VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY

Annual Report 2011

Hanoi – 2012

Preface

This brochure is the annual report 2011 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 2011.

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.

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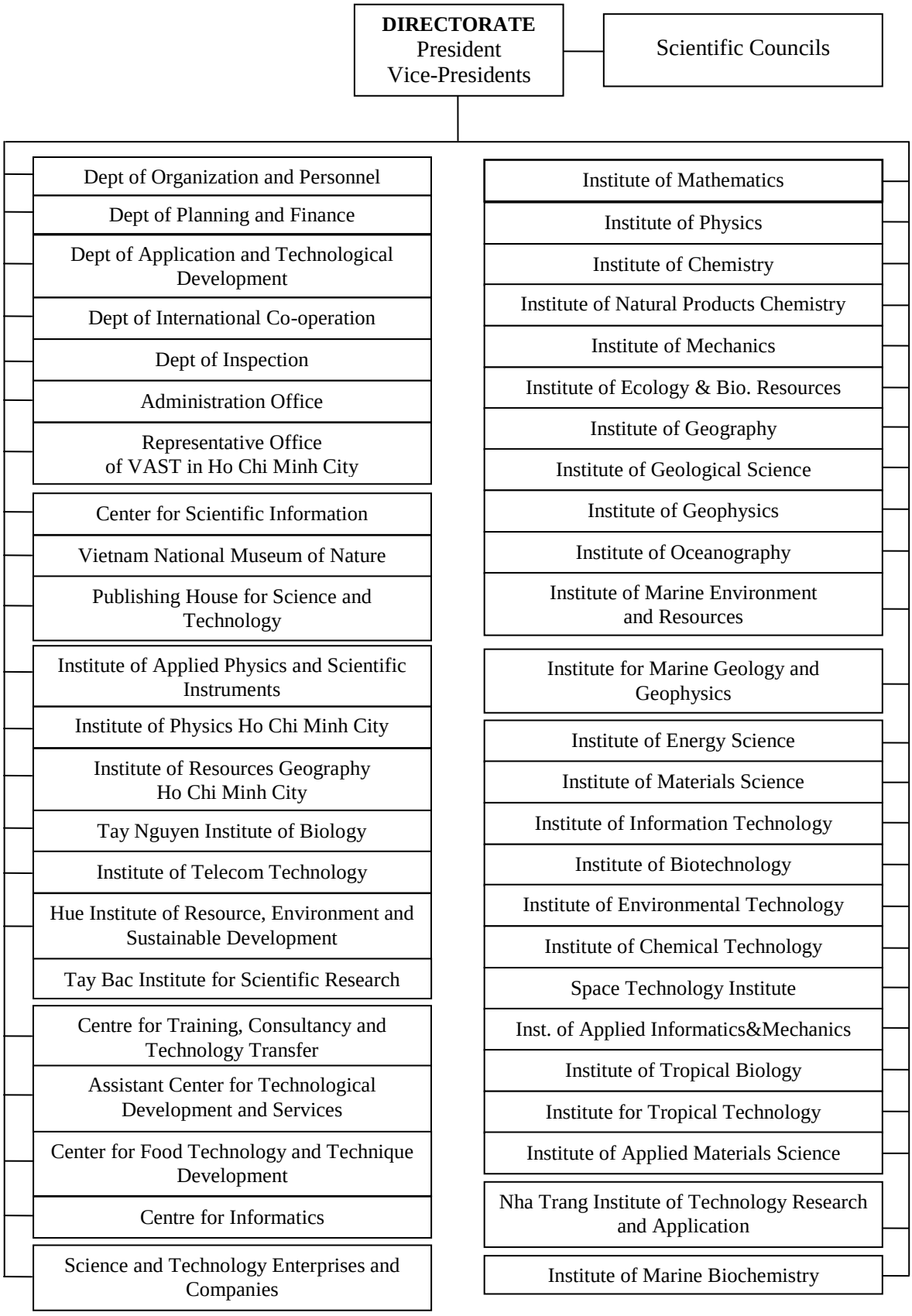
1. Introduction

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. Duong Ngoc Hai

1.4. Particular situation during the year 2011

The year 2011 is the start year for many programmes, long term and mid-term plans of the country such as the 2011-2020 socio-economic development strategy, tech-specific development strategy 2011-2020, fundamental orientation, goal and mission of technology and science covering the period from 2011-2015, planning and strategy for Vietnam human resources development 2011-2020, etc. In 2011, the "Master Plan to develop VAST to 2020, with a vision to 2030" was approved by the Prime Minister. This is important milestone, opening new a phase for VAST's development. Moreover, in this year, VAST also achieved the honour of giving a reception to leaders of the Ministry, Party and state for example the visit by Secretary General Nguyen Phu Trong on 13/8/2011 or the visit by a government working group lead by Deputy Prime Minister Nguyen Thien Nhan on 12/7/2011.

In 2011, VAST established Tay Bac Institute for Scientific Research, Quang Tri Centre for science and technology (directly under the Institute of Marine Biochemistry), carried out scientific tech activities step-by-step to adapt the demand of locals, regions. Besides that VAST also set up a Satellite Exploring Centre (directly under Institute of Space Technology) and on 16 Sep. 2011, the Government issued the decision (No 1611/QĐ-TTg) to establish National Satellite Centre (directly under VAST) for implementing and receiving the Vietnam Space centre project worth 600 million USD from Japan's ODA capital in a 10 year period.

This is the largest project of VAST until now, initiating a new development step in the pace satellite of Vietnam.

Currently, The Academy consists of 47 direct organizations, including 31 specialized research institutes. VAST has 2331 permanent staff, including 42 professors, 182 associate professors, 673 PhD's and Doctor's of Science, 683 MA and 824 B.Arts Engineers. On another scale, VAST has 102 senior researchers, 448 major researchers, 1621 researchers. In total VAST has 1235 non-permanent researchers.

In comparison with previous years, 2011 is full of difficulties and challenges. At the beginning of year, the country was faced with risk of high inflation. The Government issued resolution No 11 (24/2/2011) on essential solutions to retrain inflation, stabilize macro-economy, ensure social security; and to carry out the fiscal year tightly, limited public investment, reduced overspending of state budget; re-arranged spending duty for saving 10%. Despite the difficult situations, Scientists of VAST have made great efforts and completed the set mission of the 2011 plan. The general situation of the Academy in 2011 had many vigorous initial steps for paving the way for the next stage of development in 2012.

2. Research activities in the year 2011

2.1. Fundamental research in Mathematics and Physics

Fundamental research in Mathematics

The members of the institute led 28 research projects of the National Foundation for Science and Technology Development (NAFOSTED):

- 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.

- Non smooth constrained multi objectives to 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 non-convex 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.

- Non-commutative 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.

There were 27 research projects which phased out at the end of 2011, among them only three projects could not fulfill the criteria of NAFOSTED.

In 2011, the institute published 72 research papers, of which 40 appeared in ISI listed journals. Significant results have been obtained in the fields Algebra, Geometry and Topology, Mathematical Analysis, Number Theory, Optimization and Control Theory.

The number of the current PhD students is 31, among them 8 have defended their theses. The total number of students of the current Master Programmes is 108. The institute organized 9 conferences and a summer school for gifted mathematics students. Besides the international participants of the conferences, the institute got 19 visiting guests from abroad.

Fundamental research in Physics

The research activities and distinguished achievements in physics at VAST have been remarkably increased in both quality and quantity. There are currently 59 scientific projects in Physics that have been funded by NAFOSTED and led by the physicists of VAST. Very interestingly, these new projects have been directed by the young physicists. The VAST physicists published in 2011 more than 250 referred papers (among them 121 publications in international journals) increased nearly 50% in comparison with last year.

The research activities have covered theoretical physics, condensed matter physics, nano-materials sciences, nuclear physics, optics and photonics, applied physics, physical engineering and development activities in priority fields of technology, etc.

- *Regarding the researches in theoretical physics:*

Besides traditional directions of research such as quantum field theories, high energy physics and solid-state physics, some new directions of research appeared and are very highly evaluated such as Quantum information, Computational physics and Biophysics. For example, Quantum information science has been investigated very recently and among the top-ten topics over all the scientific branches in the world. The revolutionary feature of quantum information is that information is stored, transmitted and processed in a quantum way. The ability to manipulate quantum information enables us to perform tasks that would be unachievable in a classical context, such as unconditional secure transmission of information. The theoretical research of quantum information has been carried out at IoP, VAST under the direction of Prof. Nguyen Ba An. In 2011, this group published 8 research papers in reputed scientific journals (ISI).

- *Regarding the research in nuclear physics:*

The research activities in nuclear physics at IoP, VAST have been focused on: Investigation of Exotic nuclei using accelerators, Study photonuclear reactions and charge exchange reaction at accelerators, and Study of nuclear reactions with complexity mechanisms induced by Bremsstrahlung and photoneutrons generated from electron accelerators with energies from 15 MeV to 2.5 GeV. As results of effective and fruitful cooperation in nuclear physics with international research centers, such as Dubna (Russia), GANIL, ORSAY (France), POHANG (R. Korea), RIKEN, University of Tokyo (Japan), the scientific results and papers published in 2011 continuously and considerably increased. Remarkably, the two physicists in nuclear physics at VAST - Prof. Dr. Nguyen Van Do and Prof. Tran Duc Thiep –

were nationwide selected and awarded the honour as "**Vietnam Talents for Natural Science**" in 2011.

Vice President Nguyen Thi Doan and Prof. Nguyen Van Hieu awarded the honour as "Vietnam Talents for Natural Science" to Prof. Dr. Nguyen Van Do and Prof. Tran Duc Thiep, Institute of Physics, VAST

- Regarding the research in quantum electronics, optics, photonics and spectroscopy:

In this research field, there are 14 scientific projects funded by NAFOSTED and directed by the physicists of IOP and IMS, VAST. Almost all investigations have been carried out at the Center for Quantum Electronics (IOP) and Division of Optics and Spectroscopy (IMS). Some of these scientific projects are of potential application such as Photonics in study of interactions of biomocules using nano materials as cellular biomarker, applied for cancer diagnostics and therapy; Nano structural interactions in Multifunctional Composant for Biomedical Application; Theoretical models and some applications of nano, Quantum, bio systems. 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, biophysics and medical physics... are being developed. In 2011, they published more than 40 referred papers and a few new patents were issued.

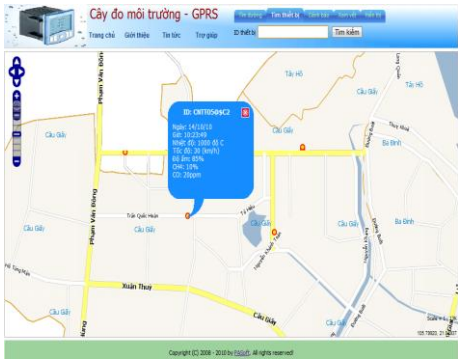
2.2. Information Technology, Automation, Electronics & Space Technology

2.4.1. Information Technology

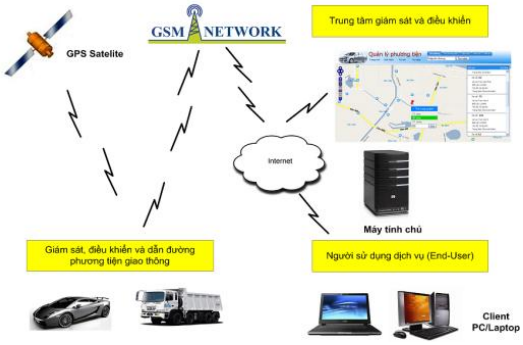
The following is some typical research results in the field of Information Technology:

The project Research, Design, and manufacturing the GPS receiver to monitoring and controlling remote objects via mobile phone networks gives the following results:

- Controlling the embedded technology, GPS technology, wireless communication technologies based on Bluetooth and GSM/GPRS, enabling proactive design and manufacture of GPS devices for monitoring the application process, environmental monitoring and LBS services.



Centre for monitoring and controlling remote using GPS VN-WebCC technology



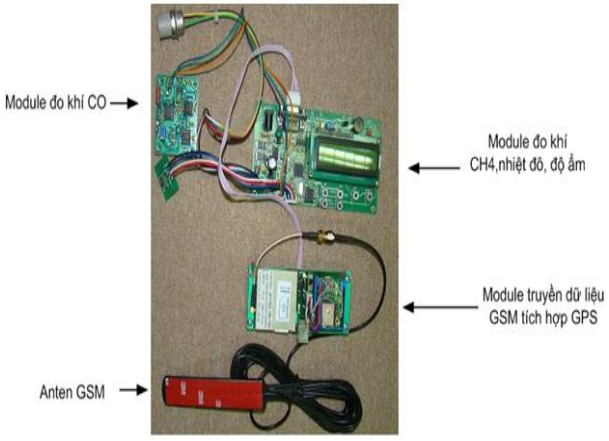
Monitoring system to control transport

- Controlling the technology of digital mapping, GIS and Web2.0 technology, which allows all software development services LBS, mobile monitoring service atmosphere, services of process monitoring and monitoring system to control transport.

- Having successfully developed the embedded products including GPS devices VN-GBR06 based on the chipset EMD1000K and GSC3f/Lpx which allows transferring the GPS data and other location-related information to the Monitoring Centre via wireless communication networks of mobile phones.

- Having successfully developed software products including GIS software application on mobile devices with integrated GPS and digital application map of Hanoi. The Hanoi map is a standard GIS map based on ESRI shape files or MapInfo file. This data is edited, modified on desktop computer by popular GIS tools as MapInfo 8.5, ArcGIS 9.0 or PopMap 4.1… The data will be converted to appropriate format for mobile phones that have tiny memories.

GPS receiver with integrated GSM and Bluetooth

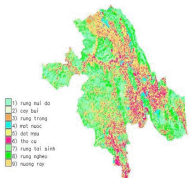
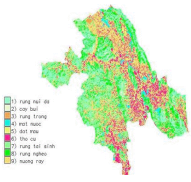
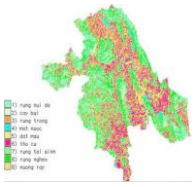


The environment measurement device with integrated GPS

The other project "Development of a software for processing of the remotely-sensed images based on GRASS" developed a software for remotely sensed image processing with characteristics as the following: GUI and Help in Vietnamese; Remotely-sensed image preprocessing; Image improvement using fuzzy logic algorithm; Image classification using different techniques, including C-Fuzzy model, Wavelet transformation and Watershed techniques; Remotely-sensed image databases, including SPOT images of the Hoa Binh area for 2003 and 2008; Import and Export many types of Remotely-sensed images; and Integration with different GRASS versions. The project is designed and analyzed by object oriented methods (using UML) and developed by modern programming language (using .NET and C#).



Image improvement by histogram using C Fuzzy

The results of image classification using Wavelet and C Fuzzy

The Project developed some software modules with Remotely-sensed image preprocessing noise filtering, contrast enhanced, regional clarify, highlighting the image border with advanced techniques as in wavelet transformation. Image classification using different techniques, including C-Fuzzy model; Remotely-sensed image database: using over 100 Remotely-sensed images with many types:

LANSAT, SPOT, ENVISAT, ERS, JERS, ALOS; and Vietnamese modules for easy training and deploying in Vietnam.

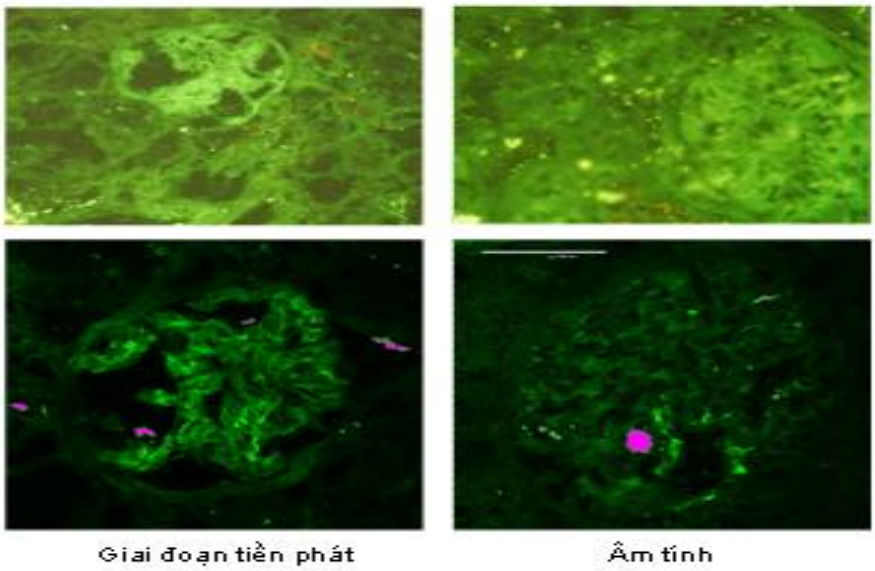
All modules are integrated with GRASS open source software tools useful for training and deploying.

2.4.2. Electronics

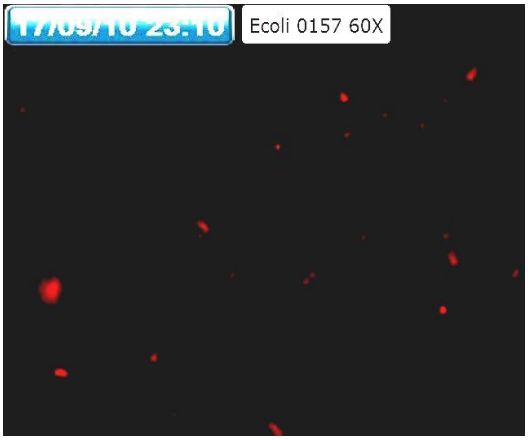
A system of Confocal Laser Scanning Fluorescence Microscope (CLSM) has been successfully designed and integrated at the Institute of Physics, VAST. The device parameters were optimized. First applications of the developed CLSM system have been successfully carried out in bio-medical imaging. The obtained results based on the expanding research and development of the Techno-scientific Project (KC01.20/06.10).

The system of Confocal Laser Scanning Fluorescence Microscope (CLSM) developed at the Institute of Physics, VAST

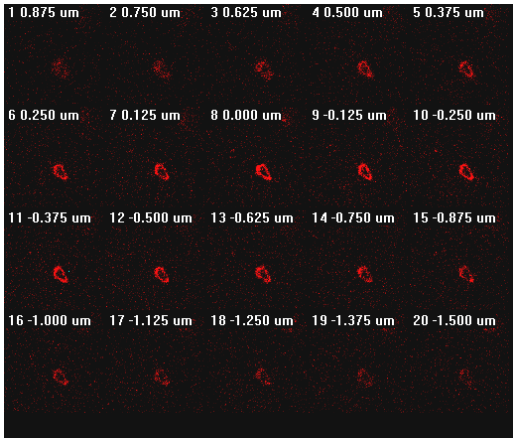
In cooperation with scientists at Bach Mai Hospital, the system of CLSM has been successfully used to take fluorescence microscope images of different samples. The fluorescence imaging results show visible possibilities to diagnose and detect exactly and early the chronic kidney disease and diseased position. Furthermore, this system has been successfully used to detect pathogenic bacterium E.coli 0157:H7 in silica-doped – living organisms using their scanning fluorescence microscope images obtained by Nikon C1plus – Ti-E CLSM.



The fluorescence microscope images were taken by conventional microscope (up) and CLSM (down)



Silica-E.coli 0157 fluorescence images by conventional microscope



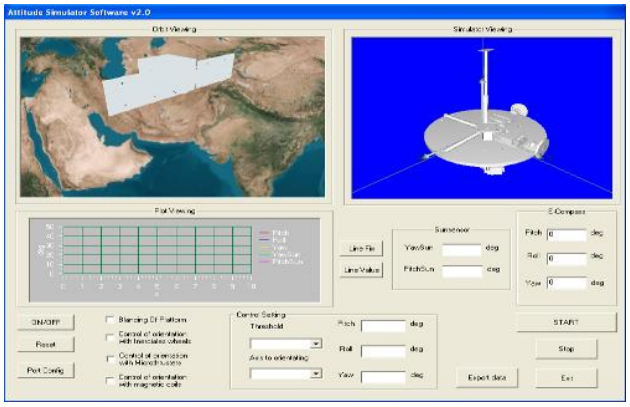
Silica-E.coli 0157 fluorescence images by CLSM

In the near future, recording time resolved fluorescence images can be achieved by combining the CLSM system with an ultrafast laser and an advanced Time - Correlated Single Photon Counting imaging technique.

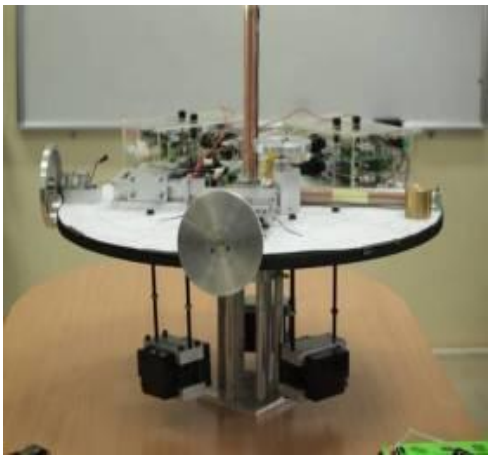
CLSM has been a revolutionary device in bio-medical imaging with high contrast due to effective suppression of light scattered from outside the focal plane, simple colour fluorescence imaging by single or two-photon excitation and the 3D imaging capability (with a spatial resolution of several hundred nanometers) are features beyond the reach of conventional microscopes.

2.4.3. Space technology:

- Development of the Altitude Determination and Control System (ADCS) simulator for tracking simulation of satellites on orbit, altitude and posture control systems: The objective of this project is to do research on the ADCS of the satellite, maintain the orbital parameters, proper operation of the payload, data transference with solar cells.

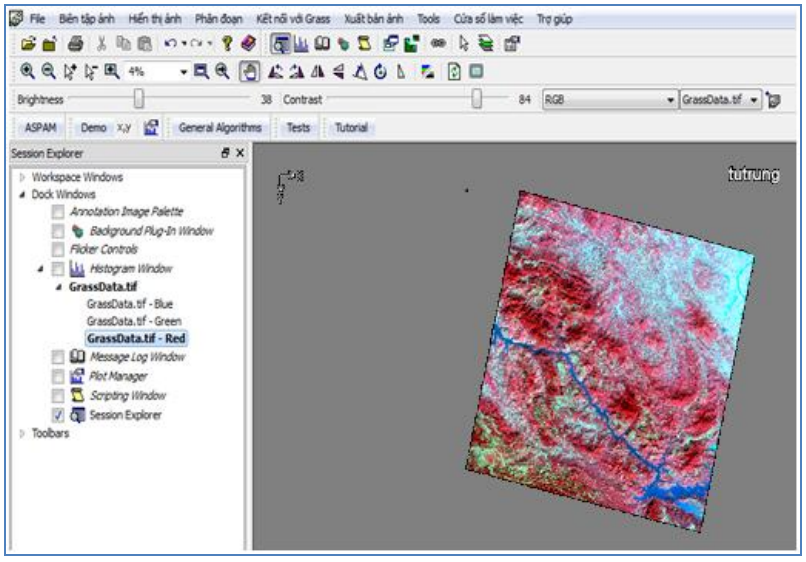


ASiS software interface



The ADCS simulator of the satellite

For satellites, this function is provided by Altitude and Orbit Control System (AOCS). The project has successfully built software for simulation of satellite tracking, altitude control, successfully integrated and tested the semi-physical simulator for satellite altitude determination and posture control system which is the first system being researched, technology transfer, design and manufactured in Vietnam.



The example of the Hydrology Map of the Hoa Binh province

- Development of the software for satellite image processing based on the GRASS software: The project has developed the software for satellite image processing based on the open source software GRASS to save on labour and budget, including development of new modules and modifying the existing modules of GRASS for improving the system performance. The software interface was developed accordingly to the user's requests; supporting the research and teaching; applying for satellite image processing for natural resources and environmental management, disaster reduction and mitigation.

2.3. Biotechnology

Currently, the number of staff in VAST institutions working in the field of biotechnology is reaching nearly 600, except PhD, Master and Bachelor students working for their thesis (Institute of Biotechnology, Institute of Tropical Biology, Tay Nguyen Institute of Biology and others). The number of laboratories specializing on biotechnology research at VAST is nearly 40. This is a fairly large force, including dozens of senior research associates with full and associate professors positions, hundreds of researchers with doctoral degrees, the major part of the remaining staff have Master's degrees and only a small percentage are undergraduates working as contract researcher assistants.

The amount of actual expenditure in 2011 summarized from the national projects of MOST, MARD, MIT, especially top down projects, bilateral cooperation projects with partners from aboard, projects funded by Nafosted, annual budget for research in national key laboratories, projects using provincial budgeting, annual institutional projects and projects using other International funding resources, estimated at over 60 billion VND, not including training and funding abroad to strengthen laboratory facilities. This sum was used for implementing over 150 research projects.

The total number of VAST projects in 2011 was 9 with a total fund of 1350 million VND. By the end of 2011 three projects finished implementation time and the remaining six projects will continue into 2012. Of the six continuing projects, there are 5 implemented at the Institute of Biotechnology (IBT) and one project performed at the Institute of Tropical Biology (ITB). Products of the nine themes of biotechnology implemented in 2011 are of scientific value and promised to bring high applicability in the production. Manufacture of biological products for rapid detection of influenza A virus, primary Liver cancer cells, food poisoning caused by *S. aureus* toxins; drugs for prevention and treatment of increased blood uric acid,

recombinant analgesic conotoxin, antibiotic active substances as well as raw materials, preparations for community health promotion (two preparations of medicinal herbs plants, improving the quality of rice grains).

Highlighted results on the field of biotechnology can be stated as follows: Cloning and determining the sequence of the genes encoding mutilated Staphylococcal enterotoxin B (SEB); Constructing SEB mutated genes in expression vector pET21a +; Expression and purification of recombinant toxin proteins; Determining the concentration of SEB mutated toxin and testing SEB mutant toxin protein as antigen and manufacture of biological products (KIT) for rapid detection of food poisoning caused by *Staphylococcus* toxin.

Designing primer pairs for genes encoding conotoxin; cloning and sequencing *PCR products, constructing expression vector and producing recombinant conotoxin have been completed; Analgesic testing of recombinant conotoxin using hot plate model in mice was successful; LD-50 testing of recombinant conotoxin mice; Two articles were published (one in the Journal of Biological, No. 4/2011, 1 in Proceedings of International Scientific Conference of Coastal Marine Biodiversity and Bioresources of Vietnam and Adjacent areas to the South China Sea, November 24-25, 2011, NPLs) in (VAST03.02/11-12).

Ngoc Linh ginseng collected and inoculated into in vitro as materials for tissue and cell culture and genetic transformation, Tay Nguyen Institute of Biology

Plant samples of Ba Benh and Ngoc Linh ginseng have been collected and inoculated into in vitro as materials for tissue and cell culture and genetic

transformation; Type of samples and culture medium, conditions for gene transformation in order to develop the hairy roots culture root system (VAST 03.05/11-12).

Termites have been chosen as sources to metagenomic screening: Termite gut DNA extraction, creating successful metagenomic libraries in the plasmid are results of the project "Screening of enzymes involved in the process of breaking down cellulose, hemicellulose by metagenomics techniques "(VAST03.03/11-12).

Gram-negative bacteria from water samples, collected sludge sedimentation in a few locations in the waters of Vietnam have been isolated and tested for antibiotic activities. They were the first outcome of the project: Search for active substances of new antibiotics for medical purposes from marine micro-organisms Vietnam (VAST03.04/11 -12).

Successful extraction procedures have been developed for recovering and purifying uricase from selected strains of bacteria; activity of the enzyme obtained was identified. Uricase of high purity level with the physical and chemical properties met the requirements for production of the drug which will be used in the prevention and treatment of increased blood uric acid.

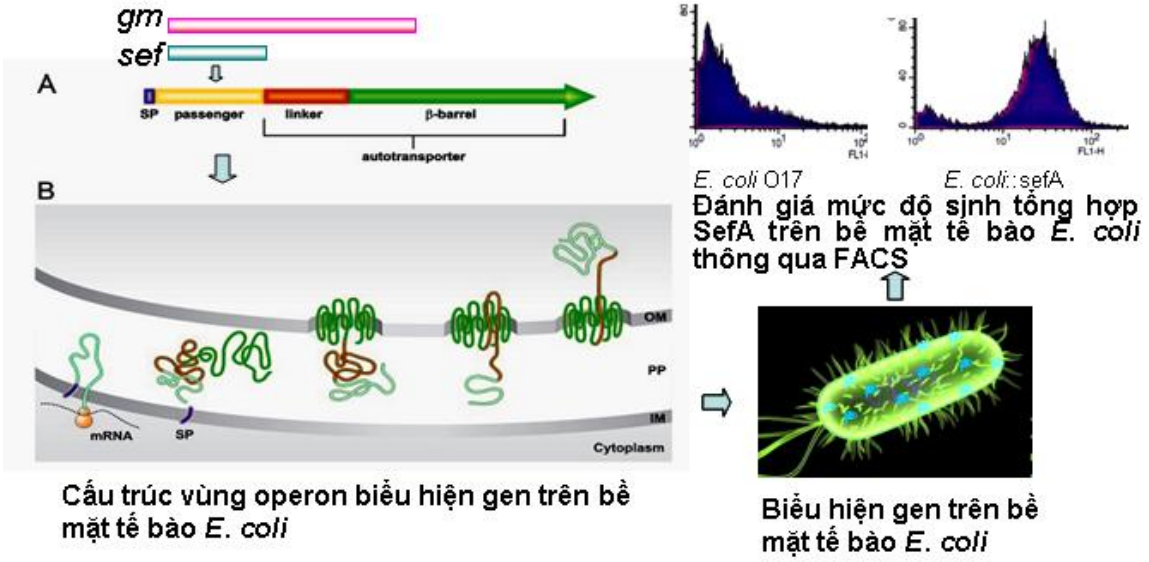
Fabrication of the "BIOAFP-ELISA" kit for qualitative and quantitative determination of Alpha-feto-protein (AFP) in serum samples in order to support the diagnosis of hepatocellular carcinoma (HCC) in patients. BIOAFP-ELISA kit can detect minimal AFP concentration at 4 ng/ml with high specificity. The ability of qualitative and quantitative ELISA BIOAFP kit has been well proven using over 30 serum samples from liver cancer patients and two healthy people which were collected in the Hospital K, Hanoi.

Cell suspension from callus culture was established as a system for in vitro plant regeneration from callus and rice suspension cells and initial studies of selected transgenic rice lines expressing omega-7 (VAST03.06/11-12).

The green dwarf virus-resistant transgenic cotton lines have been developed using RNAi technology. These results will be used as a basis to develop stable lines in the next generation and development into green dwarf virus-resistant cotton varieties.

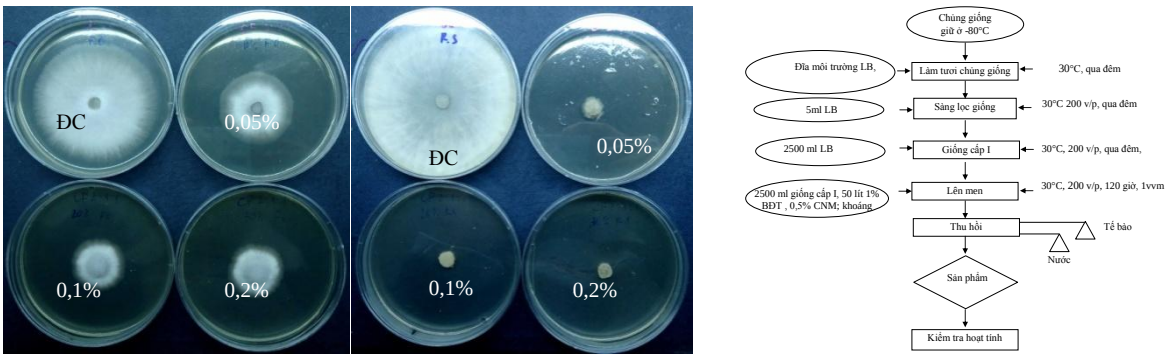
Strains of *E. coli* O17 expressing Gm antigen from *Salmonella enterica* and SefA Serovar enteritidis on the cell surface is the first result for development of poultry vaccine. The test for immunity is ongoing.

Single chain antibodies (ScFv) specific to recombinant surface antigen of influenza virus HA and M1 in E. coli HB2151 have been expressed, purified and attached to latex particles, creating test kit for rapid detection of influenza A/H5N1 in the form of a Quick test for influenza A virus antibody single chain recombinant (VAST03.01/11-12).



Process technology to create live vaccine strains of bacteria have on the price hypotoxic, at the same time can be prevented two types of poultry diseases, low price, convenience in use immunize ingestion. Institute of Biotechnology

Procedure for the production of BCF from micro-organisms isolated from soil in Vietnam using available agricultural waste such as soybean meal which will reduce production costs has been completed.



A B C

Technological processes produce biological products prevent plant pathogenic fungi - BCF. Ability to inhibit the fungal strain preparations with (A) and Fusarium (B) Rhizoctonia. After 5 days, inhibited 80-100% growth and development of two strains, (C) Procedure 80-liter fermentation scale production of raw materials to create products

Biodiesel products from marine algae biomass of Vietnam

BIOAFP-ELISA kit for support diagnosis of liver cancer cells

Products increasing more resistant leaf blast, neck blast, cotton and gold leaf blight (ET-rice)

Special-purpose fertilizer for vegetable crops (AMINO-6DD)

Biodiesel is produced from biomass of marine micro-algae of Vietnam: The biodiesel from micro algae biomass of Vietnam reached 10 of 15 standard categories of quality B100 biodiesel according to the original published Vietnam standards. This is the first product diesel produced from algae biomass of Vietnam. The technology started with growing algae biomass, converting biomass into algae biodiesel, quality test demonstrated that the potential and challenges in biodiesel production from algae in a large scale oriented to commercial products.

Sets of biological to simultaneously diagnosing and typing of foot and mouth disease virus circulating in Vietnam. Advantages are estimated low costs (by one third of the imported price), simple operation, ease of use and storage. The Biotechnology Institute will collaborate with the diagnostic laboratories, veterinary Diagnostic Centers for testing and national deployment of this biological testing.

Remains of 15 martyrs have been identified using mt DNA analysis. The success of name identification using gene analysis of martyrs' remains have

contributed to solving and easing the spiritual consequences of the families lost who lost their relatives during the wars.

In 2011, the VASnT biotechnology staff published over 200 articles in national scientific journals, 50 articles in international journals, 4 bands of monographs and 3 patents. Dozens of Ph.D., students successfully defended their doctoral thesis.

Generally it could be concluded that with investment levels estimated to be less than that in some ministries the outcomes of the VAST research projects has reached advanced level in terms of innovation, and practical relevance compared nationally and regionally.

2.4. Material Sciences

In the field of Material Sciences the research activities on nanoscience and nanotechnology were the most active ones and have achieved the following main scientific results:

Iron oxide-based conjugates for cancer theragnostics

Several conjugates of Fe_3O_4 nanoparticles (MNPs) encapsulated by organic materials such as oleic acid (OL), starch (ST), dextran (D), chitosan (CS) and modified chitosan (OCMCS) and the copolymer of poly(Styrene-co-Acrylic acid (AA)) were fabricated and thoroughly characterized. The Magnetic Inductive Heating (MIH) curves were measured using a set up with an AC field of a strength of 40-100 Oe and frequency of 180-240 kHz. *In-vitro* experiments carried out with the use of the MNP/copolymer for Sarcoma 180 cancer cells showed that the cells while mixed with the ferrofluid were killed totally within a MIH time of about 60 minutes. We have successfully carried out *in-vivo* MIH experiment on treatment of solid tumor of the same line cancer (Sarcoma 180) incubated on Swiss mice with use of the MNP/copolymer as the thermoseed. Additionally, curcumin loaded MNP-based conjugates showed up to be potential agent for application as bimodal contrast enhancer of MRI and fluorescence imaging. *In-vitro* and *ex-vivo* studies by these two techniques showed that macrophage is capable to uptake and carry the MNPs into tumor. The toxicity of the ferrofluids has also been characterized.



Ferrofluid, mice and magnetic inductive heating for Cancer Theragnostics

Copolymer encapsulated curcumin/paclitaxel nanoparticles

Two amphiphilic copolymers, PLA-TPGS and PLA-PEG, were synthesized with polylactide acid (PLA) as the hydrophobic and Vitamin E TPGS (d-a-tocopheryl polyethylene glycol 1000 succinate) (TPGS), polyethylene glycol (PEG) as the hydrophilic segment. H-NMR nuclear magnetic resonance and FTIR Fourier transform infrared spectroscopy revealed that the conjugation was through an ester linkage, which is biodegradable. The utility of the PLA-TPGS; PLA-PEG copolymers to encapsulate the potent chemopreventive agent curcumin/paclitaxel in the core of micelles was investigated. The encapsulated curcumin/paclitaxel was characterized by different methods such as IR, UV-Vis, PL and FESEM. Therefore, being much more soluble in water than freeform, the encapsulated curcumin/paclitaxel showed the positive effects on tumor promotion of Hep-G2 cell line *in vitro* with the enhanced cellular uptake.

Gold and fluorescent silica-based nanoparticles for medical applications

The water mono-dispersed colloidal gold nanoparticles (NPs) of 15-40 nm size and OD~1-4 were fabricated by the Tourkevich method. The gold NPs were bio-conjugated and functionalized by Bovin Serum Albumine (Au@BSA) and Polyethylene Glycole (Au@PEG) capping. The PEG capping has 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 Institute of Biotechnology, VAST). The bioactivities of the complex Au@BSA – Ab and Au@PEG-Ab were examined by ELISA test. The toxicity of the Au@BSA and Au@PEG nanoparticles was carry

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 results are a necessary premise 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 Stöber method from methyltriethoxysilane $CH_3Si(OCH_3)_3$ precursor (MTEOS). The NPs are surface functionalized by differrent groups such as amine, carboxyl, thiol... The nanoparticles are also capped by Bovine Albumine Serum (BSA) and Polyethylene Glycol (PEG). The capping improves on 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 labeled bacteria. The results show the ability of NPs as a label in biosensor.

High luminescent nanomaterials containing rare earth ions in development of fluorescent labels for biomedicine

The luminescence lanthanides nanomaterials (LLNs)-bioconjugate were prepared and applied to the determination of vaccine.

Several LLNs with different nanostructure forms of YVO_4: Eu (III), EuNTATOPO@PVP, $TbPO_4.H_2O$, $Eu_{1-x}Tb_xPO4.H_2O$ and $CePO_4@YPO_4$ were prepared to develop a novel label for fluorescence immunoassay (FIA) analysis. By chemical reaction the functionized LLNs have been linked with some bioactive molecules such as biotin, IgG or BSA. The appropriated core/shell structures can play a double role, one for remaining/ enhancing luminescence efficiency and also for providing the LLNs to longer stability of water colloid and finer compatibility to bio-organisms.

The nature of functional sol gel matrix has great influence on the luminescence properties. The use of the LLNs-bioconjugate linked with IgG for determining of vaccine fabrications of measles or Rota has been performed in the industrial production factory. The fluorescence images of the incubated specimens consisted of LLNs biconjugate and fabricated vaccine upon the immunoreaction conditions could be obtained well reproductively. In comparison with traditional

organic dyes the LLNs-bioconjugate has shown a major advantage in sharpness, constrast, stability and illustrated also the non-toxic nature.

The LLNs-bioconjugates fabricated from YVO4: Eu-nanoparticles, TbPO4.H2O & $EuPO_4H_2O$ nanorods & wires could be used as nanostructured label for recognizing virus/vaccine by using of FIA methodology.

CdTe and CdSe Quantum dots for applications in agricultural productions

Semiconductor QDs emit strong luminescence in the green-to-red spectral region.

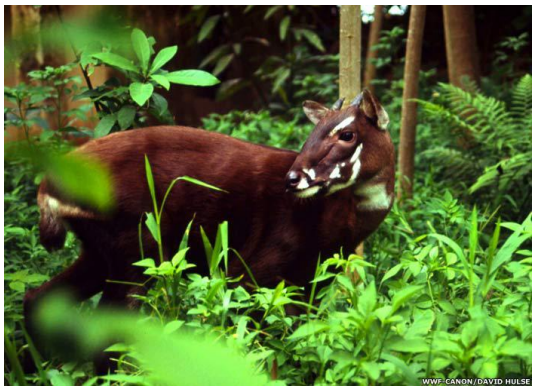
The successful synthesis of semiconductor CdTe quantum dots (QDs) in aqueous phase and CdSe QDs in diesel or in trioctylphosphine oxide solvents. These semiconductor QDs emit strong luminescence in the green-to-red spectral region (~500-700 nm) with the luminescence quantum yield of 30-80%. Systematic characterizations show that the synthesized QDs have good crystalline, sphere shape of and good optical properties. The testing of the fluorescence labeling for agricultural-bio-medical objects (tracing residual pesticide in the agricultural products to ppm content, detection of H5N1 virus…). For the detection of organophosphorus (OP) pesticides, we have realized two different kinds of biosensors: (1) to measure the change in the fluorescence intensity of QDs functionalized with acetylcholinesterase (AChE) enzymes. In this structure, acetylthiocholine (ATCh) was used as an indicator for the presence of the AChE enzymes because ATCh is a powerful hydrolyte with the presence of AChE enzymes; while OP molecules act as the inhibitors for the AChE enzymes, giving rise to the change in the luminescence intensity of QDs. Our study showed the detection sensitivity of 0.05 ppm for parathion methyl and 2.5 ppm for acetamiprid; (2) to turn-on luminescence from CdTe QDs conjugated with dithizone at the surface. In this kind of sensor, coordination of dithizone at the surface of CdTe QDs in the basic environment can strongly quench the green emission (~520 nm) of CdTe QDs by a FRET mechanism. By adding organophosphorothioate pesticides, the dithizone ligands at the CdTe QDs surface are replaced by the hydrolyzate of the organophosphorothioate, and hence release from their energy acceptor role, making the fluorescence turn-on in QDs. The fluorescence intensity change gives

rise to the detection limit of 0.1 nM for chlorpyrifos. For the detection of H5N1 virus the sophisticated biosensors must be realized. These sensors are based on the pH-sensitive CdTe QDs fluorescence in which the CdTe QDs are used as proton sensors to detect proton flux driven by adenosine triphosphate (ATP) synthesis in chromatophores. Therefore, the system of CdTe QDs on chromatophores prepared from the cells of Rhodospirillum rubrum and the antibodies against beta-subunit of F0F1–ATPase could be a sensitive detector for the avian influenza virus subtype A/H5N1 or other kinds of antigen depending on the specific antibody. For the detection of clenbuterol, a harmful chemical residual in pork or beef, CdTe QDs functionalized with Naphthylamin molecules have been used to show the change in the fluorescence intensity with the presence of clenbuterol as low as 10 ppm.

2.5. Biodiversity and Biological active substances

- Project "Evaluation of potentials of biological materials in Vietnam" in cooperation with KRIBB, Korea: 650 plant species have been collected and extracted. Among them 276 species are useful and 165 species having potential as drug candidates. Bioassay show 22 species contain bioactive substances. The project is ongoing.

Triatoma rubrofasciata



Pseudoryx nghetinhensis (*Sao la*)

- Investigation and evaluation on the animal and plant species which are being threatened, in order to improve the **Red Book** of Vietnam. Establishing a list of 2000 threatened species from 13 groups (ĐTĐL. 2011-G/23).

- Investigation and evaluation on the status of *Pseudoryx nghetinhensis* (Sao la) as well as the ecological situation in South-West of Quang Binh province. Estimation of 5 concentrated living zones for *Pseudoryx nghetinhensis* in the South-West of Quang Binh with an estimated no. of 25 - 30 pieces.

Amorphophallus Khoai nua konjac

Funtional food HERIGLUCAN

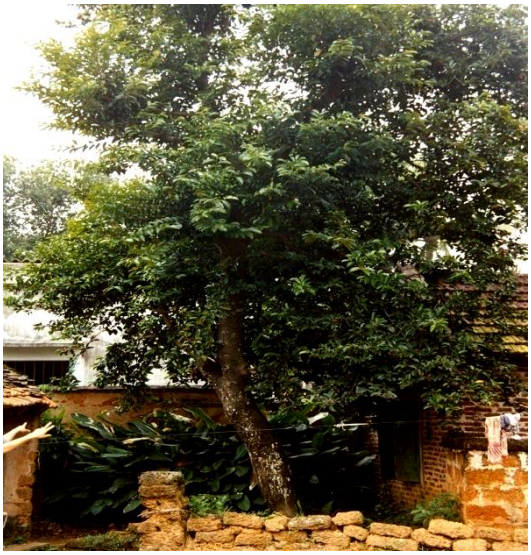
- Study on the cultivation and exploration of rhizomes of *Amorphophallus konjac* C. Koch [Araceae] (Khoai nura konjac) for production of functional foods and drugs for treatment of high blood cholesterol level and obesity. Study on procedures for preparation and characterisation of glucomanane from *Amorphophallus* species.

- Some functional foods: HERIGLUCAN for enhancement of immune system, protect from and against Alzheimer disease, supported the treatment of liver and stomach cancer. HERIGLUCAN is a product from a Vietnamese mushroom, cultivated according to the traditional method combined with modern ways.

- The biokit Hud-5, Hud-567, Hud-10A, Hud-10B, Hud-Biof are used for the decomposition of the organic contaminations, reduction of the toxic chemicals like NH_3, H_2S in the water and the bottom of ponds and lakes cultivating shrimps and fishes.

- The herbal anti-drug medication HEANTOS 4 has successfully passed 3 phases of the clinical trials under supervision of Ministry of Health of Vietnam on 450 patients. The clinical trial phase 3 has been conducted in: Central Psychiatric Hospital No. 1, Thuong Tin, Hanoi (151 patients), the psychiatric hospital in Bac Ninh province (51 patients) and the Centre for Labour and Social Affairs No.1, Ba Vi, Hanoi (56 patients).

HEANTOS 4 helps the addicts to get out of drugs in a mild and calm manner. The health of patients was improved quickly. No adverse side effects have been observed.



Anti-drug medication Heantos 4

Artocarpus tonkinensis (Cây chay)

- Research in the field of the marine biochemistry has been successfully carried out. The projects: "Isolation of the anti-cancer substances from *Asteroidea*, *Holothuroidea* and *Echinoidea* species in Vietnam",

- "Investigation and exploration of the pharmaceutical-potentially substances from the marine organisms belong to the soft coral group..." get interesting results.

2.6. Earth Sciences

The 2011 Annual Report on earth sciences includes achievements of the Institute from the Geological Sciences, Institute of Geophysics, Institute of Geography and Ho Chi Minh City Institute of Geography and Resources (thereafter the Institutes).

2.6.1. Implementation of 2011 Science and Technology projects and programmes:

In 2011 the Institutes completed 11 national science and technology projects. These include one independent, three protocol-based international collaborations, one fundamental investigation, one sub-project of the East Sea and Islands program, and five basic research projects. The Institutes have also completed 9 science and technology projects assigned by VAST for earth sciences, 21 projects and topics of departmental and ministerial level, and collaboration with provincial and city organizations. The Institutes have also fulfilled missions in international cooperation with the Russian Federation Republic under VAST funded projects. The Institutes have actively provided scientific and technological services to other science and technology organizations and private business companies.

Since the year of 2011 the Institutes have been actively deploying funded science and technology projects. These comprise 41 of national level, including 12 projects that belong to key science and technology programs; three protocol-based international cooperation, two independents, 19 basic researches, and 5 national-authorized VAST projects. The Institutes have also been implementing an ODA project (official development assistance), 12 VAST-level topics and 13 science and technology contracts with local organizations, together with many other topics of institutional level.

The projects both having been approved as well as continued to deploy in 2012 aim at three major topics: natural disaster prevention and mitigation, environmental protection and rational use of natural resources.

Part of the achievements of the earth science projects in 2011 are marked by 26 international publications, 90 articles in domestic journals and 3 special monographs.

2.6.2. Major results:

Natural disaster prevention and mitigation:

The Institutes have carried out detailed studies of geological hazards such as landslide, flash-flood and mud-stone flood that routinely occur in Son La, Da Nang and Lam Dong provinces. Detailed studies of geotechnical conditions have also been conducted with the aim to predict possibilities of disaster occurrence along the Red River dyke within the Hanoi area, Son La reservoir-induce earthquakes, and earthquake assessment and classification for big cities. Specifically, a detailed study of seismicity in the Song Ma fault zone has also taken place. Among the most important achievements, many characteristically geo-dynamic parameters of soil foundations in important national socio-economic zones were acquired.

Many of the results have been transferred to professional or local organizations for application. In particular, data of Son La reservoir-induced seismicity provide not only important evidence for safety assessment of the Son La hydropower dam itself but also scientific explanation of underground explosions in the Song Tranh reservoir area (Bac Tra Mi district) in late 2011. The explanations helped to calm confused local residents.

Aside from the studies of geological hazards in the Vietnamese territory, VAST geoscientists, for the first time ever deployed a project in a foreign country, conducted a project of “studying and mapping regional natural environmental

hazards in Lao People's Democratic Republic" in Laos, which was highly praised and supported by the Laotian government. During the implementation of the project, Vietnamese geoscientists were facilitated and funded to train Laotian researchers and to help establish their own research and managing institutes in natural hazards, in general, and geo-hazards, in particular.

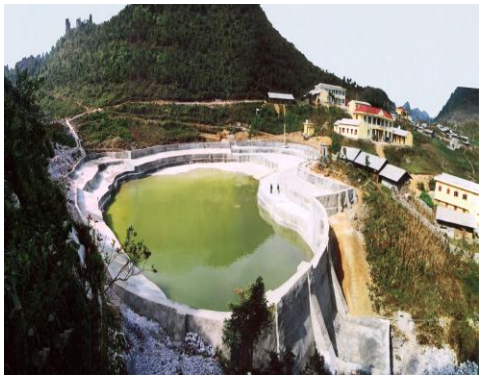
Study of a roadside landslide in Da Nang

With regards to flood and drought hazards the Institutes have deployed many predicting studies of flood, flash flood and drought in river basins in central regions as well as conducting investigations relating to socio-economic zones in the Red River plain.

Other matters relating to climate change and sea level rise and their consequences from geological point of view have also been studied. The studies include sedimentation process, relationship between chemical trace elements and natural factors in coral developing cycles, inductive magnetism research of late Pleistocene to Present sediments to study paleo-climate as basics for predicting and modeling climate change in Vietnam. These studies have gained many positive results that help promote a new, promising direction in study of climate change.

Study and assessment of the impact of sea level rise, as a result of climate change, on dynamic fluctuations of the Truong Sa Islands have resulted in establishing procedures of monitoring sea level rises, mapping island distributions, sandbanks, and periodically submerging sandbanks. The studies have established situation maps for Truong Sa islands following trends of sea level rise and proposed adapting measures for sustainable development and national sovereignty.

Survey water quality on the Truong Sa Islands



Thài Pìn Tủng lake *Tả Lủng lake*

The suspending-lake solution to supply water for the North distant mountainous regions. Until 2011, about 100 suspending-lakes were constructed. The solution could also be applied to Tay Nguyen and the Island regions.

Environmental protection:

The implementation of reporting on strategic environmental assessment within the project of general planning key socio-economic development zones in the Central region, Mekong Delta and other southern provincial areas' (in cooperation with the Development Strategy Institute, Ministry of Planning and Investment) to the year 2020 with a vision to 2030 provides a general scenario and predicts major

environmental problems related to the project, thus contributes scientific facts for implementing and adjusting approved projects. Besides, studies of surface and ground water quality at some locations in Thai Binh province helped set up a new database serving reasonable exploitation of water for sustainable use.

Rational use of natural resources:

In research of finding new types of mineral resources the Institutes have implemented study and evaluations of prospects and possibilities of Indium recovery, a worldwide highly requested rare metal, in tin mineral associations in Vietnam with an aim to establish new sources of material widely used in the field of nanotechnology. On the other hand, while investigating and assessing prospects and possibilities of exploitation of natural stones and minerals (for example, sericite) as material for production of cosmetics, ornaments and decorating tiles serving local industrial development in several Central provinces many valuable mineral cumulates have been discovered to meet the above purposes.

Handicrafts made from Marble in *Nghe An province*

Determination and evaluation of surface water resources and coastline sand dunes in Ba Tri district, Ben Tre province, serve as basics for proposing measures of supplying additional water to the sand dunes in order to increase water capacity for use in dry seasons. Whereas, implication of water filtration technology helps secure water supplies to household and local economic production.

Studying and surveying of rice and mangroves using remote sensing technology in southern territories, and determining function of inundated grounds in

the Sai Gon river bank area - downstream area of Dong Nai river in accordance with water cleaning strategies and protecting eco-environment have provided scientific bases for utilizing and protecting soil and water resources in southern provinces.

2.8.3. Other activities:

Resolution of unexpected tasks: by the end of 2011 geoscientists from the Institute of Geological Sciences and Institute of Geophysics were dispatched to Song Tranh 2 hydropower plant (Bac Tra My district, Quang Nam province) to find causes of ground shaking commonly accompanied by underground explosions under this area. Results of field surveys in combination with earthquake studies revealed that Song Tranh 2 reservoir-induced seismicity was the cause. This explained scientifically a phenomenon of natural hazards which consequently helped calm confused locals including both administrative and common citizens alike.

2.7. Marine Science and Technology

2.7.1. The Scientific Projects

The Scientific Projects at institute level, VAST

In 2011, there were six projects completed, checked and taken over (period 2009-2010); seven on-going projects, which were started since 2010; and six new projects will be carrying out for a period of two years 2011-2012. The main results of the projects at state level are presented below:

In the field of marine physics and marine dynamics: one project is being summarized which developed and improved the prediction and forecast model on both sea level changes and tides for coastal areas, as well as constructed the calculation software in order to forecast storm, waves, sea level rises and tides. Thus, its results have been applying for the prediction and forecast of several storms that affected Nam Dinh coastal area.

In the field of marine geology and geophysics: there was one completed project which was checked and taken over, two on-going projects, two new projects have just been implementing. The research project on forecasting the risk of erosion and slope of stone and soil along shorelines and on the mainland of the south central part were successful in choosing the study method complex as well as ground slope prediction on the mainland with erosion zone maps at the ratio of 1:500.000 together with construction of the moving block model of crust under the sea caused by earthwakes. Its results were applied and expanded in further research and thus

the project was upgraded to state level under the programme KC.09 (11-15). The project studied and accessed the changes of terrain in the north coast due to sea level rise giving out general characteristics that caused influences to the formation and geomorphology of Northern coastal areas as well as construct geomorphology map of dynamic morphology of Northern coastal areas at ratios of 1:250.000. The project of research on high floating accretion and expansion of the coastal alluvial of the Red River associated with climate changes has identified topography, geomorphology, alluvial structure, accretion architecture, high floating and expansion accretion, as well as established group maps at ratios of 1:250.000 together with rational solutions.

Workshop international cooperation on investigation and research of marine natural resources and environment, Institute of Marine Geology and Geophysics

In the field of marine biology: there were four completed projects which were checked and taken over, one project is being summarized, with two on-going projects. The project of research on localization of spawning ground of Coral reef fish groups in the protected areas of Vietnam has identified the natural and environmental elements relating to the formation of spawning ground and reproductive biology of Coral reef fish groups. The above studied results has been applying in localization of spawning ground of coral reef fish, as well as pointing out four criteria that would be applied for Hai Van, Son Tra, Vinh and Nha Trang seas. In addition, the project also analyzed the influences on the formation and development as well as conclusion of five management rules together with solution groups in support of the management of spawning grounds.

The research on biodiversity study and toxins-ciguatera of Benthic Dinoflagellate has identified and classified 30 species of four sets; isolated and brought up the genetic resources of Dinoflagellate; splitted, grafted and read ARN sequencing in order to distinguish five colours of Dinoflagellate; and carried out the research on biology as well as individual ecology and ecological conditions that affected the development of Dinoflagellate. Furthermore, the project defined two marine algae creating toxic which helps to set up the supervised system to control ciguatera in order to ensure the food safety.

American-Vietnam cooperation on investigation and research of Bac Bo Bay, Institute of Marine Environment and Resource

The research on the current status of distribution and resource conservation measures for Red Seaweed which listed 367 species and 12 variation species, and classified into four variable classes, 19 sets, 42 groups, and 130 branches of Red Seaweed in our country. Its result also showed the decline of Red Seaweed in some main areas and established distribution maps of Red Seaweed at a ratio of 1:1.000.000. According to its statistical results, contrary to 24 species of Red Seaweed have large reservation, 10 species of Red Seaweed are in danger of extinction. In addition, the project identifies the potential development of Red Seaweed and proposed seaweed farming directions together with protection measures serving the exploitation of Vietnam Red Seaweed resources in an effective way.

The research on the influences of human life and hydrodynamic forces to the communities of ephemeron and floating bacteria in Bach Dang estuary (the project to cooperate with IRD-France) provides the data on the current distribution and seasonal variation density of algae groups including nano-, pico- and virus, virus communities, and bacteria communities, as well as the synchronized figures of

hydrodynamic parameters and the environment of Bach Dang estuary. Based on these data, the project evaluated the human waste sources to the water environment as well as other factors to natural communities of ephemeron and bacteria together with proposals the environmental protection measures for Bach Dang estuary.

The project of research on the influences of the climate changes to Coral ecosystems of Vietnam coastal assessed the influences of different climate types to Coral reefs of Cat Ba, Hai Van-Son Tra and Nha Trang bay as well as proposed sustainable solutions in respect of the exploitation of coral reef resources effectively.

In the field of natural resources and marine environment: there is one on-going project "Assessment of the carrying capacity of environment of lagoons and gulfs of the coastal area of south central region to serve the development plan of aquatic farming and tourism".

In the field of marine technology: one project was completed, checked and taken over, three projects are being summarized and one project is being implemented.

The project of research on the use of corrosion forecast methods (hydrodynamic) for inside part of onshore pipeline systems set up one calculation programme to estimate the corrosion level inside the pipeline. The project has built a physical model which studied on the experimental two-phase flow of oil-water movement within the horizontal and slightly inclined pipes system. Based on both theoretical and experimental results, it made technical solutions to minimize the corrosion in the transportation pipeline of oil extraction and gas. The project needs to continue its further research on vertical tubes.

The project of research on analysis of the fatigue limit and longevity assessment of marine works in consideration of uncertain elements has completed modums of both new analysis programmes and assessment of remaining life of marine works together with the experimental application for a bar work.

The project of research on the fluctuation of estuaries of North and North of Vietnam Central using high-solution density data and GIS to serve for maritime economic development, natural resources and environment protection has analyzed the space interaction between natural factors and human life activities in the fluctuation of estuary zones; constructed fluctuation maps on space of estuaries of North-Central Northern areas at a ratio of 1:25.000 and 1:50.000; and proposed rational solution in exploitation of lowland coastal areas and estuarine cold flow.

The project “calculation, design to upgrade the water tank for DK1-Truong Sa work” is being implemented.

The scientific project at state level

In addition to the projects at Institute level, there were numerous projects and programmes at state level. There are two projects in programme 47, project “Position resources in Vietnam”, (completed, checked and taken over at local level) and project “International Cooperation in Marine Science and Technology” (is summarized), and other independent projects at state level, protocols.

2.7.2. Other activities

The fifth national conference of marine science and technology held successfully at VAST. Attending the conference were more than 400 scientists and managers of the country. The conference has five sub-committees:

The fifth national conference of Marine Science and Technology

- Hydrometeorology and ocean dynamics
- Geography, Geology - Geophysics
- Biology and marine resources
- Ecology and management of marine environment
- Energy, transport engineering and marine technology

There are 315 scientific works published in six volumes of nearly 3000 pages. At the conference, in addition of scientific reports and discussion at the five sub-committees, the delegates discussed the report on “the current situation of marine scientific research and the orientation of research for the coming period”.

2.8. Environmental technology and energy

In 2011, nine projects on the area of environmental technology and energy were carried out, which focused on the following fields:

- Analyze and assess pollution to select suitable treatment technologies

- Research technology and produce modern materials that are used for environment protection and the exploration of the new source of energy.

The results of scientific research and application for the environmental field and energy are as follows:

- Research and apply GC-MS to analyze antibiotic residue in agriculture water and seafood products. Based on the results, the procedures for analyzing 42 antibiotic medicines of forbidden and limited usage antibiotics in agriculture water have been established.

Electric-Chemical Machine WATERCHLO, Institute of Environment Technology

- Research on the possible formation of by-products, Trihalometan (THM), which are capable of causing risks when running water is sterilized by chlorine; propose safe sterilizing technology.

- Research the procedure of producing and usage of equipment to assess pollution of volatile organic compounds (VOCs) in air to set up a monitoring model of air pollution in urban areas.

Bacteria finished product BIOMIX 1 for decomposing organic waste

- Set up a technical model of domestic waste for a rural populated area by using bacteria product BIOMIX 1. 6 anti-bacteria of limb streptomyces and 3 bacteria of limb bacillus have been selected to produce bacteria products for decomposing organic waste BIOMIX1.

- Research and produce equipment for arsenic treatment by absorbent material NC-F20 to contribute to solving the problem of running water treatment contaminated with arsenic.

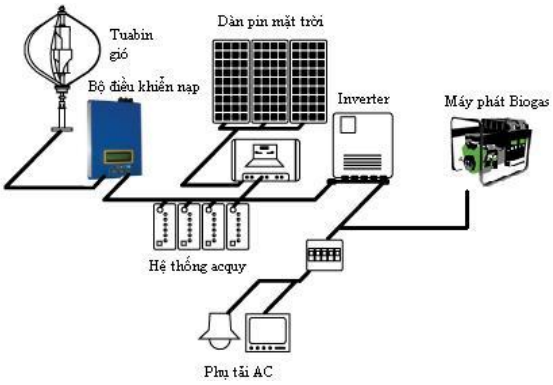
Water fillter machine for health service

NanoVast water treatment system

- Research, design and produce technical modules of CO_2 collection from air waste of coal burning to produce biomass of nutrient rich microalgae.

- Research a comprehensive technical procedure and use nano oxide mixture of rare earth material system – manganese that absorb concurrently ammonium, arsenic, iron and manganese in running water.

- Research a technique of pesticide residue treatment for the group of POPs by carbonization method to minimize the environmental pollution.



Outline of mixed electric system

One system at Mê island, Thanh Hoa province

The mixed electrical system: solar cells, wind turbine, bio-gas to supply electrical power to Vietnam Island regions, Institute of Energy Science

- Research sub-dividing and selecting some types of bacteria that have the ability of producing hydrogen used as a new source of energy.

3. Technology Applications and Deployment

3.1. Promotion of technology Applications and Deployment

- To build up "The Scheme on development of hi-tech agriculture through 2020" and "The Programme on support the application and transfer of science and technology for socio-economic and rural mountainous areas development in the 2011 to 2015 period" through holding the Conference to collect scientists' ideas to develop "High Tech Agriculture Scheme". The Conference welcomed many scientists in biotechnology and agriculture fields and indicated issues of urgent concerns in agricultural plants, maritime products, environment, epidemic diseases… At present, detailed contents are being planned to fulfill procedures to submit to the Ministry of Science and Technology in the first quarter, 2012.

- To set up "The Project on pharmaceutical chemistry ***pilot laboratory".*** ***A***greement on principles has been achieved by the Department of Science and Technology of Ho Chi Minh City and Pharmaceutical Chemistry Programme Office to build the Project on specialized laboratory-chemical pilot.

- To make proposals and subjects of VAST for "The overall scheme on basic survey and management of marine natural resources and environment during 2011-2015".

- To organize the signing ceremony of agreement on scientific and technological cooperation between VAST and Quang Ninh Provincial People's

Committee in Quang Ninh province. To sign with Tay Nguyen University to widen the cooperation of VAST in training high-quality human resources for Tay Nguyen provinces.

The signing ceremony of agreement with Quang Ninh province

- To develop scientific and technological cooperation programmes with Quang Tri province. The cooperation program in the same field is expected to be signed with Ho Chi Minh City in 2012.

- To develop a cooperation programme with the Vietnam National University, Ha Noi is to widen cooperation of VAST in training high-quality human resources for the society ready for the signing in 2012.

- To sign with localities cooperation in information exchange; to unify some working principles as well as foster and promote scientific-technological cooperation with these localities.

3.2. Cooperation topics and Pilot production projects

In 2011, VAST approved 02 newly-introduced projects and 01 continuing project. VAST has approved 6 projects at Ministerial, Sectored and Local level to be carried out in 2011 and 8 projects will be executed in the 2nd year (from 2010).

**Overall assessment:*

- Topics in cooperation with the localities have gained effective achievements and been highly assessed by the localities. For example, the project in cooperation between VAST and the General Department of Technique - Ministry of Public Security, namely "Application of semen cryopreservation technology and artificial insemination to dogs to propagate and preserve some races of professional dogs from the public security sector". Artificial insemination of dogs has been the first

one to be carried out in Vietnam by a group of researchers. With the result that insemination for multiplication will not depend on the dog being in season. The project has obtained the result that 111 professional dogs have been inseminated by artificial insemination with the same good results as natural insemination. This project has solved a difficult problem in weak reproduction of packs of professional dogs belonging to the Ministry of Public Security; it has successfully preserved and developed 3 races of professional dogs Berger, Labradore and Coker) capable of serving as guard dogs, fighting, discovering explosives and drugs. In terms of the economic effect, expenses for importing dogs have been reduced (at the moment, unit prices of importing dogs is US$8000 per dog). This technology process can be widened and developed to build a Centre for preservation and multiplication of the dog race to serve Security, National Defense, Customs and Forestry in Vietnam.

Board for sterilization of medical tools with its application at Anaesthesia and Recovery Department, Friendship Hospital

Board for sterilization displayed in the International Fair

- Implementation results of some piloting production projects that have been accepted and being executed for applications are very good. For example the project *"Finalization of Urea Super Phosphat (USP) fertilizer production process to serve agriculture*", chaired by the Institute of Applied Materials Science has manufactured 687 tons of USP fertilizer with a turnover of 4,728 million VND. Due to rising social demands, the project is expected to be transferred to enterprises upon acceptance. The Project "*Research to finalize production technology of board for control and sterilization of medical tools with ozone gas to serve medical sector*" has been highly assessed and put into pilot scheme in the Friendship Hospital, 354 Hospital; the Project leader has been issued a license of practice by

the Ministry of Health to research, produce and circulate medical equipment until 2016. This is also in the priority the Ministry of Science and Technology predicts to open the Programme on Medical Equipment.

In general, production and piloting projects and topics in collaboration with ministries, sectors and localities are driven from urgent demand of the concerning ministries, sectors and localities. So, they have their high practice and can be executed on a large scale, applied with high rate and make real contributions to the social-economical development of the localities.

3.3. Scientific - Technical Services Contracts (without the State Budget).

In 2011, subsidiary units of VAST have signed Scientific - Technical Contracts with a total budget of 117,636 million VND, implementation budget spent in 2011 is 70,239 million VND. The Units carrying out contracts of large values include Institute of Environmental Technology (36,742 million VND), Institute of Applied Mechanics and Informatics (19,500 million VND). These are the leading ones in term of total budget for realizing contracts in recent years.

3.4. Intellectual property activities

- In 2011, registering intellectual property of the Academy has increased in terms of both quantity and quality, of which, 07 inventory custodies, 04 useful solutions, 01 goods trade and 01 shape registration.

Training on intellectual property in scientific and technological research activities

- To promote intellectual property activities, VAST has organized two training seminars “Scientific and technological property rights in scientific research” in Ha Noi and Ho Chi Minh City with the aim of preparing necessary knowledge and skills for representatives, leaders and researching officers of its subsidiary units.

Based on that, researching officers will clearly understand benefits of registering inventories, useful solutions, and methods to search and explore data on patent applications. Then, to apply into related researches so as to be able to both inherit available achievements and prevent repeated and unnecessary researches.

4. Education and training activities

VAST is a leading scientific and technological agency of the country, it has an important position in the national and technological system, and conducts basic research on natural sciences and has comprehensive and high-standard technological development. VAST is always ready for its high-standard technological and scientific potential to satisfy arising issues in factual situations and train high-standard scientific and technological human resources for the country.

Derived from the common political tasks of VAST in recent years, VAST is always interested in the training of high-standard (Ph.D., Masters) for VAST and the country. In 2011, there were dozens of new doctors and protection training, hundreds of Masters' of all different expertise in the field of natural science. VAST also sent many young staff to be trained abroad to supplement the force of high-standard officials.

Overall, the organization of VAST is thoroughly stable, complete and synchronous staff of high-standard and is quite large in most fields of natural sciences. Force high-standard staff is always the strength of VAST in recent years (compared with other research units and development as well as universities all over the country).

4.1. Results of postgraduate training achieved in 2011

18 Institutes under VAST are engaged in postgraduate training and maintaining and further improving the quality of postgraduate training under the new regulations. Of the teaching staff they 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 of Circular No. 10/TT-BGDDT dated 05/07/2009 of the Ministry of Education and Training who held a series of measures and management training institutes which have been set. The main purpose of these measures is to ensure the quantity and quality of students allowed to institute specialized training doctors at international standards.

A total of 335 PhD's and 383 Graduate students, including 72 Ph.D's have successfully defended doctoral thesises and 155 Graduate students defended Master thesis. The number of PhD's and Graduate students is increasing every year, it is expected in 2012, 392 PhD's will train together with 269 Graduate students. In 2011, the researchers of VAST published 29 textbooks and 23 in 2012 for proposed curricula.

From the results of the practice of the Institute under VAST achievements show the training and re-training of VAST initially meet the requirements to ensure and improve the quality of education of postgraduates of VAST. However, the initial training is facing many difficulties due to objective and subjective reasons in which bring prominence to the issue of funding for training - VAST is very limited. Work competition faced many obstacles due to the specialized topic which entails foreign language competition, the compulsory subjects, time and equipment for training which is also one major cause of difficulty in developing and implementing training plants for VAST.

With the mission of building up Human Resources with international standard competencies, increasing the effectiveness of postgraduate-education activities by combining the research activities and education, VAST had promoted the establishment of The Graduate Academy of Science and Technology. This plan was approved by the Prime Minister in the "advanced project for development of VAST up to 2020 and orienting to 2030". The establishment of The Graduate Academy of Science and Technology will bring the postgraduate-education of VAST to a higher level, promoting the development of the leading experts on natural sciences and technology in the period of globalization today.

4.2. Human Resource training activities

Human resource training activities were always receiving special attention and guidance from the leaders of VAST. In 2011, VAST sent a number of staff to participate in training courses, helping them to enhance their knowledge and competencies. This was the first step to meet the requirements of enlarging the knowledge and sharpening the management skills for human resource of VAST. Below were our achievements so far:

- Training for advanced political theory: 17 staff APT
- Training for intermediate political theory: 60 staff IPT
- Training for national management: 58 staff NM

- Training for economic and technical knowledge: 90 staff E & TK
- Training for economic international integration: 210 staff EII
- Training for professional knowledge: 220 staff PK

5. International co-operation activities

In the recent years, international cooperation on science and technology (S&T) always has been paid, instructed and pushed up closely by the leading generations of VAST. On the basic of international cooperation, VAST has sent a lot of scientists and researchers abroad to study, to realize scientific exchanges etc, at universities, institutes as well as to accept foreign colleagues to VAST to take part in joint research programmes, scientific exchanges, S&T consultancy, etc. Through this collaboration, VAST has set up a rank of high level S&T scientists and researchers who have full capacity to carry out research and management works in a new period. 2011 was a year of active international cooperation of VAST with great, dynamic changes in rich content as well as high quality.

Prime Minister Mikhail V. Myasnikovich, Belarus visit to VAST on 29/11/2011

In 2011, VAST accepted 45 delegations from different scientific organization centres from China, Taiwan, Thailand, Japan, Republic of Korea, New Zealand, the Netherlands, Australia, Belgium, Czech Republic, Italy, Russia, Belarus, Ukraine, Germany, France, the Congo, USA and Cuba, to come to work with VAST in fields of environment, energy, biotechnology, marine research, IT, space technology, materials science, chemistry, physics and training. Especially, a Belarus delegation led by the Prime Minister Mikhail V. Myasnikovich to VAST to push up and to strengthen cooperation relationships and sign establishment of a Center for Scientific Research and Technological Development on Machines & Equipment Manufacturing, Energy and Chemistry between VAST and the National Academy

of Sciences of Belarus. Institutions, Centers of VAST also have received 674 oversea delegations to visit.

VAST organized 14 delegations led by the President and Vice-Presidents together with Directors, Deputy Directors from different organizations, institutes to visit Laos, China, Japan, Republic of Korea, New Zealand, Ukraine, Russia, Austria, France, Germany, Belgium. Sweden and the USA. Remarkably, it was the first official visit led by Prof. Chau Van Minh, full member of Vietnam Central Communist Party, President of VAST to the National Authority of Science and Technology of Lao P.D.R. It was an important event to establish all-around cooperation possibilities on S&T, starting in the period of 2011-2015. In 2011, VAST nominated nearly 806 scientists, researchers and managers to go abroad for exchanges.

The Project "Vietnam Natural Resources, Environment and Natural Disasters Monitoring Satellite" (VNREDSat-1) was carried out in 2010-2014 by ODA from the French Government, with an amount of 55.8 million Euro and 64.8 million VND, from the Vietnam State budget. In 2011, VAST sent 2 delegations to France to accept the bidding on the satellite project, 15 scientists and researchers were sent to France to attend the training courses. In 2011, a small satellite managing Board organized to open bid and selected the bidder who would realize the bidding construction "Hoa Lac Satellite Managing Signals Ground Station".

The Project "The Second Project for Natural Resources and Environment and Disaster Monitoring Satellite of Vietnam - VNREDSat - 1B" has been approved by the Prime Minister in dispatch No 1044/TTg-QHQT dated on June 30, 2011 that allowed the Project to be realized by ODA from the Belgium Government, with an amount of 63 million Euro and 60 billion VND counter-capital from Vietnam Government, in the project time from 2012 to 2020. VAST has been supplementing and finalizing project documents for approval and start of the project in management and using ODA regulations of the Government.

On September 16th, 2011 the Prime Minister decided the establishment of a National Satellite Center at the Decision No 1611/QĐ-TTg. This Center belongs to VAST with functions of receiving and managing the infrastructures of the Space Center of Vietnam, with total budget from Japan ODA of 46.595 billion ¥ and 1,774 billion VND from the Vietnam State budget. November 2nd, 2011 the Agreement of Privileged ODA for this project was signed by the Government of Vietnam and the Government of Japan in Tokyo.

In 2011, VAST has been carrying out 28 S&T Agreements signed by Russia, Belarus, Germany, France, USA, Belgium, and Denmark The numbers of agreements on S&T between scientists and researchers of VAST and counterparts of block speaking which have been superior, the most remarkable is the project from specialized institutes of VAST with the partners from universities in Wallonie-Belgium, National Institute of Research in Quebec, Paris-Sud University, Institute of Development Research (IRD) with CNRS – France and the National University of Chungnam - Korea.

In 2011, there are 22 international cooperation (IC) projects that have been continued in 2010-2011 and 24 IC projects have been opened and realized in 2011-2012. Besides these projects, VAST has discussed and agreed a list of 50 ideas, suggestions for negotiations and selection with foreign counterparts for the period 2012-2013.

The programme of international collaboration on surveys and investigations on ocean resources and the environment between Vietnam and overseas partners in the framework of the project 47 has been realized with 8 missions abroad to China, Japan, Republic of Korea, Russia, Belgium, France, Singapore, Malaysia, Australia, New Zealand, Germany, UK, and USA for better understanding of systems Ocean Research Institutes, Centers of above-mentioned countries and setting up the collaboration, invitation of joining the network of the programme of international collaboration on surveys and investigations on the Vietnam East Sea resources and environments.

In 2011, 74 events of conferences, workshops and seminars (46 workshops, 28 international training courses) have been organized at VAST. The increasing numbers of international workshops and seminars have been proved that the international collaboration of VAST has been strengthening in different research directions, activities for sharing experiences among VAST's researchers and the world scientists. The remarkable events are the conference for estimating the value of international collaboration on S&T between VAST and Russia partners, Belarus, Ukraine, France, Czech Republic, Japan, Korea. The workshop on "Application of space technology for economic and social benefits" co-organized by U.N. and VAST, the workshop on biomass between VAST and Japanese partners as well as the Do Son School on Mathematic Methods in Finance and Statistics jointly organized by VAST and CNRS.

In order to stimulate and encourage in time, foreign scientists and researchers, international organizations who have contributed in training and research on S&T for VAST. In 2011, the President of VAST, Prof. Chau Van Minh awarded 2 certificates of Merit, 6 Commemorative Medals, 6 Degrees of Honourable Doctorate Causa from VAST for USA., Russia, Germany, Hungary, Switzerland and Italy.

The results gained in 2007 - 2011 that has shown the successes of the international bilingual collaboration (IC) projects were generated by the right decisions of VAST's leaders. The amount of excellent ideas and suggestions have been increased in recent years and the numbers of the projects in application have been reduced. From results of IC projects, many articles joined every year due to the limited budget for VAST. Many were written by VAST's researchers and overseas scientists and have been published internationally. In order to increase IC projects as well as budgets for each project to meet the needs of scientists and researchers. In 2011, VAST has set up the list upgrading IC projects, bilingual projects from VAST to ministerial agreements on S&T through government to government (G to G) that brings those aforementioned projects into annual budgets.

In 2011, VAST signed 9 documents of MOU with overseas partners in which 5 documents of MOU were newly signed, one document was extended, and one MOU was signed again. Newly signed MOU has been shown that the expanding partners, research directions with previous and new partners in potential countries have been greatly interested by VAST's leaders. 52 additional signing MOU between institutes of VAST and related institutes in China, Korea, Japan, Russian, German, U.K, Canada and the USA. It is a year with many important events in international cooperation with VAST. One of the most remarkable event is the visit of VAST's delegation led by Prof. Chau Van Minh, President of VAST to the National Authority of Science and Technology, Lao's People Democratic Republic that has opened the all round possibilities on S&T in the field of S&T activities in coming years.

The working visit at VAST of the Republic of the Belarus delegation led by the Prime Minister Mikhail V. Myasnikovich, the former President of the National Academy of Sciences of Belarus (NASB) has opened a great promise on S & T between VAST and NASB, especially the undertaking commitment of building the Joint Research Centre for Scientific Research and Development on Machinery, Equipment, Energy and Chemistry as well as the establishment of Applied

Factory's on S&T to transfer technology and scientific achievements into production to serve economic and social development of the country.

VAST has co-ordinated with UNOOSA to organise the International Workshop on "Application of Space Technology for Economic and Social Benefits-2011" in Hanoi, October 2011 with the participation of 150 participants in which 60 foreign experts will be attending. This is a good opportunity for Vietnamese scientists, researchers and managers to exchange experiences, to find partners, and to train the human forces on space science and technology for Vietnam.

November 2nd, 2011, it is a date for an Agreement of ODA privileged capital for the National Satellite Centre Project which was signed between the Vietnam Government and Japanese Government in Tokyo. December 15th, 2011, the Joint Statement of Intent was signed between VAST and NASA, this event has opened a new prospect in space technology R&D for the purpose of managing natural resources, environment and reducing natural disasters as well as addressing with climate change.

Promoting all the results gained during the recent years as well as to orient the international cooperation contents of VAST, some key works should be concentrated on the following steps:

Keeping close collaboration and friendship with all partners who have already signed with VAST;

Continuing extending international cooperation with foreign sponsors, partners etc., in the multiform, multilateral cooperation to make the maximum effort from added resources, select and concentrate on S&T collaboration in 7 priority research directions of VAST with key potential foreign collaborators and jointly set up the programme of deep and wide international intergradations. Through these activities, the position of VAST has been raised not only in the region but worldwide. The International Cooperation Department continues managing, unifying perfectly international cooperation and strengthens co-ordination on international activities of VAST, seeking other funding resources in the field of S&T. The Staff of ICD should be included and trained well in order to meet the needs of new collaboration, in new challenges.

6. Activities of Key Laboratories at VAST

Four Key laboratories (Gene Technology, Plant Cell Technology, Materials and Electronic Components, Network and Multimedia Technology facilities) have

been operated in VAST. In 2011, Key Laboratory of Materials and Electronic Components assigned to perform State independent tasks and 5 themes of the key laboratory functions; Key Laboratory of Gene Technology assigned to perform a State independent topic and 4 themes in the function of key laboratories; Key Laboratory of Plant Cell Technology made 3 themes in the function of key laboratories; Key Laboratory of Network technology and Multimedia made 3 in the function of key laboratories, carried out in two years 2011-2012. Totally, at 2011, 15 scientific themes are implemented in four Key laboratories. During this year, all scientific themes completed the implementation in the period 2009-2010 were accepted during 2011.

A number of equipment can operate with very high frequency like mass spectrometry, high-performance liquid chromatography (HPLC), liquid chromatography purification (FPLC), sequencers, PCR and real-time PCR, the centrifuge, micro-array system, the 2-Dimensional electrophoresis, equipment for sample preparation of protein analyzing, spectroscopy and fluorescence microscopy - scanning electron microscopy (FE-SEM), X-ray diffraction system, the Raman scattering and some instrumentation system for studying optical properties of the material (measured fluorescence absorption system). Overall, the equipment of the four key-laboratories are put into operation as soon as received. All equipment are operating with a capacity of 100%.

VAST has issued decisions on financial regimes applicable to the four key-laboratories at VAST as dependent accounting units belonging to the hosted institutions.

The Key Laboratories have issued regulations on organization and operation and received the science and technology licensing activities from the Minister of Science and Technology; The 4 Key Laboratories have also strengthen leaders and units, dispatched officials to work regular and irregular (collaborators) establish research units affiliated laboratories.

Achieved research results of the Key laboratory made an important premise for specialized research institutions directly performing assigned and urgent major significant and practical science and technological themes and various topics, for example, as the task "Application of DNA techniques in the assessment remains of martyrs", etc.,

Also, thanks to the modern laboratory’s equipment, scientists of VAST have good conditions for registration, bidding and implementation of a variety of projects

belonging to State Science and Technology Programmes, National Target Programmes, National Foundation for Science and Technology Development (NAFOSTED), basic research oriented applications, at ministerial-level and municipal level.

Many teams working at Key laboratories have got collaborative research, training and coordinate with other agencies in the country and abroad (for example as Training workshops for Laos' scientists).

Many young scientists have got PhD thesis upon the scientific directions of the Key laboratories. Many doctoral and Master dissertations have been completed here. Many papers have been published in specialized domestic and international scientific journals.

Scientists of the Key laboratories are involved in teaching and training for graduate students in and outside the VAST institutions through guiding PhD and Master thesises (Hanoi State University, Hanoi Medical University, University of Thai Nguyen, Thai Binh's Medical University, Bach Mai Hospital, and National Pediatric Hospital). The graduate students with the guidance of the researchers of Key Laboratories also used the device in the laboratory of his specialized research.

The topics and tasks implemented in the laboratory have to progress and monitoring for the approved estimates, spending the allocated budget. The laboratories are managed and efficiently used with given budgets and assets of the State, contributing to the good of the institute presided over the function. Thus always making proper use of the settlement, in accordance with the budget of the State.

7. Publishing, Museum and Information activities

7.1. Publishing activity

Publishing of the scientific magazines, reference books or text books is one of the most important scientific and technological activities of VAST. Annually, hundreds of books plus thousands of papers are published.

7.1.1. Publishing scientific and technological journal

Currently, VAST issue 12 specialised scientific and technological journals. This is a national journal of prestige with is recognised and granted operation by the state. Many magazines are published bilingually such as maths, mechanics, physics, plus advances in natural sciences. Vietnam Journal of Mathematics is

issued in the cooperation with Springer Singapore publisher's and has been internationally released for many years. These journals are constantly improved in terms of quality, content, form, issuance frequency.


Signing ceremory between VAST and Springer publisher's for issusing of the Vietnam Journal of Mathematics

Editoral boards of magazines include top scientists of Universities, Research institues nationwide, consequently some journals ask for the participation of foreign scientists from England, France, Russia, etc.,

Since 2010, upon the requirement of development and integration, VAST decided to upgrade issuing of 12 journals with the target of having at least 1 to 3 journals reaching ISI standards in 2014. They are Advances in Natural Sciences, Acta Mathematica Vietnammica and Vietnam Journal of Mathematics. 2011 is the 2nd year for the Journal of Advances in Natural Sciences: NanoSciences and Nanotechnology is published in cooperation with international publisher IOP, having increasingly remarkable access (one article 2011 had 200 reviews in one month, the average was 268 reviews per article) and being purchased under publication.

7.1.2. Publishing scientific and technological book

Apart from periodicals and magazines, annually VAST also spend significant efforts on issuing scientific and technological books.

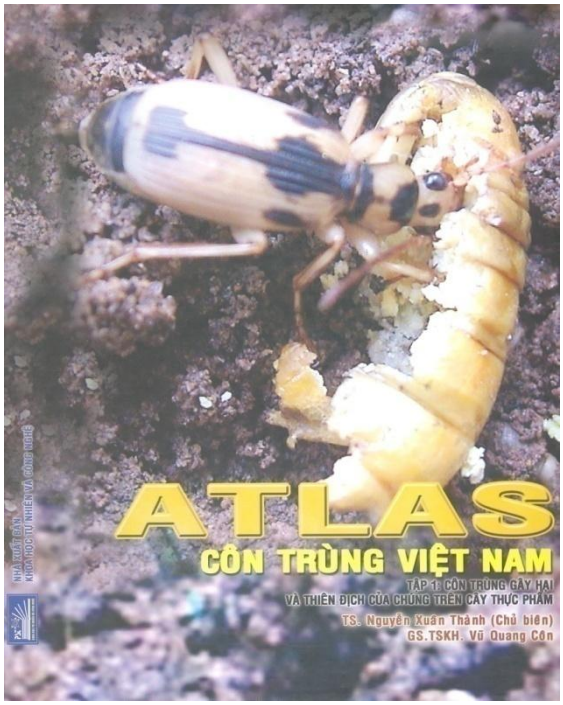
VAST continue publishing a series of reference books. It covers 4 fields:

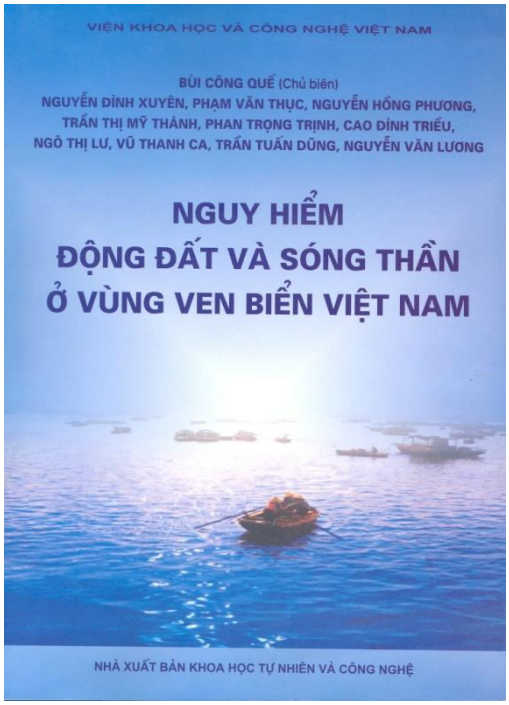
- Monograph about technology and tech development
- Monograph about natural resources and environment of Vietnam
- Monograph about marine science and technology
- Text books in university and post graduate

Editoral board of this set is established based on above fields

Monograph of selection and publication are a result of specialised science and technology by authors of VAST. The form is in harmony and printed with high quality. After issuing, the publisher will deliver to required places. As scheduled, there are 5 to 10 book titles on average, only 2011 achieving 7 monographs

VAST continue issuing set of books about Marine-Island Vietnam. This set of VAST's strength is ordered by the State. Till the end of 2011, 20 book titles on marine and island life were published. Through assessment of scientists and readers, this set of books owns high scientific nature and value on popularizing and enhancing the marine understanding of the people, contributing to implementing national marine strategy up until 2020.





Books win Silver awards for Vietnam books

In 2011, VAST mobilised it's publishing schedule with 18 turns of 130 book titles. Publishing decisions will be delivered for standard publication in accordance with publisher's purpose which the authority gives permission for. There will be no errors in 2011 publicationing.

The Publishing house participate in the Vietnam books award and won high prizes with silver awards: Earthquake and tsunami by Prof. Bui Cong Que; Insect Atlas of Vietnam by PhD Nguyen Xuan Thanh, Professor Vu Quang Con.

7.2. Museum activity

7.2.1. Vietnam National Museum of Nature's activities

In 2011, Vietnam National Museum of Nature (VNMN) was assigned to implement 03 national projects, 02 tasks of VAST, 01 bilateral cooperation with the Czech Academy, 04 projects of Nafosted and 04 institutional projects. Moreover, several staff also took part in 04 science and technology projects in other institutes.

Some main results in summary:

a. Research activities:

* Completed the National independence project: "Study the scientific basis in order to identify, classify, arrange and manage the specimens collection, Vietnam National Museum of Nature system". The project had been completed as the plan, content and expected objectives and it is going to be approved.

b. Implementation of the tasks given by the Prime Minister:

* Performing the task of planning the Vietnam National Museum of Nature system according to the Decision No. 86/2006/QD-TTg dated 20/4/2006 by the Prime Minister:

Opening ceremony of Zoological Taxidermy class at Vietnam National Museum of Nature

Practicing at Zoological Taxidermy class

- Organized successfully was a two-month training course (10-12/2011) on "Zoological Taxidemy" for the Museum staff and the technicians of another 16 units belonging to the Museums in the system of VNMN, and from the National Park, the Natural Reserves nationwide, by the experts coming from Saint Petersburg Zoological Institute, Russian Academy of Sciences. After the course, the learners received the certificates.

- Also signing the co-operation agreement with 13 National Parks, local Nature Reserves, in order to develop the co-operation between the two sides on biodiversity, identification, and the bio system, promote the implementation of projects in the system as the plan.

* Performed the tasks of specimen's collection for Vietnam National Museum of Nature (according to the Note No. 611/TTg-NN, dated 16/5/2007 from the Prime Minister):

- Collect specimens from the Centers and the relevant locals Hanoi Zoology, Con Dao National Park, Can Tho, and Department of Finance in Binh Thuan

- Received 148 samples of 25 species, (of which there were some precious species such as Tiger, Dugong, Gorilla, Bear…).

- Initially tested 50 samples, processed 08 specimens for display, including the Mola mola specimens. We made successful copies for display such as: Mola mola, *Ophiophagus hannah* (Snake), Turtle, and Dugong specimens.

c. Information, communication:

* Responding to the World Environment Day 06/05/2011, the Museum in collaboration with the Department of Environment, Ministry of Natural Resources and Environment, Natural Resources and Environment of Bac Kan province and Ho Chi Minh Communist Youth Union successfully organized the exhibition "Forests: The value of life from Nature". Many photos on Vietnam insects were exhibited, together with several panels and images introducing Vietnam National Museum of Nature in general and the Museum activities in the process of forest protection, environment and biodiversity protection. The exhibition took place from 5-9/6/2011 in Bac Kan city.

The first National Conference, Vietnam National Museum of Nature system

Exhibition "Forests: The value of life from nature" in Bac Kan

* Responding to the International Year of the Forest in 2011 and the International Decade to Combat Desertification 2011-2020 launched by the United Nations, Vietnam National Museum of Nature in collaboration with the General Department of Forestry, Vietnam Association of Science and Forestry technique organized the photographic contest nationwide with the theme "Vietnam Forests", the contest took place from March to September 2011 and got fruitful results. The organizing board selected 80 photos among a total of 2000 for display. The exhibition lasted for 7 days and gained good results, from 27/11 to 3/12/2011 at 45 Trang Tien exhibition room, Hoan Kiem ward, Hanoi city. Moreover, according to the proposal of Vietnam Military Museum, the Director of Vietnam National Museum of Nature gave a talk under the theme: "Forests, life value from Nature" to all the staff of the Vietnam Military Museum.

d. Publication:

* Published the Proceedings of scientific reports for the first National Conference, Vietnam National Museum of Nature systems on the occasion of its fifth year foundation anniversary and the implementation of planning Vietnam National Museum of Nature system assigned by the Prime Minister.

* Coordinated with the General Department of Forestry and Vietnam Forestry Science and Technology Association who published the illustrated book "Forests in Vietnam", in which more than 80 photographs were selected from that contest and were broadcast. VNMN has played a key member of the contest.

e. Building potential:

* Completed the scenario document and basic design of project "Organism evolution exhibition room" of Vietnam National Museum of Nature at Building A20, Nghia Do, with the tentative budget of 21.8 billion VND funding.

* Explanations were completed and the VAST president approved the project "National specimens collection from Vietnam's Nature" with a total investment of 340 billion VND, achieved in the period 2012-2015.

f. International cooperation:

Signed 15 agreements and memorandum of cooperation in the field of museum and scientific research with the Museums, Research Institutes, Universities in Australia, Singapore, Japan and China.

7.2.2. The museum's activities at the Institute of Oceanography

- Stored the sample (chemical submerge, redo the label, change jars, etc ...) for about 1,500 sample bottles.

- Added approximately 20 large sea creature samples of many different species.

- Implemented and put into operation the theme "Marine Resources at Hoang Sa, Truong Sa islands".

- Opened the exhibition areas raising marine organisms.

- Received and displayed ship transferred by the Institute of Mechanics, VAST.

- Joined the zoological taxidermy training course (organized by VNMN from October to December 2011).

Organized and taught students (University of Highlands, Hue University of Science, Can Tho University, University of Saigon, etc.)

- In 2011, the Oceanographic Museum received about 276,000 visitors to visit and study (domestic 265,300; overseas 10,700).

7.2.3. The museum' activities at the Institute for Marine Resources and Environment:

The Director of the Institute of Marine Resources and Environment established a project preparation board for Do Son Oceanographic Museum, the board is responsible for advising and helping the Director to promote the procedures needed to prepare for the project.

Project preparation board implemented the project as planned completed the plan for compensation and ground clearance.

Project preparation board is cooperating closely with the Center for Land Fund Development at Do Son district, and completed the detailed inventory of using area, works and assets on land, verified the land origin of each household, determined the land giving quotas for each household, applied the new compensation rates in 2011 according to the Decision of Hai Phong People's Committee and relevant legal documents to make detailed plans for compensation and site clearance of the project's land area.

7.3. Information activity

After effective operation of digital library since 2009, 2011's project "proposal to buy foreign scientific and technical magazine of VAST in 2011-2015" is implemented with transfering a number of foreign magazines from paper to

electronic form and buying access right of some high quality database. For example: Science Direct of Alservier publisher (including 1800 top electronic-magazines about technology and science of access rights since 1995); SpringerLink (covering 1200 electronic magazines with access rights since 1995); collection of 34 e-journals from ACS; collection of 66 e-journals from IOP with access rights purchased from back years (some beginning from 1874)

Conference of Science Direct database's introduction for VASTs scientists was organized in Hanoi (May, 2011)

By a considerable number of electronic magazines of value, demand in searching, loading maths, literature by VAST scientists is improved distinctly. 2011 is first year of implementing projects that serve VAST's scientists very well with more than 70,000 article downloads of which:

- 50,810 downloads are from Science Direct and mostly subjects of geology, marine geology, chemistry, geo-chemistry application and earth science.
- 7,344 downloads from Springer Link and mostly the subject of botanical cells, bio technology, cell biology, microbiology...
- 2,291 downloads from collection 34 e-magazines of ACS and mostly subjects of nature products, agricultural and food chemistry.
- 5308 downloads from collection 66 e-magazines of IOP and mostly subjects of nano technology and application physics, nano science etc.,
- Morever, downloads from other e-magazines such as Directory of Open Access Journals – DOAJ, Scirus, MetaPress, BioOne, Open J-Gate,

ArXiv.org, Astrophysic Data System (ADS), E-Print ArXiv via SCIRUS, PubMed, Proceedings of the National Academy of Sciences (PNAS), CiteSeerX, BioMed Central,…

To enhance using effectiveness of digital library, the Conference of Science Direct database's introduction for scientists was held in Ho Chi Minh city and Hanoi; the general report on scientific research and tech implementation was checked and taken over in period 2006-2009, reports of VAST staff was posted on domestic journals and digital libraries.

Internal network and the electronic information board ran well. Website - http://www.vast.ac.vn/ is consolidated with 221 writings posted in 2011 (an increase of 9% in comparison with 2010), access rate of 1,119,349 turns (increased 53% in comparison with previous years). After 2 years of official operations, the web of VAST became one of the most effective tools in popularizing activities of VAST to domestic readers as well as foreign partners. This gets good responses and evaluations from Staff in VAST and other offices, orgnizations in relation with VAST.

8. ODA-funded satellite projects

8.1. Vietnam natural resources, environment and disaster monitoring satellite project (VNREDSat-1).

General information:

Total investment budget: 55.2 million Euro from French ODA and 64,820 million VND counter-capital; implementation period 2010 – 2015.

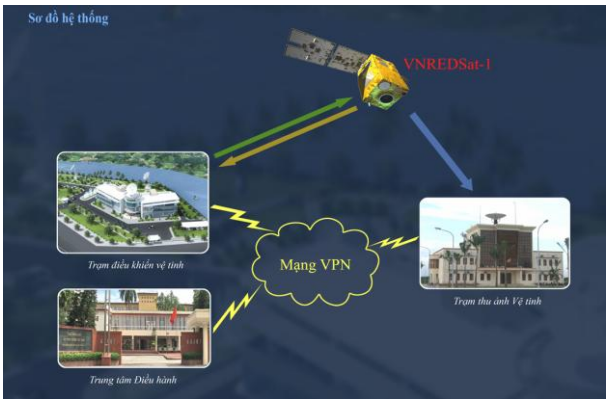
ODA-funded items: design, manufacture and launch a satellite; satellite insurance until IOT (completion of in-orbit test); training and technology transfer; project implementation consultancy.

Counter-capital funded items: Establishment of ground facilities including: Satellite control tranceiving station located in Hoa Lac; Mission and Data back-up Center in Nghia Do; Upgrade of Image receiving station in National Remote Sensing Centre (Ministry of Natural resources and Environment) in Minh Khai, Tu Liem; Communication links for the ground segment.

Implementation status:

The project officially started in 01/01/2011. The package 01 valued at 55.2 million Euro consists of design, manufacture and launch of a satellite; training

(long-term training for 15 Vietnamese engineers and more than 100 men a month short-term training) to acquire technology, satellite operation and exploitation; launch insurance until IOT implemented by EADS Astrium (France). The package 05: project implementation consultancy valued at 600,000 Euro implemented by VEGA (France). The preliminary design review was completed in April 4/2011 and critical design review had taken place from 04 – 14/1/2012. The satellite is foreseen to be completed in the end of 2012, and expected to be launched in 2013 - 2014. 15 members of Staff have been selected and dispatched to France for training.



Vietnam small satellite system diagram - VNREDSat-1

Contract signing ceremory VNREDSat-1

VAST working and long term training team in Toulouse, France

The satellite control tranceiving station was started in 10/6/2011 in Hoa Lac Hi-tech Park, and it is anticipated to be delivered in 6/2012; the Satellite Mission and data back-up center is expected to be completed in 04/2012 located on 7th floor of 2H building, Nghia Do Hi-tech Zone.

Regarding the communication links for the ground segment, the solution and design has been fixed. 30 million euro and more than 25 billion VND have been released. Generally, the project is on track.

8.2. The 2nd project for natural resources, environment and disaster monitoring satellite (VNREDSat-1B):

In 30/6/2011, based on the VAST-submitted project outline, which had been augmented against comments and recommendations from relevant ministries and agencies, the Prime Minister decided to assign VAST to complete the project documentation, to negotiate with SPACEBEL, a Belgium company, to organize ratification and implementation of the VNREDSat-1B project financed by Belgium ODA with a total value of 63 million Euro and 60 billion VND counter-capital.

In order to implement the assigned task, VAST and the Belgium partner has been keeping active exchange and coordination to prepare the feasibility study report. Three working sessions have been carried out in 28-29/08/2011, 21-30/11/2011 in Vietnam and 17-19/9/2011 in Belgium, focusing on technical solutions which will be appropriate for the project scale and applicability in Vietnam, to materialize objectives specified in the Project Outline.

VAST working visit to Belgium facilities for satellite manufacture, control and image receiving in order to select technical specifications for VNREDSat-1B satellite

Main objectives of the Project:

- Manufacture and launch of a hyper-spectral earth-observation satellite for natural resources, environment and disaster monitoring.

- Coordinate with VNREDSat-1 satellite to build up a remote sensing image data base for both VNREDSat-1 and VNREDSat-1B in order to assist national economic sectors and national defense and security, and to set up and operate a Vietnam's constellation of earth-observation satellites as well;

- Acquire earth-observation small satellite technology.

The VNREDSat-1B project is correctly implemented as in the "Strategy for research and application of space technology until 2020" approved by Vietnamese Government. It will pave the way for earth observation satellite system in Vietnam.

Main items funded by ODA: Design, manufacture and launch of VNREDSat-1B satellite; provision of equipments, installation and testing operation of X-band receiving station, VNREDSat-1B image store and processing; provision of equipment, installation and testing operation of S-band control station; procurement of launch service; satellite launch and in-orbit operation insurance; provision and installation of equipment for satellite technology laboratory; small satellite training and technology transfer.

Main items financed by counter-capital: Establishment of ground facilities: Receiving and processing station; Satellite control station; communication links for the ground stations.

Project implementation plan:

The VNREDSat-1B project is foreseen to start at the end of 2012 by construction and provision to Vietnam's several facilities such as small satellite laboratory, ground stations, human-resource training.

In 2013: Design and manufacture of a satellite are expected to be launched into orbit in 2017, when the VNREDSat-1 satellite has already passed ~3.5 years of operation or 75% of its designed life time. Therefore, VNREDSat-1B will assure that there will be no interruption in active reception of remote sensing data for Vietnam.

8.3. Vietnam Space Centre project

In the frame of the project, earth-observation satellites will be applied for natural disasters and climate change protection (namely Vietnam Space Project) with a total capital of 54,400 billion JPY consisting of 46,595 billion JPY from Japanese ODA and 1,774 billion VND of counter-capital; implementation period 2012–2020. In Tokyo, the ODA preferential loan agreement for the project between Vietnamese and Japanese governments was signed in 02/11/2011.

Principal components of the projects: technical infrastructure establishment (facilities and equipment) accommodated in 9 ha area in Hoa Lac Hi-tech Park. Technology transfer: Satellite data application; satellite manufacture, integration, test and control technology; taking-over and manufacture of 02 radar earth-

observation small satellites with 1m resolution; training and human-resource development.

Expectations: the 1st satellite will be launched in 2017; technical infrastructure will be completed in Hoa Lac Hi-tech Park by 2018; in 2020 the 2nd satellite will be launched.

For project implementation, management and take-over, the Vietnam National Satellite Center (VNSC) was established by the Decision 1611/QĐ-TTg dated 16/09/2011 approved by the Prime Minister. VNSC is a scientific entity with its-own bank account and stamp, situated in Hoa Lac Hi-tech Park. Its functions, missions and organization are decided by the VAST President.

9. Infrastructure and Facilities

9.1. Infrastructure and facilities of VAST

Until the end of 2011, total properties of VAST (value of land not included) are approximately 831,084 million VND, of which:

- Housing: ~349,652 million VND
- Transport vehicles: ~34,174 million VND
- Other assets: ~477,258 million VND

About object:

+ *Total land area:* 2,096,000 m^2

Of which: - Land area for headquarters: 149,000 m^2

- Land area for experiements, research work: 1,947,000 m^2

+ Total building surface area ~150,000m^2

Of which: - Building surface for Research : ~125,000 m^2

- Building surface for technology development: ~15,000 m^2
- Building surface for bases, stations: ~ 10,000 m^2

+ *4 national key laboratories:*

- Gen. Technology (Investment amount 57 billion VND)
- Multimedia and networking technology (48 billion VND)
- Electronic materials and devices (56 billion VND)
- Plant cell technology in the south (53 billion VND)

+ 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.

+ Cars: 74 pieces

The Academy's facilities and bases (land, infrastructure, office of specialised institutes, equipment etc.,) are invested with main purpose serving scientific research. Investment for Target of research and technology development is not commensurate. Since the end of 1990s and early of 2000's, The Academy made strong moves to equipment investment for research (average 20-30 billion VND per year) but just for deep investment and initial equipment. Investment for research and technology development is still limited.

9.2. Investment in Infrastructure and Facilities in 2011

Result of carrying out investment plan for capital construction

In 2011, The Academy was assigned investment plans for basic construction worth 93 billion VND, in which working capital is 90 billion VND, captial for investment preparation is 3 billion VND. Immediately at the beginning of the year, The Academy carried out allocation 100% expense for projects (under decision No 123/QD-KHCVN of VAST's president dated 17/01/2011). However, pursuant to resolution No 11/NQ-CP of the Government dated 24/2/2011 on curbing inflation, macro economic stability and direction no. 1792/CT-TTg of the Prime Minister on managing investment funds from the state budget, VAST review all invested projects on basic construction, re-allocated expenses and stop 3 projects. This expense was transfered to projects completing in 2011 and for upcoming handovers.

Athough the 2011 plan is implemented under global crisis, public investment reduction by Government's resolution No. 11, the Academy re-adjusted plan 3 times to follow requirements of resolution no. 11 and ensure 100% general plan of the year. Under direct and close instruction of the Academy's leaders with high responsibility, effort of leaders and PMU, investment plan on basic construction has gained encouraging results: Reimbursement gain 100%, all projects are completed upon adjustment.

Carrying out plans of small repairs and construction

In 2011, 25 items on repairing and maintainance was implemented with a total expense of 20,000 million VND; 22/25 items are accomplished, of which 19 items were handed over, 3/25 are under progress with a period of 2 years 2011-2012. Here are some examples of remarkable results:

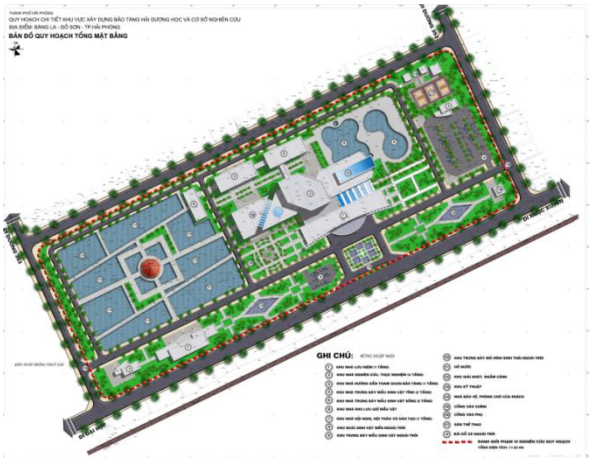
Commencing ceremony of satteline-controlling station VNREDSat-1 (6/2011)

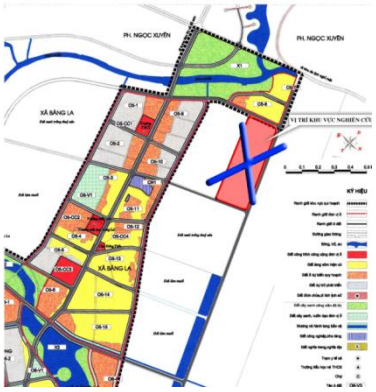
Improved building, A25, IoP

Improved building, A26, IAPSI

Storey working building of VAST at 321 Huynh Thuc Khang, Hue city (01/10/2011)

Building of Tay Nguyen Institute of Biology (to handover at 6/2012)





Comprehensive planning of 12 hectare land at Do Son, Hai Phong

Complete receiving 2 storey working building (400 m^2) with sufficient condition, infrastructure to be Head Office (HO) for institute of environment and resources and sustainable development in Hue (since 01/10/2011).

Complete improving and delivering building A25 (nuclear physics centre, Institute of Physics) with total expenditure of more than 3,000 million VND, 250 m^2 increasing for working area; Accomplish improving A26 to be main office of institute of applied physics and scientific equipment, 350 m^2 increase for working area with total expense above 4,000 millions.

Complete improving 5 storey building of Nha Trang applied research institute and working place in Thu Duc, tropical biology institute, create more spacious working place and convenience in re-arrangement. General evaluation: Fullfil 100% plan and high efficency in using capital. This is indispensible and highly effective capital that needs to be developed.

10. Some important statistics

10.1. Statistics on Human Resources

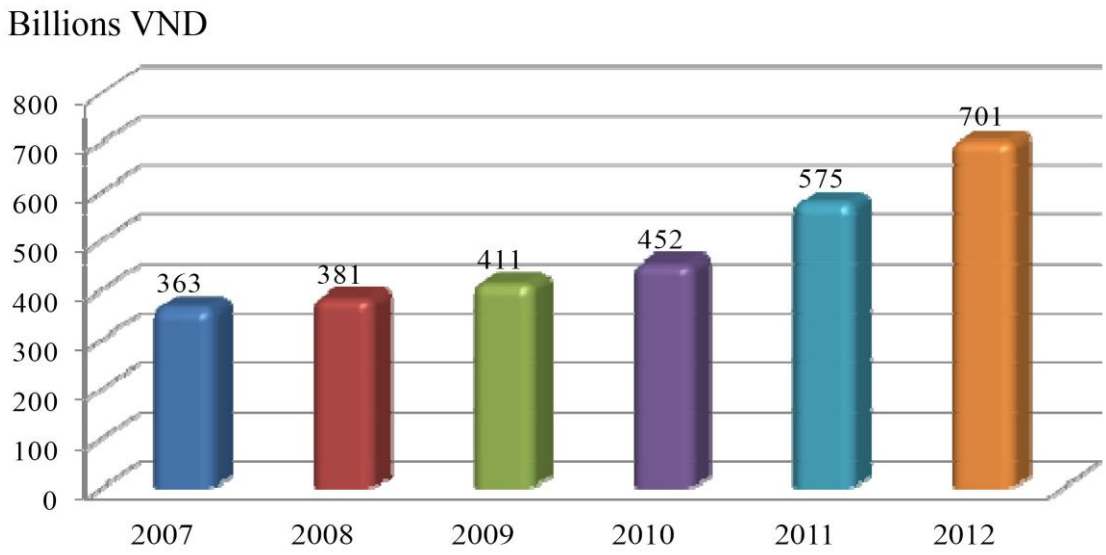
Qualification of Staff (As of 31/12/2011)

No	Institutions	Perm anent staff	Contract signed staff	Title		Degree				
				Prof	Ass. Prof	Dr Sci	PhD	MSc	BA	Others
1	Functional departments	**43**	18	0	6	0	10	11	22	0
2	Administration office	**49**	23	0	0	0	0	5	23	21
3	People Party Office	**8**	5	0	1	0	1	0	7	0
4	Representative office in HCM city	**10**	5	0	0	0	0	1	5	4
5	Institute of Mathematics	**65**	10	16	12	17	32	7	9	0

No	Institutions	Permanent staff	Contract signed staff	Title		Degree				
				Prof	Ass. Prof	Dr Sci	PhD	MSc	BA	Others
6	Institute of Physics	**95**	27	7	12	3	44	22	23	3
7	Institute of Chemistry	**120**	55	3	17	1	54	28	29	8
8	Institute of Chemistry of Natural Product	**43**	24	0	4	1	12	13	14	3
9	Institute of Mechanics	**94**	28	3	8	5	20	33	33	3
10	Institute of Ecology and Bio. resources	**114**	43	0	9	1	36	38	36	3
11	Institute of Geography	**83**	40	0	6	1	26	21	31	4
12	Institute of Geological Science	**101**	33	0	7	2	35	29	31	4
13	Institute of Geophysics	**72**	18	1	5	1	15	22	21	13
14	Institute of Oceanography	**87**	26	0	2	0	14	32	31	10
15	Institute of Marine Environment and Resources	**42**	13	0	2	0	10	19	11	2
16	Institute of Marine Geology and Geophysics	**49**	20	0	0	0	13	17	17	2
17	Institute of Energy Science	**37**	14	0	0	0	2	10	22	3
18	Institute of Materials Science	**211**	66	3	14	3	52	62	80	14
19	Institute of Information Technology	**143**	29	2	14	2	31	40	68	2
20	Institute of Biotechnology	**172**	113	2	19	0	80	55	23	14
21	Institute of Environment Technology	**52**	21	1	3	0	18	20	13	1
22	Institute of Chmical Technology	**40**	12	1	1	1	14	15	8	2
23	Institute of Space Technology	**39**	12	0	1	0	5	17	14	3
24	Institute of Applied Inforamatics and Mechanics	**66**	13	0	4	0	7	17	38	4
25	Institute of Tropical Biology	**73**	24	0	3	0	15	30	25	3
26	Institute of Tropical Technology	**72**	25	0	6	0	18	21	26	7
27	Institute of Applied Materials Science	**39**	14	0	4	1	11	9	14	4
28	NhaTrang Institute of Technology Research and Application	**45**	15	0	1	0	9	14	19	3
29	Institute of Marine Biochemistry	**37**	17	1	2	0	12	9	15	1
30	National Satellite Center	**2**	0	0	1	0	2	0	0	0
31	Center for Scientific information	**27**	17	0	0	0	1	5	18	3
32	Vietnam National Museum of Nature	**25**	7	0	4	0	8	7	10	0
33	Publishing house for Science and Technology	**25**	20	0	0	0	0	10	15	0
34	Institute of Applied Physics and Scientific	**17**	5	0	0	0	1	5	8	3

No	Institutions	Permanent staff	Contract signed staff	Title		Degree				
				Prof	Ass. Prof	Dr Sci	PhD	MSc	BA	Others
	Instruments									
35	TayNguyen Institute of Biology	**28**	12	0	1	0	6	14	7	1
36	Institute of Resources Geography HCM city	**26**	11	0	1	0	5	11	9	1
37	Institute of Physics HCM City	**35**	11	0	2	0	6	9	19	1
38	Institute of Telecommunication Technology	**1**	0	0	0	0	1	0	0	0
39	Hue Institute of environment recourses and sustainable development	**10**	3	0	0	0	2	1	7	0
40	Tay Bac Institute for Scientific Research	**7**	2	0	0	0	1	0	5	1
41	Centre for Training, Consultancy and Technology Transfer	**9**	3	0	0	0	0	3	6	0
42	Center of informatics	**9**	2	0	1	1	2	0	6	0
43	Center for food technology and Technique Development	**1**	0	0	0	0	0	0	1	0
44	Center for Assistance of Technological development and services	**8**	4	0	0	0	2	1	5	0
	Total:	**2331**	**860**	**40**	**173**	**40**	**633**	**683**	**824**	**151**

10.2. Statistics on finance, scientific publications and education



Annual budget of VAST for the period 2007-2012

Statistics on projects and budget of VAST in 2011

No	Type of project	Number of project	Budget (Millions VND)
1	Missions of the government	4	1,702
2	National priority programmes	15	12,969
3	National projects (Tay Nguyen III Programe)	19	35,000
4	Application-oriented fundamental research projects	14	12,944
5	National protocol projects	28	22,510
6	National level test production projects	2	1,940
7	VAST appointed projects	20	5,780
8	VAST priority research projects	98	17,870
9	Key program of science and technogly	21	14,994
10	Space science and technology program	18	2,450
11	VAST-ministry and VAST-locality cooperative projects	14	4,055
12	VAST international cooperation research projects	46	4,750
13	Missions of President	4	700
14	VAST level test production projects	3	1,200
15	Fundamental investigation projects*(including project 19, CT 47)*	14	12,227
16	VAST- MOST co-operative research projects *(including upgrade 03 international standard journals*)	13	6,815
17	Clean water, environment for rural areas program	4	1,000
18	Environment protection programme	14	5,780
19	Eastern Vietnam Sea – Vietnamese Island programme	2	2,800
20	Reciprocal of ODA projects	3	24,347
	Total	**356**	**191,833**
21	ODA projects (including VNREDSAT 1 project: 574 **000 million VND**)	6	583,596
21	NGO projects	12	5.000

Statistics on publications and intellectual properties of VAST for the period 2006-2011

TT	Content	2006	2007	2008	2009	2010	2011(*)
A	*Total SCI and SCI-E papers (1+2)*	159	144	191	271	336	334
1	SCI papers	96	92	166	202	247	209

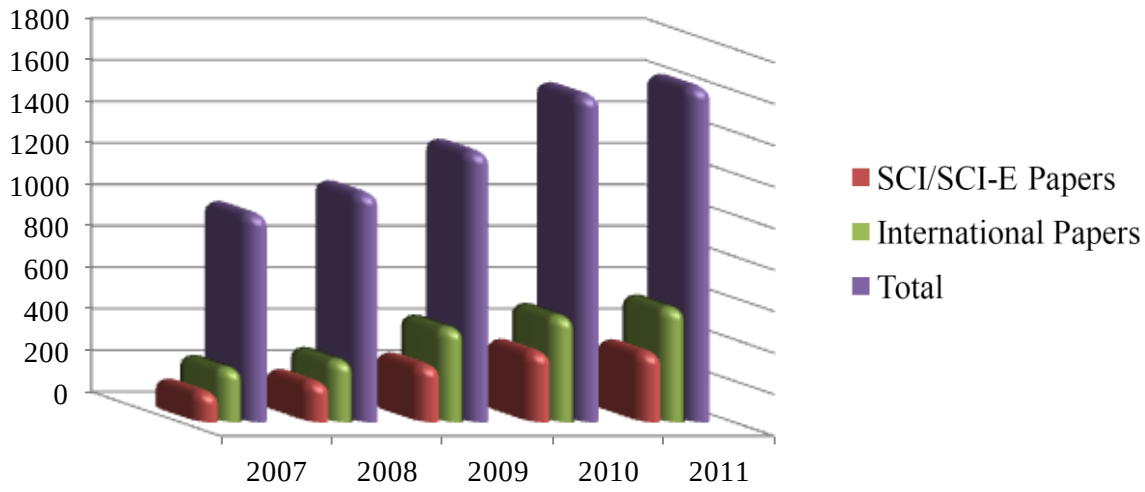
2	SCI-Expanded papers	63	52	25	69	89	125
3	ISSN/ISBN papers	133	115	106	182	173	216
B	*Total international level papers (1+2+3)*	292	259	297	453	509	550
4	National Journal papers	548	701	750	823	1066	1062
C	*Total published papers (1+2+3+4)*	840	960	1047	1276	1575	1612
5	Patents	9	7	2	2	9	7
6	Utility Solutions	2	4	1	1	1	4

(*) up to 30/11/2011

Statistics on papers, books, patents and solution of VAST's institutes in 2011

No	**Institute**	**International papers**				**National papers**	**Specialized books**	**Patents**	**Utility Solution**
		Total	**SCI**	**SCI-E**	**ISSN/ ISBN**				
1	Institute of Physics	70	38	2	30	32		1	
2	Institute of Mathematics	56	30	12	14	17			
3	Institute of Materials Science	51	27	13	11	96	5		
4	Institute of Marine Biochemistry	41	24	16	1	25		2	1
5	Institute of Chemistry	40	17	9	14	74	3	1	
6	Institute of Ecology and Bio. Resources	65	14	30	21	160	4		
7	Institute of Biotechnology	34	10	10	14	115	4		2
8	Institute of Mechanics	17	10	3	4	41			
9	Institute of Chemistry of Natural Product	17	7	7	3	21	2	2	1
10	Institute of Geological Science	13	7	2	4	45	2		
11	Institute of Geophysics	8	6	1	1	17			
12	NhaTrang Institute of Technology Research and Application	7	6		1	45	1		
13	Institute of Marine Environment and Resources	13	4	2	7	106	2		
14	Institute of Tropical Technology	10	4	1	5	22	1		
15	Institute of Environment Technology	13	3	4	6	36	2		
16	Institute of Applied Materials	5	3		2	8			

	Science								
17	Vietnam National Museum of Nature	11	2	6	3	2			
18	Institute of Information Technology	23	2	4	17	5			
19	Institute of Oceanography	18	2	2	14	82	3		
20	Institute of Chemical Technology	5	2	1	2	16			
21	Institute of Physics HCM City	2	2			1			
22	Institute of Resources Geography HCM city	4	1	1	2	9			
23	Institute of Tropical Biology	16		10	6	44			
24	Institute of Energy Science	24			24	4		1	
25	Institute of Applied Inforamatics and Mechanics	8			8	2	2		
26	Institute of Space Technology	1			1	17			
27	Institute of Marine Geology and Geophysics	1			1	15			
28	Institute of Geography	1			1	21	2		
29	Institute of Applied Physics and Scientific Instruments	1			1	1	1		
30	Tay Nguyen Institute of Biology					5			
31	Hue Institute of environment recourses and sustainable development								
32	Tay Bac Institute for Scientific Research								
	Total:	**550**	**209**	**125**	**216**	**1046**	**34**	**7**	**4**



Distribution of the published papers by VAST scientists in the period 2007-2011

Statistics on PhD and MSc education in 2011

No	Institution	Quantity		Budget (millions VND)			
		PhD	MSc	PhD	MSc	Syllabus assistance	Total
				a	***b***	***c***	***a+b+c***
1	Institute of Mathematics	15	65	105.0	325.0	40.0	470.0
2	Institute of Information Technology	61		427.0		30.0	457.0
3	Institute of Mechanics	6	21	42.0	105.0	45.0	192.0
4	Institute of Materials Science	25	9	175.0	45.0	77.0	297.0
5	Institute of Physics	30	39	210.0	195.0	80.0	485.0
6	Institute of Chemistry	48	19	336.0	95.0	60.0	491.0
7	Institute of Chemistry of Natural Product	12		84.0		45.0	129.0
8	Institute of Biotechnology	28		196.0		45.0	241.0
9	Institute of Ecology and Bio. Resources	25	74	175.0	370.0		545.0
10	Institute of Geography	27		189.0		50.0	239.0
11	Institute of Geological Science	6		42.0		30.0	72.0
12	Institute of Geophysics	3		21.0		10.0	31.0
13	Institute of Applied Inforamatics and Mechanics	1	8	7.0	40.0	25.0	72.0
14	Institute of Chemical Technology	6		42.0		20.0	62.0
15	Institute of Tropical Biology	1		7.0		15.0	22.0
16	Institute of Oceanography	5		35.0		45.0	80.0
17	Institute of Tropical Technology	12		84.0		45.0	129.0
18	Institute of Environment Technology	6		42.0			42.0
Total		**317**	**235**	**2,219**	**1,175**	**662**	**4,056**

11. Master Plan for developing VAST

After more than 1 year implementing, the "Master plan to Develop VAST to 2020, with a vision to 2030" was approved by the Prime Minister according to decision no. 2133/QD-TTG dated 01/12/2011. This is an important decision for the

development of VAST in the next period. This plan includes: view point, target and orientation of development, also givings solutions. Full documents of this plan is shown in VAST's web (http://www.vast.ac.vn/ index.php?option) or web portal of the government (http://vanban.chinhphu.vn/portal/page/portal/chinhphu). Below is some main information:

Development point of view:

Expanding VAST with a strong breakthrough to be a research centre, and place of staff training as well as powerful technology and motive force in scientific-technological development of the country. More importantly, this plan emphasizes strongly innovate effective evaluation, financial mechanism and investment method towards scientific-technological activity.

Development target:

Building VAST to be a top scientific-technological centre of multi sector research with highly skilled Staff, modern facilities of advanced level, close relationships with many countries of advanced technology to meet development requirements and socio-economic sustainability of the country. Detailed target of 2020 is:

- Building VAST to be a top scientific-technological centre with state of the art potential as in Southeast Asia.
- Step by step, enhancing advisory role of VAST to the government in making strategy and policy of socio-economic development, national defense, environmental protection, response to climate change, natural disaster and other related fields.
- Strengthening technical material facilities of VAST and enhancing level of staff. Intensifying human resource training for the country. Focusing on specialized institutes, upgrade national key laboratory to advanced level in Southeast Asia.
- Setting up about 10 key units of science and technology, strong research group with international prestige, capacity of undertaking important mission of country staff training.
- Organizing VAST with a structure of 35 specialized research institutions and direct administrative cells, 01 Graduate University of Science and Technology, 15 scientific and technological enterprises (spin-off enterprise). Having 3500 permanent staff and 1,700 non-permanent staff of

which 50% being PhD's & M.A's. Striving for high rate of above average assistants to create reasonable mechanisms.

- Issuing around 5 scientific and technological journals that will be recognized internationally.
- The number work of international publicity and patents will increase 3 times in comparison with 2001-2010 period.
- Up to 2020, 100% basic research works in natural science will be published on prestigiously scientific magazines both domestic and overseas; 50% research units under direction of VAST have sufficient criteria for integration with the region and worldwide.
- Implementing effectively the national programme project approved by the Prime Minister.

Development orientation:

Speed up research and technology development; Develop scientific and technological potential; Enhance international cooperation. Detail is as below:

a) Basic research

Focusing on basic research in the field of basic natural science and potential sector in service of heightening the VAST position.

Investing properly in basic research upon developments requirements of the country. Developing science and technology serving national defense and the community.

Assessing results of basic research through the number of international issues on prestigious journals

Connecting closely among basic research, post-university training and training scientific –technological Human Resource

Prioritizing for building key scientific-technological cells, strong research groups in basic research of natural science and advanced technology in Southeast Asia.

b) Application research and technology development

Focusing on key science and technology to meet requirements of necessity. Scientific and key elements to the socio-economic development of the country.

Self-studying for source technology; receiving tech transfer and following advanced ones.

Focusing on 7 key sectors meaningful to the course of industrialization and modernization:

- Informatics technology, electronics, automation and space technology;
- Biotechnology;
- Materials Science;
- Biology Diversification and Biologically active substances;
- Earth Science;
- Marine Science and Technology;
- Environment and Energy.

Assessing applied research and tech develop through international announcement on prestigious journals and patents, useful solutions.

c) Technological application and development

Effectively applying key technologies such as information technology, biotechnology, modern material technology, space technology and automation technology for production and daily living.

Promote the research of scientific and technological solution applications and transfer in order to effectively make use of natural resources, protect the environment and minimize natural disaster effects; apply modern technology in the resource investigation and environmental pollution control and treatment; speed up the operation of consultancy & appraisal, natural museums, publication information, scientific and technological dissemination in service of the national socio-economic development.

Further commercialization of scientific and technological products so as to develop the scientific and technological market; to encourage the technology incubators and spin-off company developments. Build and perfect the organization of and improve the effectiveness of technological experiment zones.

Cooperate with the relevant Ministries and local departments in applying the scientific and technological achievements to the production and people's life with a view to helping the settlement of some important affairs of socio-economic development and national security and defense.

d) Human resources development

Further the training in order to improve the quality of scientific and technological human resources, particularly VAST's high-level ones; to intensify

the international cooperation in training; to implement the training in accordance with the international standards; to associate the training with the scientific research and technological development; to closely cooperate with the universities in basic research in mathematics, theoretical physics and other natural sciences.

Set up the plans for the scientific and technological human resources supplement and scientific personnel retraining in order to meet the VAST's demands in the new situation.

Build up the breakthrough mechanism and policy with a view to attracting good scientists and leading experts to work for the Academy.

Build up and develop the support programme for young scientists; to send them on overseas training courses through the Academy's international cooperation programs or the state scientific and technical training in the foreign bases.

Give priority to the establishment of good research groups with the participation of leading experts.

Intensify the training in order to improve the capacity and professional knowledge of those working on management, administration and services, etc. to meet the Academy's demands in individual development stages.

đ) Organizational consolidation and development

Strengthen the organization of VAST and the sub-units in line with the integration trend and the international custom, contributing to the performance of scientific research and technological development.

Only establish the new scientific and technological organizations in the fields which are significant for the Academy's development strategy.

e) Material and technical basics development

Build up and improve the material and technical basics for the units directly under the Academy, meeting the regional standards on the area, working conditions and scientific equipment.

Have proper planning and furnish the equipment for the network of stations, experiment zones, technological development zones in order to well serve the sub-units 'scientific and technological activities.

Upgrade and modernize the information technology infrastructure and scientific technological information infrastructure including internet networks,

libraries, digital libraries, scientific and technological magazine publications, etc. achieving the advanced level in the South-East Asian region.

Perform the pilot mechanism of halls of residence for rent for the newcomers of the Academy.

g) International cooperation

Promote the international cooperation with the traditional partners; to multi-lateralize and diversify the kinds of cooperation; to strengthen the international and regional integration in order to improve the Academy's prestige and position in the international and regional scientific community.

Make full use of the international cooperation opportunities in order to have access to modern science and technology in the world.

The international cooperation should be focused on the following trends:

- Scientific and technological exchange
- Technological transfer
- Human resources training
- Scientific and technological development policy consultation and exchange

Give advantages in the mechanisms and policies with a view to appealing to the intellectual contribution from the Vietnamese scientists living in foreign countries to the Academy's scientific and technological achievements.

Innovate the international cooperation mechanism towards the encouragement of organizational and individual self-control; to have the mechanisms and policies, especially those regarding the organizational and individual rights and interests in the international cooperation in science and technology in accordance with the laws; to continue the completion of regulations on the international cooperation in science and technology to fit the practical situation; to instruct the units directly under the Academy to implement the international cooperation.

The solutions

The solutions have been actually mentioned in the targets and the development orientations such as improving the scientific technological potential, conducting the inter-sectorial and multi-sectorial researches, training the human resources, investing in material basics and promoting international cooperation.

The Planning also puts forward some particular measures for individual sectors. For basic researches, it should be required to properly invest the capital and

associate researches with training. For application researches, it should be needed to link the professional institutes so that they can co-ordinate together to deal with practical matters, study and develop power technology by themselves. The key issues of seven main research orientations as defined above are also clearly stated in the Planning.

One of the breakthrough steps in the scientific-technological human resources training is to submit the project to establish the Institute of Science and Technology directly under Vietnam Academy of Science and Technology to the Prime Minister for approval.

The Decision made by the Prime Minister to approve "the Master Plan to develop VAST to 2020, with a vision to 2030" can be considered a landmark in the Academy's development process. The successful performance of the *Master Planning* will make the Academy a scientific organization on a par with other Asian leaders. Which will consequently help to speed up the socio-economic development, therefore protecting the national security and defense, meeting the requirements of the industrialization and modernization and the international integration.

12. Orientations and plans for the year 2012

By the year of 2012, VAST will implement the scientific and technological plan under "the Master Plan to develop VAST to 2020, with a vision to 2030" approved by the Prime Minister, of which some particular targets and performance results demand for funding have been anticipated. With the fund given to the Academy at the beginning of this year, we will focus on the crucial tasks as follows:

- ✓ Deploy tasks approved by the Prime Minister:
    - *Projects of space technology strategy: VNREDSat-1, VNREDSat-1B satellite projects*; *Vietnam space center project; Space science and technology programme.*
    - *The construction of Vietnam National Museum of Nature.*
    - *Project "Strengthening the network of seismic stations serving the Earthquake observation and tsunami warning".*
- ✓ Deploy State Science and Technology Tasks:
    - *Projects of programme Tay Nguyen 3.*
    - *State projects.*

- ✓ Implement VAST projects
    - *Independent projects, tasks assigned by VAST President.*
    - *VAST 7 key sectors projects.*
- ✓ Deploy national-authorized VAST projects: *East Sea – Islands programme; National environment programme; Environmental cause; Basic investigation projects.*
- ✓ Deploy VAST's young scientists programme.
- ✓ 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.
- ✓ 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.