription level among 3 strains (Control, Amy, IL-2) at three time points of sample collection (24hrs. 48hrs.) on the main aim of the study which is to identify differences of the *Pichia pastoris* wild-type and the strains over-expressing recombinant proteins are results of “*Optimizing expression level of a recombinant Pichia pastoris strain over expressing IL-2 via transcriptomics and proteomics analyses*”, 2009-2010, head: Ass. Prof. Dr. Trương Nam Hải.

Collect and store venom samples of several families of poisonous snakes in Vietnam (Lord cobra, scorpion hot, scorpion fork); Treatment, separation of snake venom proteins by electrophoresis techniques (1DE and 2DE) and chromatography; Identification of snake venoms' proteins by LC-MS/MS and bioinformatics; Characterization main snake venom proteins and

initial study their properties and 1 submitted manuscript for publication are results of “*The research on proteomics of snake venoms’ diversity*”, 2009-2010, head: Prof. Dr. Phan Văn Chi.

b. Some typical results of the key laboratory for electronic materials and devices:

Synthesis and study of optical properties of CuInS_2 core and $\text{CuInS}_2/\text{ZnS}$ core/shell quantum dots (QDs) semiconductor. These QDs exhibit clearly quantum size effect: the blue shift of the absorption and PL spectra with decreasing their size. An interesting point is the emission from donor-acceptor pair recombination in these QDs, even with only small numbers of the continent atom, happened just like in the bulk material.



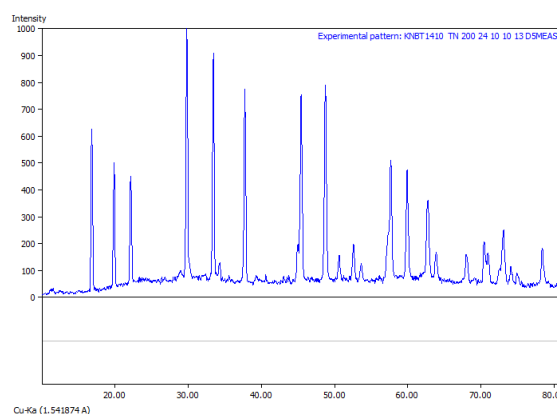
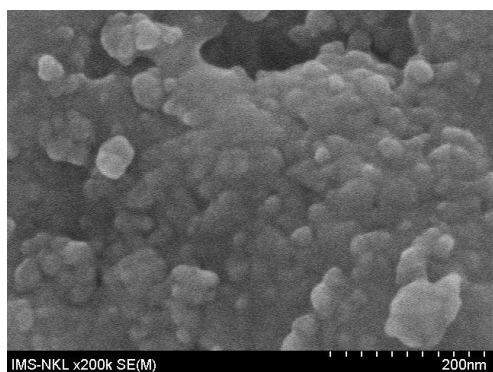
(a) CIS was synthesized at temperatures 230°C with different times 5, 15, 30 and 60 minutes (from left to right), (b) The absorption spectra of CIS QDs were synthesized at 230°C with different time 5, 15, 30 and 60 minutes, (c) The PL spectra of CIS QDs were synthesized at 230°C with different times 5, 15, 30 and 60 minutes (from left to right)

Realization and Characterization of Laser excitation system at 780 nm for Shifted Excitation Differential Raman Spectroscopy. Design, realization and characterization of diode laser systems used for excitation of Raman spectroscopy based on high-power DFB 780 nm diode lasers narrow spectral line width.

Studying on technology to prepare the Nd-Fe-B ribbons with high energy product. Evaluation of the cooling rate of Nd-Fe-B ribbons prepared on

ZGK-1 melt-spun. The function of the cooling rate is expressed by α (K/s) = $1,6 \cdot 10^5 v_w(\text{m/s}) \{(1 + \theta(1 - e^{-\beta H})\}$; Preparation of $\text{Nd}_2\text{Fe}_{14}\text{B}$ pre-alloy on Arc melting furnace and the hard magnetic Nd-Fe-B/Fe-Co ribbons by a simple route. The energy product, (BH) maximum of the ribbons is about 15 MGOe.

The synthesis and characterisation of $(\text{K}_{0.5}\text{Nb}_{0.5})\text{NbO}_3$ prepared by high-energy ball milling were carried out. Results derived from investigating the kinetics of formation of studied ceramics as a function of milling rate and of polymorphic type of Nb_2O_5 are on progress to be published. Different characterisation methods of $(\text{K}_{0.5}\text{Nb}_{0.5})\text{NbO}_3$ prepared by hydrothermal methods were performed by using different polymorphic types of Nb_2O_5 as starting material for hydrothermal reaction, a new polymorphic type of $(\text{K}_{0.5}\text{Nb}_{0.5})\text{NbO}_3$ was found for the first time.



FESEM image of an as-milled X-ray diffraction diagram of $(\text{K}_{0.5}\text{Nb}_{0.5})\text{NbO}_3$ sample prepared by $(\text{K}_{0.5}\text{Nb}_{0.5})\text{NbO}_3$ prepared by high-energy ball milling. hydrothermal method at 200°C for 24 h using monoclinic Nb_2O_5 (JCPDS 30-0873) as starting material.

Fabrication of meta-materials working at the microwave frequency regime. The results show that the properties of metamaterials strongly depend on the structural parameters. Metamaterial electromagnetic cloak at microwave frequencies was initially simulated.

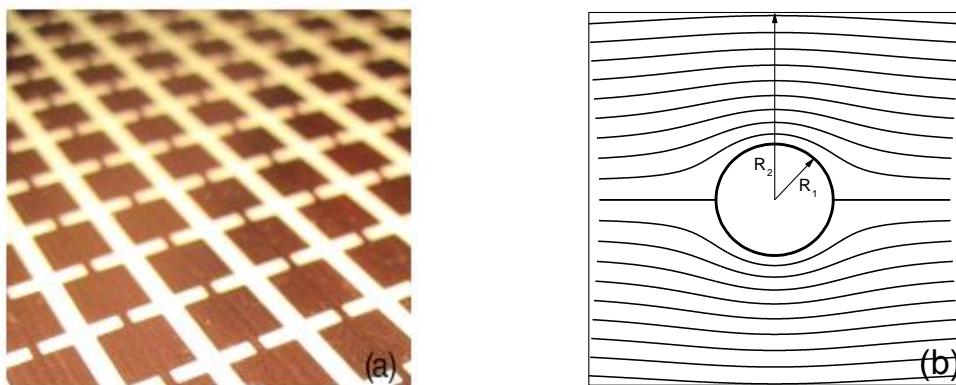


Figure 3: (a) Photograph of a fabricated **meta-materials**, (b) A standard ray-tracing programme has been performed to calculate the light propagation in an electromagnetically transformed region. The light is bent in cloaking regime ($R_1 < r < R_2$) as approaching the invisible object ($0 < r < R_1$).

8. Other activities

8.1. Science Information dissemination and publishing

In 2010, a large amount of foreign electronic journals were provided for the Digital library so that usages increased considerably. The electronic library's Project is preparing to finish the first stage with stable working of the Digital library <http://elib.isivast.org.vn/>. The list of foreign scientific and technological journals for 2011-2015 period with over 90% electronic journals as ScienceDirect, Springer, ACS, AIP, IOP, APS, will support the Digital library more efficiently. ISI's web site is deployed to help to delivery information rapidly and precisely to the readers and improve activities on scientific research and technological development and connected with the Digital library and inverse.



The workshop “The investigation using scientific and technological information resources” in Ha Noi, October 2010

The scientific and technological documentations, such as scientific reports, reports on surveying, PhD theses, documents of basic investigation, films, photographs, tapes, disks etc., are stored and updated in ISI for serving scientific researchers.

One highlight emphasis of ISI in the year 2010 is that the scientific subject of VAST’s level: “Establishing Vietnam calendar figures for 2011-2030 period” has been finished with excellent evaluation and can provide Vietnam calendar figures for publishers in the whole nation for the future.

Publishing

Publishing scientific and technological works in the form of Science journals, Monographic Books, Reference Books, Textbooks, etc is among the most important of scientific and technological functions for the Vietnam Academy of Science and Technology. With its large team of scientists, each year it has hundreds of books and thousands of articles published in 11 specializations in scientific and technology, and hundreds of articles published in international newspapers with ever-increasing quality.

(i) 12 scientific and technological journals.

Currently, VAST is publishing 12 specialization scientific and technological journals these are widely-read papers recognized and licensed by the government. Several journals have been upgraded from being published in Vietnamese to being published in English such as Mathematics journals,

Mechanics journals, Communication in Physics, and Advances in natural Science. The Mathematics journal has received the co-operation of the Springer Publishing House of Singapore to be published internationally for many years to come. Quality of the journals is improved year after year in terms of content, form, quantity and frequency of publication, etc. This improvement has helped meet the demand of publicizing the scientific research results of domestic and foreign scholars and scientists.

The editorial boards of the journals consist of leading scientists in universities, academies and institutes nationwide. The editorial boards of some journals are also sat on by foreign scientists from UK, France, Russia, etc.

Articles published in the journals are all of scientific value and precise with copyrights following the current regulations of the government, and those of the editorial boards. Normally, an article must undergo strict assessment, evaluation, editing and review to ensure its scientific quality and other requirements of the editorial boards before it is published.

Books

In addition to publishing periodical scientific journals, VAST slates a special fund each year for scientific book publishing.

A Monographic Book Volume has been compiled since 2009, divided into three fields:

- Monographs on technology and technological development;
- Monographs on natural resources and the environment of Vietnam;
- Monographs on basic research;
- Textbooks.

In 2010, VAST managed to publish the Atlas “Natural conditions and Marine environment of Vietnam and adjacent areas”. The Atlas includes 59 maps with sizings of 53 x 63 cm in which the legend in Vietnamese and English have printed 150 copies.

The Atlas “Natural conditions and marine environment of Vietnam and adjacent areas” is a great success; it presented the industrious and creative work of scientists on marine specializations.

This work justified the high level on marine science and technology of Vietnam in the first years of the 21st century. The Atlas is a valuable document providing relatively sufficient information for making the marine economic development strategy, safeguarding the national security and confirming our sovereignty over our territorial waters. It is also a useful document as a teaching resource in universities.

VAST has accepted the Atlas “Natural conditions and marine environment of Vietnam and adjacent areas” and evaluated it as an outstanding task. The Publishing House has published the Atlas for the purpose of market surveys and is planning to reprint it in 2011.

8.2. Museum activities in 2010

Vietnam National Museum of Nature (VNMN) is the National Museum, and it is the Head in the natural museum system in Vietnam that **the** President of VAST assigned the task of taking charge of overall planning of the Natural Museum system in Vietnam according to Decision No.86/2006/QĐ-TTg, dated 20/04/2006 of the Prime Minister. In 2010, VNMN performed its functions well and **all** the assigned tasks.

8.2.1. Implement collection, building the National Specimens Collection

In 2010, VNMN has continued to expand **relationships** with the local authorities and Hanoi city to receive a total number of 162 samples of individual animals belonging to 48 species from 13 agencies and units:

Hanoi Judgment Enforcement, police office in Dong Da, Hoan Kiem, and Nghe An districts, Hai Phong Customs Department, Khanh Hoa Forest Department, Can Tho, Vietnam Circus Federation, Centre for Wildlife Rescue and Protection Techniques, Forestry Department, and Hanoi Department of Agriculture and Rural Development. In particular, from the Hanoi Zoo, the Museum has conducted 77 times reception with 90 dead animals belonging to 33 species. Importantly, VNMN has collected one individual fish named Molamola, one crocodile fossil head which are rare specimens and valuable for science and conservation. The Department of Specimens Processing has initially treated more than 90 animal samples, of which there are large specimens such as elephants, tigers, ostriches and 13 samples had been manipulated for VNMN’s exhibition. All received samples are well-preserved

in safe temperature conditions and appropriate humidity that was done in compliance with all technical requirements.

VNMN have successfully applied the method to create animal's eye models and recycled the used leather samples in processing specimens for Museum exhibition.

In 2010, VNMN has successfully implemented a project "Buy specimen collection of palaeo-creatures fossils" from a private collector in Buon Ma Thuot city, Dak Lak Province. Collection consists of nearly 900 specimens dating from 203-175 million years ago belonging to the five ancient creature groups: local stone, two pieces of shell, gastropods, gymnosperms and woody plants of silicate. This is a precious palaeo - ancient living fossils collection, and valuable of VNMN.

8.2.2. Observe the overall planning implementation of the Vietnam National Museum of Nature System

In 2010, VNMN has successfully organized a Conference to review the five-year implementation of overall planning of VNMN system tasks phase I (2006-2010) in Hue city. In addition to the implementation of Decision 86 in writing, last year VNMN sent delegations to the project investment Museum units to urge them to complete tasks under Decision No.86.

Based on its own experiences, VNMN has supported the member units in the system such as:

- Support, consultancy with the Department of Science and Technology in Thua Thien Hue province to successfully set up and submit the proposal of the establishment of a museum in Central Coast region. As a result, the Natural Museum in the Central Coast under the Department of Science and Technology in Hue province has been formed by Hue People's Committee at the Decision No. GD/2010/UBND dated 15/10/2010. At present, this museum has completed the organization with full legal status and put it into operation.

- Support, consultancy for the the Geological Museum, General Department of Geology and Mineral development to establish and implement the development planning of the Geological Museum system in Vietnam by the year 2020.

- Support, consultancy for the the Forestry Resources Museum, Institute of Investigation and Forest Planning, Ministry of Agriculture and Rural Development to prepare the project for building in Vietnam Forest Resources Museum system.

- Support, consultancy Do Son Oceanographic Museum to establish and submit the preparation plan for investment project as progress approved by the VAST.

- Support, consultancy other project members to establish the up-grading project as approved by VAST.

8.2.3. Deploy the scientific research projects of all levels and implement the given tasks by the President of VAST

In 2010, VNMN has conducted three National projects, two VAST tasks, one bilateral co-operation project with Russia, and three projects supported by Nafosted, and four other local projects. All the projects and the tasks were done as expected. The Museum Staff also took part in four other projects in other Institutions. The research Staff have published 22 scientific papers, including eight articles in international academic journals (07 articles in international journals of the SCI list, one article in SCI Expanded list) and 14 articles in national scientific journals.

On the occasion of the 35th Anniversary of VAST and receiving the Ho Chi Minh Medal (from 25-26/10/2010), VNMN has exhibited a number of typically collected specimens which were processed last year. The exhibition has been highly appreciated by Deputy Prime Minister Nguyen Thien Nhan, scientists and the Leaders in the Institute as well as many visitors.

In terms of international co-operation, in 2010, the VNMN has received and worked with 15 international Delegations, including 38 foreign scientists who came to work in the Museum. Together with recent collaboration agreements with the Museums around the world and in the region, the Museum has additionally signed three (3) Memorandum of Understanding (MOU) with the Natural History Museum, research institutes and universities such as the Cleveland Natural History Museum, America, the Quangxi Botanical Institute, China and the Natural History Yale Peabody Museum, America. Especially, in response to the International year 2010 on Biodiversity initiated by the United Nations, VNMN co-operated with the Italian Embassy to organize a photo

exhibition in Hanoi from 16-19/12/2010 (the photographs were taken by VNMN researchers and the Italian Firenze University) with the theme “Insects of Vietnam” and re-performed on the occasion of VAST’s Conference in 2010 summarizing its activities.

The Nha Trang Oceanographic Museum

The Nha Trang Oceanographic Museum is a branch museum in the system. In 2010, the Museum focused on implementing its tasks and achieved the following results:

Implementing displays on the theme “Hoang Sa-Truong Sa Islands Marine resources” and carried out plans to modernize the system and diversify aquarium marine species.

The Museum has received and served about 247,500 oversea and domestic visitors to visit and study there. It has organized many training courses for the domestic and oversea students, for example: Hue Science University, Can Tho University, Saigon University, etc.

To maintain the preservation of specimens (submerged chemicals, relabelling, changing bottles, etc.) of 1000 samples, collecting an additional 100 marine creatures including samples of all kinds of species, of which there is a particularly large Whale Shark sample (six meters long, 2 tons in capacity).

The handbook called “Introduction on Vietnam Oceanographic Museum” was edited. Writing proposals for construction projects "Marine Museum in Da Nang". Writing a report for the project "Upgrading the level I Museum" were completed. Attending the conference to review the five-year implementation overall planning VNMN system in Vietnam to 2020, held on 12/2010 in Hue. Participating in educational opportunities for the Museum in Da Lat and Hanoi.

Do Son Oceanographic Museum

Based on the documents submitted by the Institute of Resources and Marine Environment on 10/2/2010, the President of VAST issued Decision No.171/QĐ-KHCNVN approving the Construction of the Oceanographic Museum Project and research facilities for the Institute of Resources and Marine Environment. Accordingly, Hai Phong City People's Committee announced a note No.109/TB-UBND, dated 09/04/2010 on Land Acquisition to

implement the project construction Oceanographic Museum and research facilities for the Institute of Resources and Marine Environment.

In 2010, the Institute of Resources and Marine Environment as an investor of the project has been involved with working with the authorities and localities to urgently survey and make statistics and inventories of the land and property associated with it, setting up the compensation plan to be submitted to the competent authorities for approval and arrange funds for site clearance compensation.



Specimen collection activities



VNMN exhibition on the occasion of 35th Anniversary of VAST



Photography exhibition "Insects of Vietnam" in Hanoi



*Conference to review the five-year implementation overall planning
VNMN system*

9. Some important statistics

9.1 Statistics on human resources

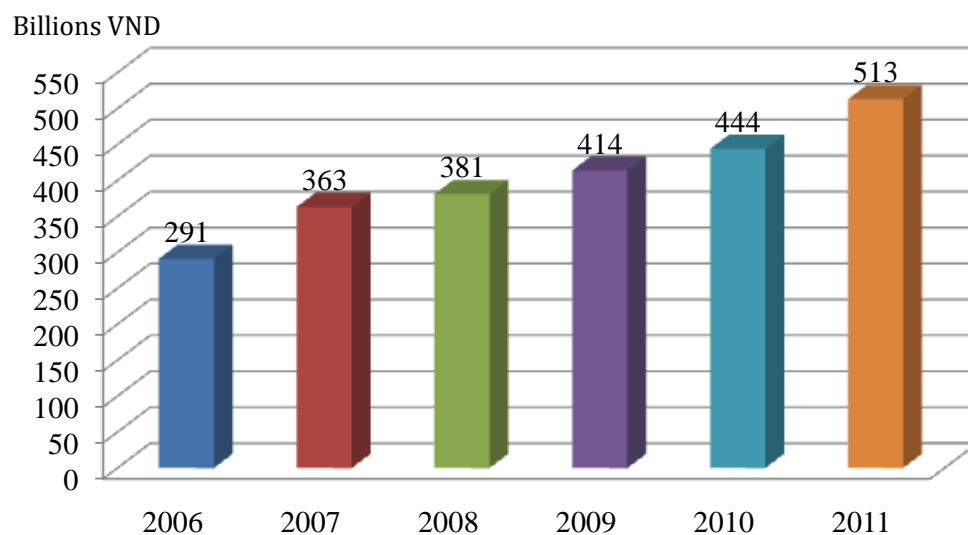
Qualification of Staff (As of 31/12/2010)

| No | Institutions | Perm anent staff | Contract signed staffs | Title | | Degree | | | | |
|----|--|------------------------|------------------------------|-------|--------------|--------|-----|-----|----|--------|
| | | | | Prof | Ass. Prof | Dr Sci | PhD | MSc | BA | Others |
| 1 | Functional departments | 35 | 9 | 0 | 3 | 0 | 9 | 6 | 19 | 1 |
| 2 | Administration office | 46 | 71 | 0 | 0 | 0 | 0 | 6 | 20 | 20 |
| 3 | People Party Office | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| 4 | Representative office in HCM city | 10 | 9 | 0 | 0 | 0 | 0 | 0 | 5 | 5 |
| 5 | Institute of Mathematics | 69 | 12 | 18 | 13 | 19 | 34 | 4 | 12 | 0 |
| 6 | Institute of Physics | 96 | 114 | 8 | 12 | 4 | 42 | 22 | 25 | 3 |
| 7 | Institute of Chemistry | 118 | 103 | 4 | 18 | 1 | 54 | 22 | 33 | 8 |
| 8 | Institute of Chemistry of Natural Product | 38 | 37 | 0 | 4 | 1 | 12 | 11 | 11 | 3 |
| 9 | Institute of Mechanics | 97 | 22 | 3 | 9 | 5 | 18 | 36 | 35 | 3 |
| 10 | Institute of Ecology and Bio. resources | 115 | 23 | 0 | 11 | 1 | 33 | 43 | 35 | 3 |
| 11 | Institute of Geography | 89 | 45 | 0 | 7 | 1 | 26 | 23 | 35 | 4 |
| 12 | Institute of Geological Science | 101 | 31 | 0 | 7 | 3 | 34 | 26 | 34 | 4 |
| 13 | Institute of Geophysics | 73 | 24 | 0 | 6 | 1 | 14 | 23 | 21 | 14 |
| 14 | Institute of Oceanography | 83 | 56 | 0 | 3 | 1 | 14 | 28 | 30 | 10 |
| 15 | Institute of Marine Environment and Resources | 41 | 20 | 0 | 2 | 0 | 8 | 19 | 12 | 2 |
| 16 | Institute of Marine Geology and Geophysics | 56 | 9 | 0 | 0 | 0 | 15 | 17 | 21 | 3 |
| 17 | Institute of Energy Science | 35 | 17 | 0 | 0 | 0 | 2 | 8 | 22 | 3 |
| 18 | Institute of Materials Science | 220 | 56 | 3 | 19 | 4 | 56 | 44 | 91 | 25 |

| No | Institutions | Perm anent staff | Contract signed staffs | Title | | Degree | | | | |
|----|--|------------------------|------------------------------|-----------|--------------|-----------|------------|------------|------------|------------|
| | | | | Prof | Ass. Prof | Dr Sci | PhD | MSc | BA | Others |
| 19 | Institute of Information Technology | 139 | 40 | 2 | 14 | 2 | 33 | 38 | 64 | 2 |
| 20 | Institute of Biotechnology | 175 | 107 | 2 | 23 | 0 | 80 | 58 | 21 | 16 |
| 21 | Institute of Environment Technology | 51 | 106 | 1 | 4 | 0 | 17 | 17 | 16 | 1 |
| 22 | Institute of Chemical Technology | 47 | 29 | 2 | 4 | 2 | 16 | 16 | 11 | 2 |
| 23 | Institute of Space Technology | 34 | 17 | 0 | 2 | 0 | 8 | 11 | 12 | 3 |
| 24 | Institute of Applied Informatics and Mechanics | 68 | 6 | 0 | 4 | 0 | 9 | 17 | 38 | 4 |
| 25 | Institute of Tropical Biology | 73 | 81 | 0 | 3 | 0 | 16 | 23 | 31 | 3 |
| 26 | Institute of Tropical Technology | 69 | 7 | 0 | 6 | 0 | 18 | 19 | 25 | 7 |
| 27 | Institute of Applied Materials Science | 36 | 19 | 0 | 4 | 1 | 11 | 10 | 10 | 4 |
| 28 | NhaTrang Institute of Technology Research and Application | 40 | 18 | 0 | 1 | 0 | 11 | 11 | 14 | 4 |
| 29 | Institute of Marine Biochemistry | 26 | 12 | 1 | 1 | 0 | 8 | 8 | 10 | 0 |
| 30 | Center for Scientific information | 29 | 5 | 0 | 0 | 0 | 1 | 7 | 17 | 4 |
| 31 | Vietnam National Museum of Nature | 24 | 15 | 0 | 4 | 0 | 6 | 5 | 13 | 0 |
| 32 | Publishing house for Science and Technology | 22 | 9 | 0 | 0 | 0 | 1 | 7 | 14 | 0 |
| 33 | Institute of Applied Physics and Scientific Instruments | 18 | 3 | 0 | 0 | 0 | 1 | 5 | 9 | 3 |
| 34 | Center for Training, Consultancy and Technology Transfer | 11 | 8 | 0 | 0 | 0 | 2 | 3 | 6 | 0 |
| 35 | TayNguyen Institute of Biology | 27 | 25 | 0 | 1 | 0 | 4 | 16 | 5 | 2 |
| 36 | Institute of Resources Geography HCM city | 29 | 18 | 0 | 1 | 0 | 5 | 13 | 10 | 1 |
| 37 | Institute of Physics HCM City | 33 | 7 | 1 | 2 | 0 | 8 | 9 | 15 | 1 |
| 38 | Institute of Telecommunication Technology | 1 | 23 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 39 | Hue Institute of environment recourses and sustainable development | 10 | 13 | 0 | 0 | 0 | 2 | 1 | 7 | 0 |
| 40 | Center of informatics | 7 | 4 | 0 | 1 | 1 | 2 | 0 | 3 | 1 |
| 41 | Center for food technology and Technique Development | 1 | 29 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 42 | Center for Assistance of Technological development and services | 6 | | 0 | 0 | 0 | 1 | 1 | 4 | 0 |
| | TỔNG CỘNG: | 2303 | 1261 | 45 | 189 | 47 | 632 | 633 | 822 | 169 |

9.2 Statistics on Finance, Scientific Publications and Education

- *Annual budget of VAST 2006-2010 (Billions VND)*



Statistics on projects and budget of VAST in 2010

| No | Type of project | Number of project | Budget (Millions VND) |
|----|---|-------------------|-----------------------|
| 1 | Missions of the government | 5 | 2,000 |
| 2 | National priority programmes | 41 | 29,690 |
| 3 | National projects | 14 | 19,225 |
| 4 | Application-oriented fundamental research projects | 7 | 5,040 |
| 5 | National protocol projects | 23 | 21,450 |
| 6 | National level test production projects | 2 | 1,830 |
| 7 | VAST appointed projects | 16 | 4,430 |
| 8 | VAST priority research projects | 86 | 16,310 |
| 9 | Key program of science and technogly | 11 | 9,475 |
| 10 | Space science and technology program | 19 | 11,840 |
| 11 | VAST-ministry and VAST-locality coperative projects | 17 | 4,845 |
| 12 | VAST international cooperation research projects | 50 | 3,635 |
| 13 | Missions of President | 9 | 1,082 |

| | | | |
|----|--|------------|----------------|
| 14 | VAST level test production projects | 7 | 1,020 |
| 15 | Local industry cooperation projects | 17 | 4,115 |
| 16 | Fundamental investigation projects(<i>including project 19, CT 47</i>) | 13 | 16,000 |
| 17 | VAST- most co-operative research projects | 15 | 5,200 |
| 18 | Clean water, environment for rural areas program | 4 | 1,000 |
| 19 | Environment protection programme | 10 | 6,650 |
| 20 | Eastern Vietnam Sea – Vietnamese Island programme | 2 | 2,900 |
| 21 | Reciprocal of ODA projects | 6 | 15,084 |
| | Total | 374 | 182,821 |
| 22 | ODA projects (including VNREDSAT 1 project: 264 000 million VND) | 6 | 288,000 |
| 23 | NGO projects | 10 | 4,000 |

Statistics on publications and intellectual properties of VAST for the period 2005-2010

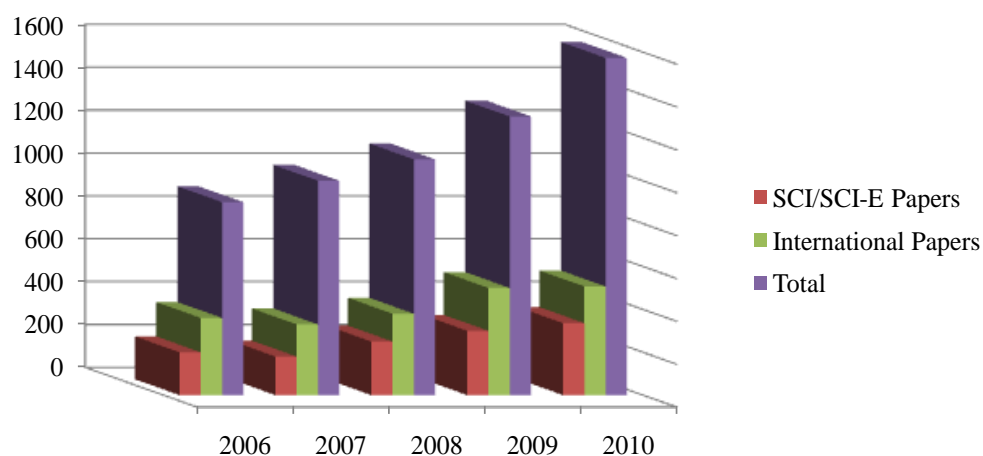
| TT | Nội dung | 2005 | 2006 | 2007 | 2008 | 2009 | 2010^(*) (up to 30/11/2010) |
|-----------|---|-------------|-------------|-------------|-------------|-------------|--|
| A | <i>Total SCI and SCI-E papers (1+2)</i> | 168 | 159 | 144 | 191 | 271 | 336 |
| 1 | SCI papers | 105 | 96 | 92 | 166 | 202 | 247 |
| 2 | SCI-Expanded papers | 63 | 63 | 52 | 25 | 69 | 89 |
| 3 | ISSN/ISBN papers | 93 | 133 | 115 | 106 | 182 | 173 |
| B | <i>Total international level papers (1+2+3)</i> | 261 | 292 | 259 | 297 | 453 | 509 |
| 4 | National Journal papers | 816 | 548 | 701 | 750 | 823 | 1066 |
| C | <i>Total published papers (1+2+3+4)</i> | 1077 | 840 | 960 | 1047 | 1276 | 1575 |
| 5 | Patents | 2 | 9 | 7 | 2 | 2 | 9 |
| 6 | Utility Solutions | | 2 | 4 | 1 | 1 | 1 |

Statistics on papers, books, patents and solution of VAST's institutes in 2010

| No | Institute | International papers | | | | National papers | Specialized books | Patents | Utility Solution |
|----|---|----------------------|-----|-------|-----------|-----------------|-------------------|---------|------------------|
| | | Total | SCI | SCI-E | ISSN/ISBN | | | | |
| 1 | Institute of Mathematics | 73 | 38 | 20 | 15 | 15 | 10 | | |
| 2 | Institute of Physics | 48 | 33 | 1 | 14 | 41 | 2 | 1 | |
| 3 | Institute of Materials Science | 44 | 30 | | 14 | 43 | | 1 | |
| 4 | Institute of Chemistry | 49 | 23 | 2 | 24 | 164 | | 2 | |
| 5 | Institute of Marine Biochemistry | 37 | 23 | 14 | | 40 | 1 | 3 | |
| 6 | Institute of Biotechnology | 28 | 12 | 1 | 15 | 147 | 5 | 1 | |
| 7 | Institute of Chemistry of Natural Product | 22 | 11 | 8 | 3 | 89 | 2 | | 1 |
| 8 | Institute of Oceanography | 17 | 11 | 1 | 5 | 69 | 4 | | |
| 9 | Institute of Ecology and Bio. resources | 46 | 8 | 18 | 20 | 30 | 4 | | |
| 10 | Institute of Geological Science | 13 | 8 | 2 | 3 | 25 | 1 | | |
| 11 | Institute of Mechanics | 13 | 7 | 2 | 4 | 26 | | | |
| 12 | Institute of Tropical Technology | 9 | 7 | | 2 | 89 | | | |
| 13 | Institute of Tropical Biology | 8 | 7 | | 1 | 0 | | | |
| 14 | Institute of Physics HCM City | 7 | 7 | | | 0 | 1 | | |
| 15 | Vietnam National Museum of Nature | 7 | 6 | 1 | | 12 | | | |
| 16 | Institute of Information Technology | 27 | 4 | 5 | 18 | 26 | 2 | | |
| 17 | Institute of Geophysics | 6 | 4 | | 2 | 19 | 2 | | |
| 18 | NhaTrang Institute of Technology Research and Application | 5 | 4 | | 1 | 20 | 1 | | |
| 19 | Institute of Marine Geology and Geophysics | 2 | 2 | | | 28 | | | |
| 20 | Institute of Environment Technology | 9 | 1 | 2 | 6 | 44 | | | |
| 21 | Institute of Applied Physics and Scientific Instruments | 1 | 1 | | | 2 | | | |
| 22 | Institute of Marine Environment and Resources | 14 | | 9 | 5 | 11 | 2 | | |
| 23 | Institute of Chemical Technology | 4 | | 3 | 1 | 36 | | | |
| 24 | Institute of Resources | 9 | | | 9 | 7 | 1 | | |

| | | | | | | | | | |
|----|--|------------|------------|-----------|------------|-------------|-----------|----------|----------|
| | Geography HCM city | | | | | | | | |
| 25 | Institute of Geography | 4 | | | 4 | 12 | 1 | 1 | |
| 26 | Institute of Space Technology | 3 | | | 3 | 4 | | | |
| 27 | Hue Institute of environment recourses and sustainable development | | | | 2 | 3 | | | |
| 28 | Institute of Applied Materials Science | 1 | | | 1 | 30 | 3 | | |
| 29 | Tay Nguyen Institute of Biology | 1 | | | 1 | 22 | 2 | | |
| 30 | Institute of Energy Science | | | | | 12 | | | |
| 31 | Institute of Applied Inforamatics and Mechanics | | | | | | | | |
| | Total: | 507 | 247 | 89 | 173 | 1066 | 44 | 9 | 1 |

Distribution of the published papers by VAST scientists in the period 2005-2010



Statistics on PhD and MSc education in 2010

| No | Institution | Quantity | | Budget (millions VND) | | | |
|----|-------------------------------------|----------|-----|-----------------------|----------|---------------------|--------------|
| | | PhD | MSc | PhD | MSc | Syllabus assistance | Total |
| | | | | <i>a</i> | <i>b</i> | <i>c</i> | <i>a+b+c</i> |
| 1 | Institute of Mathematics | 14 | 53 | 84.0 | 212.0 | 110.0 | 406.0 |
| 2 | Institute of Information Technology | 60 | | 360.0 | | 20.0 | 380.0 |

| No | Institution | Quantity | | Budget (millions VND) | | | |
|--------------|--|------------|------------|-----------------------|------------|---------------------|----------------|
| | | PhD | MSc | PhD | MSc | Syllabus assistance | Total |
| 3 | Institute of Mechanics | 5 | 24 | 30.0 | 96.0 | 40.0 | 166.0 |
| 4 | Institute of materials science | 36 | | 216.0 | | 30.0 | 246.0 |
| 5 | Institute of physics | 25 | 32 | 150.0 | 128.0 | 110.0 | 388.0 |
| 6 | Institute of chemistry | 42 | 29 | 252.0 | 116.0 | 30.0 | 398.0 |
| 7 | Institute of chemistry of natural product | 10 | | 60.0 | | 70.0 | 130.0 |
| 8 | Institute of biotechnology | 18 | | 108.0 | | 30.0 | 138.0 |
| 9 | Institute of Ecology and Bio. resources | 21 | 57 | 126.0 | 228.0 | 20.0 | 374.0 |
| 10 | Institute of Geography | 22 | | 132.0 | | 38.0 | 170.0 |
| 11 | Institute of Geological Science | 9 | | 54.0 | | 30.0 | 84.0 |
| 12 | Institute of Geophysics | 4 | | 24.0 | | 10.0 | 34.0 |
| 13 | Institute of Applied Informatics and Mechanics | 7 | 20 | 42.0 | 80.0 | 40.0 | 162.0 |
| 14 | Institute of Chemical Technology | 12 | | 72.0 | | 30.0 | 102.0 |
| 15 | Institute of Tropical Biology | 3 | | 18.0 | | 20.0 | 38.0 |
| 16 | Institute of Oceanography | 6 | | 36.0 | | 34.0 | 70.0 |
| 17 | Institute of Tropical Technology | 8 | | 48.0 | | 30.0 | 78.0 |
| 18 | Institute of Environment Technology | 2 | | 12.0 | | | 12.0 |
| 19 | Administration Office | | | | | 24.0 | 24.0 |
| Total | | 304 | 215 | 1,824 | 860 | 716.0 | 3,400.0 |

9. Highlights of the plan for the year 2011

The Academy has completed the “master plan to develop VAST for the period 2011-2020, a vision to 2030” and reported the plan to the Prime Minister for approval. With the results achieved in 2010, VAST determine to successfully implement the tasks in 2011, creating momentum for new development phase. In 2011, VAST will focus on the important tasks as following:

- ✓ Deploy projects of programme Tay Nguyen 3.
- ✓ Deploy tasks in project 19, project 47 about “Overall scheme of basic investigation and management of marine resource and environment to 2010 with a vision to 2020” approved by the Prime Minister.
- ✓ Deploy projects of Space technology programme.
- ✓ Deploy the construction of Vietnam National Museum of Nature.
- ✓ Deploy project "Strengthening the network of seismic stations serving the Earthquake observation and tsunami warning".
- ✓ Promote the application of research results into practice.
- ✓ Promote scientific research activities in the key laboratories.
- ✓ Deploy projects “University of Science and Technology” belong to Vietnam Academy of Science and Technology.
- ✓ Re-establishment of the Vast-level Scientific Council in the master plan to develop VAST for the period 2011-2020.
- ✓ Strengthen and improve the quality of library activities, continue to implement the electronic library construction,
- ✓ Continue to improve information technology infrastructure in VAST.
- ✓ Continue to expand international cooperation.