



NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY, PHILIPPINES
DEPARTMENT OF SCIENCE AND TECHNOLOGY

34th ANNUAL SCIENTIFIC MEETING

PHILIPPINE
Water
2050

Manila, Philippines 11-12 July 2012

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Republic of the Philippines
OFFICE OF THE PRESIDENT
Malacañan

My warmest greetings to the National Academy of Science and Technology as you hold your 34th Annual Scientific Meeting.

The achievements of the scientists recognized in this meeting enhanced our thirst for knowledge and inspire us to realize our aspirations as a nation. Water 2050, the theme for this meeting, is a goal we can achieve through our creativity, industry, and excellence. As you resolve to alleviate pollution and advance the practice of water management, this gathering will be vital to protecting our ecosystems and will enable our country to move forward on the path of sustainable development.

The modernization of our water facilities will empower our farmers to produce better crops, minimize flood damage, and contribute overall to our shared task to establish and sustain inclusive growth. As your government restores integrity and transparency in our institutions, we count on your dynamism in your continued endeavor to preserve our environment and help secure our people's welfare. May this gathering motivate you further to realize our potential and truly change the ways we harness the gift of water.




BENIGNO S. AQUINO III



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS



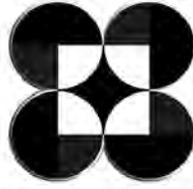
I would like to express my wholehearted support and gratitude to the members of the National Academy of Science and Technology, Philippines (NAST PHL) for choosing Philippine Water 2050 as the central focus of this year's 34th Annual Scientific Meeting.

Last year, President Benigno S. Aquino III, recognizing the importance of improving the water sector to the society, tasked me to lead a team that would prepare a master plan for the improvement of the country's water sector and optimize the country's water resources.

I envisioned the 34th ASM to provide, not only the analysis of the current problem but to recommend sustainable long term solutions. We hope that the results of the different discussions will contribute greatly to addressing the issue on water governance, water treatment and quality, prevention of waterborne diseases, irrigation for the agricultural industry, ecology and biodiversity of major bodies of water in the country and climate change. Working together, let us conserve the water resources of the country.

Again, congratulations to the officers and members of the NAST PHL on the occasion of your ASM.

ROGELIO L. SINGSON
Secretary



Republic of the Philippines
DEPARTMENT OF SCIENCE AND TECHNOLOGY



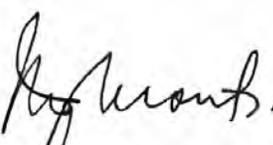
On behalf of the Department of Science and Technology, I congratulate the National Academy of Science and Technology, Philippines (NAST PHL) for organizing this year's 34th Annual Scientific Meeting (ASM).

As in the past, the ASM highlights the Academy's consistent effort to provide a thorough analysis of the current situation involving an important issue that can be addressed through science and technology. This year, I commend you for choosing Philippine Water 2050 as the theme to examine and prepare policy recommendations and programs on how to deal with the very important water issues as indicator of social stability.

The determination of the current quality of our water would help the country counter global challenges such as climate change and its effects, as well as food security. As such, it is very timely that a meaningful collaboration like this be set out in pursuit of making a direct and science based approach to the issues at hand.

As the academy holds this venue for scientists to convene, create and collaborate towards the successful implementation of would be results, DOST supports NAST as it continues to be an agent of social change. I look forward to NAST events that help chart programs for ensuring good quality of water among others. I also hope that experts and practitioners coming from various disciplines of science will continue supporting the Academy and the existing and future programs and projects of DOST that will further expand boundaries of the scientific community.

Mabuhay po tayong lahat!



MARIO G. MONTEJO
Secretary



Republic of the Philippines
NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY, PHILIPPINES

On behalf of the Officers and Members of the National Academy of Science and Technology, Philippines (NAST PHL), I am pleased to welcome you all to the NAST PHL 34th Annual Scientific Meeting (ASM), with the theme Philippine Water 2050.

Held annually, the ASM is a gathering of scientists from all over the country to discuss relevant issues related to science and technology. This year, the Academy decided to take upon the issue of water as its main theme.

Expanding human activities have extensively altered the planet's freshwaters sources and supply causing modifications impacting the physical, chemical, and biological features of aquatic systems. Data show that per capita availability of water, which is already dire in many places, will progressively decline relative to the increasing population, industrial growth, further economic expansion, and continuing degradation of water sources.



Concerns over water go beyond the need for access to clean, safe water for domestic consumption. Equally important are water-related needs relevant to health and sanitation including sewerage and septage management, food security and livelihoods, irrigation and drainage for agriculture and fisheries, protection and management of watersheds and coastal seas for conservation of biodiversity and ecological sustainability, for disaster mitigation i.e. drainage and flood control, and energy security i.e. hydro-power generation.

The outcomes of the Academy's successive round table discussions in preparation for this year's Annual Scientific Meeting will be presented during the various plenary sessions. It is with hope that the resolutions of this year's ASM would be considered by the current administration's national and local leaderships and all concerned in the crafting of policy formulations and the appropriate programs that will address access to clean and safe water and other water-related needs for Filipinos.

The Academy will also recognize outstanding achievers in science and technology who have shown important accomplishments for the betterment of the country. Also, the investiture of new Academy members will be held during the recognition rites in the afternoon of July 12.

With gratitude, allow me to thank our sponsors, supporters, and organizers for their continued continuing assistance for the Annual Scientific Meetings of NAST. It is also with utmost appreciation to the DOST Secretary, the Hon. Mario Montejo for his unflinching commitment to aid support the Academy in the attainment of their its goals.

EMIL Q. JAVIER, Ph.D.
President



The National Academy of Science and Technology, Philippines is the symbol of the nation's commitment to science. The proposal for its creation originated from the University of the Philippines and was endorsed by the National Science Development Board (the predecessor-agency of the Department of Science and Technology) to the President of the Philippines. On 06 October 1976, the National Academy of Science was created by Presidential Decree 1003. A subsequent amendment established the National Academy of Science and Technology, Philippines and expanded the base of its membership. Thus, P.D. 1003-A, signed on 17 December 1976, is the enabling legislation for the present NAST.

The science community then submitted nominations of the most eminent among them to be members of the Academy. The President of the Philippines named ten scientists from a wide range of disciplines to be the first Academicians in 1978. Henceforth, nominations have continued to come from the scientific community but their election as Academicians is the prerogative of the members of the Academy following their strict rules of review and selection. Every Member is distinguished, known nationally and internationally, in his or her own right. Collectively, the Academy represents the best in Philippine science and technology.

The Annual Scientific Meeting started in 1978 and has since earned the distinction as the most prestigious scientific conference in the Philippines. The NAST Transactions, composed of papers presented in the ASM, is the annual journal of the Academy. NAST also publishes books and monographs based on studies of its members and other renowned scientists, and policy studies on key issues discussed in NAST roundtable discussions, fora, and the ASM.

Mandates

- To recognize outstanding achievements in science and technology as well as provide meaningful incentives to those engaged in scientific and technological researches
- To advise the President and the Cabinet on matters related to science and technology
- To engage in projects and programs designed to recognize outstanding achievements in science and promote scientific productivity
- To embark on programs traditionally and internationally expected of an academy of science

Advisory

In any nation, the science academy plays an important role as an adviser to the government and the science community on issues and concerns on science and technology at the national and local levels.

Suggestions on S&T issues and concerns for research and roundtable discussions are welcome and will be considered by the NAST Executive Council.



Recognition

The Academy recognizes outstanding achievements in science and technology of Filipino scientists and institutions in all fields of science. The prestigious NAST awards include the Third World Academy of Sciences (TWAS) Prize for Young Scientists in the Philippines, Outstanding Young Scientists (OYS), NAST Talent Search for Young Scientists, NAST-Hugh Greenwood Environmental Science Award, NAST-LELEDFI Award for Outstanding Research in Tropical Medicine, Outstanding Scientific Papers, Outstanding Books and Outstanding Monographs. The Academy provides incentives to those involved or would like to engage in scientific and technological endeavors.

Deadline for submission of nominations is on the last working day of November.

Scientific Linkages

Since 1978, the Academy has forged international and national scientific linkages with other science, engineering, and technology academies and similar organizations. These linkages aim to: (1) promote collaborative efforts among Filipino scientists, and between Filipino and foreign scientists; (2) promote and encourage scientific cooperation through its Scientist Exchange Visit Program under the memorandum of agreement between NAST and a foreign science academy; (3) endorse participation in international conference, meetings, fora, seminars, workshops, and similar scientific activities; and (4) publish and exchange scientific bodies of literature.

Through these scientific linkages, interested scientists may seek grants for scientific and technological undertakings, including fellowships, research grants, study visits, and grants for other collaborative projects from the academies associated with the National Academy of Science and Technology.



The National Scientists



CLARE R. BALTAZAR
Systematic Entomology



GELIA T. CASTILLO
Rural Sociology



ONOFRE D. CORPUZ
*Political Economy &
Government*



MERCEDES B. CONCEPCION
Demography



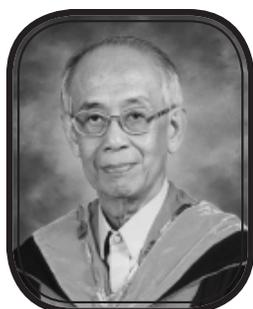
LOURDES J. CRUZ
Biochemistry



ERNESTO O. DOMINGO
*Internal Medicine /
Gastroenterology*



RAUL V. FABELLA
Economics



BIENVENIDO O. JULIANO
Cereal Chemistry



RICARDO M. LANTICAN
Plant Breeding



CLARA Y. LIM-SYLIANCO
*Biochemistry and Organic
Chemistry*



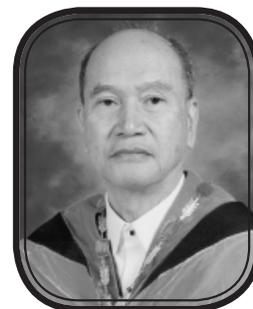
BIENVENIDO F. NEBRES, S.J.
Mathematics



DOLORES A. RAMIREZ
Biochemical Genetics



TEODULO M. TOPACIO JR.
Veterinary Medicine



BENITO S. VERGARA
Plant Physiology

The Academicians



RAMON F. ABARQUEZ JR.
Cardiology



ELIEZER A. ALBACEA
Computer Science



ANGEL C. ALCALA
*Vertebrate Systematics
and Ecology*



RHODORA V. AZANZA
Botany



ARSENIO M. BALISACAN
Economics



JOSE MARIA P. BALMACEDA
Mathematics



RAMON C. BARBA
Horticulture



ALLAN BENEDICT I. BERNARDO
Cognitive Psychology



CHRISTOPHER C. BERNIDO
Physics



SOLITA F. CAMARA-BESA
Biochemistry



FILOMENA F. CAMPOS
Plant Breeding/Cytogenetics



VERONICA F. CHAN
Microbiology



GISELA P. CONCEPCION
Marine Science



LIBERTADO C. CRUZ
*Reproductive
Biotechnology*



ALVIN B. CULABA
Mechanical Engineering



ANTONIO MIGUEL L. DANS
Clinical Epidemiology

The Academicians



ROMULO G. DAVIDE
Plant Pathology



FABIAN M. DAYRIT
Chemistry



ERNESTO J. DEL ROSARIO
Chemistry



SALCEDO L. EDUARDO
*Veterinary and Medical
Parasitology*



CEFERINO L. FOLLOSCO
*Mechanical, Electrical and
Agricultural Engineering*



EDGARDO D. GOMEZ
Marine Biology



RAFAEL D. GUERRERO III
Fisheries Management



EMIL Q. JAVIER
Plant Breeding



JOSE O. JULIANO
*Nuclear Chemistry and
Physics*



QUINTIN L. KINTANAR
Environmental Medicine



RODEL D. LASCO
Forestry



ANGEL L. LAZARO III
Civil Engineering



LEONARDO Q. LIONGSON
*Water Resources
Administration and Hydrology*



AURA C. MATIAS
Industrial Engineering



MARCO NEMESIO E. MONTAÑA
Biological Chemistry



JAIME C. MONTOYA
Infectious Diseases

The Academicians



APOLINARIO D. NAZAREA
Biophysics



CARMENCITA D. PADILLA
Human Genetics



WILLIAM G. PADOLINA
Phytochemistry



EUFEMIO T. RASCO JR.
Plant Breeding



ASUNCION K. RAYMUNDO
Microbial Genetics and Plant Pathology



AGNES C. ROLA
Agricultural Economics



CAESAR A. SALOMA
Physics



FERNANDO P. SIRINGAN
Geology



GUILLERMO Q. TABIOS III
Civil Engineering



**EVELYN MAE
TECSON-MENDOZA**
Biochemistry



WILLIAM T. TORRES
Computer Science



GAVINO C. TRONO
Marine Botany



THELMA E. TUPASI
Infectious Diseases



FILEMON A. URIARTE JR.
Chemical Engineering



REYNALDO B. VEA
*Marine Transportation System
and Naval Architecture*



RUBEN L. VILLAREAL
Horticulture

The Corresponding Members



JOSE B. CRUZ, JR.
Electrical Engineering



LIWAYWAY M. ENGLE
Genetics



MANUEL M. GARCIA
Microbiology



EDUARDO R. MENDOZA
Mathematics



AMADOR C. MURIEL
Physics



BALDOMERO M. OLIVERA
Biochemistry



EDUARDO A. PADLAN
Biophysics



KELVIN S. RODOLFO
Marine Geology



REYNALDO L. VILLAREAL
Plant Breeding and Plant Pathology

34th Annual Scientific Meeting

Theme: Philippine Water 2050

The Philippines is relatively blessed with fresh water because of its average rainfall of 2400 mm. In 2005, with a population of 84.5 million and a theoretical annual renewable water supply of 479 billion cubic meters (BCM), per capita availability of water was 5690 m³, which was five times the figure of 1000 m³ per capita per year which is used for benchmarking global water scarcity. However the realizable available water supply is much below those theoretical estimates because only about 1/3 of the country's river systems are classified as suitable sources of water supply and up to 58% of groundwater is contaminated with coliform and therefore requires further treatment (CEA for the Philippines, ADB 2004).

Even now 15.73 million Filipinos live in 212 waterless barangays in Metro Manila and in 432 waterless municipalities in the rest of the country without access to safe water supply (NEDA, 2011). Current projections indicate that water availability will be unsatisfactory in 8 out of 19 major river basins and in most major cities by 2025 (AWDO 2001, ADB).

In addition, concerns over water go beyond the need for access to clean, safe water for domestic consumption. Equally important are water-related needs relevant to (1) health and sanitation including sewerage and septage management, (2) food security and livelihoods, irrigation and drainage for agriculture and fisheries, (3) protection and management of watersheds and coastal seas for conservation of biodiversity and ecological sustainability, (4) for disaster mitigation i.e. drainage and flood control, and (5) energy security i.e. hydro-power generation.

The objectives of the ASM are:

- (1) To assess the current and prospective water situation of the country by 2050;
- (2) To review water resources development plans for different regions and major urban centers by various departments/agencies for their respective subsectors;
- (3) To prepare a long-term research and development agenda for water; and
- (4) To craft recommendations to the President, Congress, Executive Departments and Agencies responsible for water resources planning and development.

Organization of the 34th ASM is led by the Biological Sciences Division of NAST with Acd. Emil Q. Javier as chair and Acd. Guillermo Q. Tabios III of the Engineering Sciences and Technology Division as co-chair. In preparation for the ASM, the six divisions of NAST held roundtable discussions on the above-mentioned topics.

Program

11 JULY (DAY 1)

7:00	REGISTRATION AND COFFEE	Millennium Hall, Polkabal Ballroom, and Fiesta Pavilion
8:00	OPENING OF POSTER SESSION & EXHIBITS	Pandanggo Ballroom and Millennium Hall
	Ribbon Cutting	HON. MARIO G. MONTEJO <i>Secretary</i> Department of Science and Technology
		ACADEMICIAN EMIL Q. JAVIER <i>President</i> National Academy of Science and Technology, Philippines
		HON. ROGELIO L. SINGSON <i>Secretary</i> Department of Public Works and Highways
8:30	OPENING CEREMONIES	Polkabal and Rigodon Ballrooms, Fiesta Pavilion
	Entry of Colors	UP Rayadillo
	National Anthem	ACADEMICIAN AURA C. MATIAS <i>Dean, College of Engineering, University of the Philippines Diliman</i> <i>Member, Engineering Sciences and Technology Division, NAST PHL</i>
	Welcome	ACADEMICIAN EMIL Q. JAVIER
	Opening Message	HON. MARIO G. MONTEJO <i>Secretary</i> Department of Science and Technology
	Introduction of the Keynote Speaker	ACADEMICIAN EMIL Q. JAVIER
	Keynote Address	HON. ROGELIO L. SINGSON <i>Secretary</i> Department of Public Works and Highways
	Special Number	ATTY. JOSE "JOEY" D. LINA, JR. <i>President and Director, Manila Hotel</i>

Master of Ceremonies

NATIONAL SCIENTIST MERCEDES B. CONCEPCION

Vice President and

Chair, Social Sciences Division, NAST PHL

PLENARY SESSIONS

9:30 *PLENARY SESSION 1: THE COUNTRY'S WATER RESOURCES BY 2050*

Speaker: ACADEMICIAN FERNANDO P. SIRINGAN
Professor, The Marine Science Institute, UP Diliman
Member, Chemical, Mathematical, and Physical Sciences Division, NAST PHL

Open Forum

Moderator: ACADEMICIAN CHRISTOPHER C. BERNIDO
President and Founding Director, Central Visayan Institute Foundation
Member, Chemical, Mathematical, and Physical Sciences Division, NAST PHL

Rapporteur: DR. REGINA C. SO, OYS 2011
Associate Professor, Ateneo De Manila University

10:45 *PLENARY SESSION 2: AGRICULTURAL WATER SOURCES, SUPPLY AND CONTROL: ISSUES AND CONCERNS*

Speaker: ACADEMICIAN RODEL D. LASCO
Senior Natural Resource Management Specialist and
Philippine Coordinator, World Agroforestry Centre
Member, Agricultural Sciences Division, NAST PHL

Open Forum

Moderator: ACADEMICIAN RUBEN L. VILLAREAL
Member, Agricultural Sciences Division, NAST PHL

Rapporteur: DR. EDILBERTO D. REDOÑA, OYS 1998
Senior Scientist II, International Rice Research Institute

12:00 Lunch and Viewing of Posters and Exhibits

MEETINGS: a) Scientific Poster Board of Judges	Pandanggo Ballroom
b) Resolutions Committee	Pandanggo Ballroom

BOOK LAUNCHING AND RECOGNITION OF SUPPORT FROM SPONSORS, DONORS, ETC.	Polkabal and Rigodon Ballrooms Fiesta Pavilion
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1:00 *PLENARY SESSION 3: WATER SUPPLY AND SEWERAGE PLANS, DRAINAGE AND FLOOD CONTROL*

Speaker: ACADEMICIAN LEONARDO Q. LIONGSON
Professor, Institute of Civil Engineering, UP Diliman
Member, Engineering Sciences and Technology Division, NAST PHL

Open Forum

Moderator: ACADEMICIAN REYNALDO B. VEA
President, Mapua Institute of Technology
Member, Engineering Sciences and Technology Division, NAST PHL

Rapporteur: DR. JOSE BIENVENIDO MANUEL M. BIONA, OYS 2011
Associate Professor V, De La Salle University

2:15 *PLENARY SESSION 4: WATER: HEALTH AND SAFETY ISSUES*

Speaker: DR. ERLE S. CASTILLO
Consultant, National Poison Management and Control Center

Open Forum

Moderator: ACADEMICIAN JAIME C. MONTOYA
Executive Director, Philippine Council for Health Research and Development
Member, Health Sciences Division, NAST PHL

Rapporteur: DR. EDSEL MAURICE T. SALVAÑA, OYS 2011
Assistant Director, Institute of Molecular Biology and Biotechnology
University of the Philippines Manila

3:30 *PLENARY SESSION 5: PURIFICATION AND QUALITY OF DRINKING WATER: ISSUES AND CONCERNS*

Speaker: ACADEMICIAN ERNESTO J. DEL ROSARIO¹
¹Emeritus Professor, University of the Philippines Los Baños
Member, Chemical, Mathematical, and Physical Sciences Division, NAST PHL

Authors: ACD. ERNESTO J. DEL ROSARIO¹, DR. VERONICA P. MIGO²,
MS. EVANGELINE CLEMENTE³, and ACD. EVELYN TECSON-MENDOZA⁴
*²Research Associate Professor and Head Chemist, BIOTECH, University of the Philippines Los Baños (UPLB); ³Laboratory Manager, Manila Water Inc.; ⁴Research Professor, UP Los Baños and *Chair*, Chemical, Mathematical, and Physical Sciences Division, NAST PHL*

Open Forum

Moderator: ACADEMICIAN FABIAN M. DAYRIT
Professor, Chemistry Department, Ateneo de Manila University
Member, Chemical, Mathematical, and Physical Sciences Division, NAST PHL

Rapporteur: DR. ALICIA M. AGUINALDO, OYS 1993
Professor, College of Science, University of the Santo Tomas

12 JULY (DAY 2)

8:00 REGISTRATION AND COFFEE Millennium Hall and Polkabal Ballroom, Fiesta Pavilion

8:30 *PLENARY SESSION 6: ECOLOGY AND BIODIVERSITY OF MAJOR INLAND BODIES OF WATER: CHALLENGES AND OPPORTUNITIES*

Speaker: ACADEMICIAN RHODORA V. AZANZA
*Professor, Marine Science Institute, University of the Philippines Diliman
Member, Biological Sciences Division, NAST PHL*

Open Forum

Moderator: ACADEMICIAN SALCEDO L. EDUARDO
*Professor, College of Veterinary Medicine, University of the Philippines Los Baños
Member, Biological Sciences Division, NAST PHL*

Rapporteur: DR. MUDJEKEEWIS D. SANTOS, OYS 2011
*Scientist I, National Fisheries Research & Development Institute
Department of Agriculture*

10:30 *PLENARY SESSION 7: TOWARDS GOOD WATER GOVERNANCE IN THE PHILIPPINES*

Speakers: ACADEMICIAN AGNES C. ROLA
*Dean, College of Public Affairs and Development, UP Los Baños
Member, Social Sciences Division, NAST PHL*

Open Forum

Moderator: ACADEMICIAN ALLAN BENEDICT I. BERNARDO
*Chair, Counselling and Educational Psychology Department, De La Salle University
Member, Social Sciences Division, NAST PHL*

Rapporteur: DR. RONALD U. MENDOZA, OYS 2012
Executive Director, Policy Center, Asian Institute of Management

12:00 Lunch Polkabal and Rigodon Ballrooms and Fiesta Pavilion

Viewing of Posters and Exhibits Pandanggo Ballroom and Millennium Hall

MEETING: Resolutions Committee Pandanggo Ballroom

AWARDING AND CLOSING CEREMONIES

2:00 Processional

Presentation of Resolutions ACADEMICIAN EMIL Q. JAVIER
President
National Academy of Science and Technology, Philippines

Response HON. MARIO G. MONTEJO
Secretary
Department of Science and Technology

Special Number MR. RAYMOND ROLDAN
Tenor Soloist, College of Music, UP Diliman

Presentation of NAST Awards

- BEST SCIENTIFIC POSTER AWARD
- NAST-HUGH GREENWOOD ENVIRONMENTAL SCIENCE AWARD
- NAST-LELEDFI AWARD FOR OUTSTANDING RESEARCH IN TROPICAL MEDICINE
- OUTSTANDING SCIENTIFIC PAPERS
- OUTSTANDING BOOK/MONOGRAPHS
- NAST TALENT SEARCH FOR YOUNG SCIENTISTS
- THIRD WORLD ACADEMY OF SCIENCES (TWS) PRIZE FOR YOUNG SCIENTIST IN THE PHILIPPINES
- OUTSTANDING YOUNG SCIENTISTS

INVESTITURE OF NEW ACADEMICIANS / CORRESPONDING MEMBER

ACADEMICIAN EMIL Q. JAVIER
President, National Academy of Science and Technology, Philippines

NATIONAL SCIENTIST MERCEDES B. CONCEPCION
Vice President, National Academy of Science and Technology, Philippines

OATH TAKING OF NEW ACADEMICIAN(S)/CORRESPONDING MEMBER

Administered by HON. MARIO G. MONTEJO

Closing Remarks NATIONAL SCIENTIST MERCEDES B. CONCEPCION

Exit of Colors UP Rayadillo

Master of Ceremonies
ACADEMICIAN EVELYN MAE TECSON-MENDOZA
Secretary and Chair, Chemical, Mathematical, and Physical Sciences Division, NAST PHL

(Note: afternoon snacks to be served after the ceremonies)

Profile of the Keynote Speaker



HONORABLE ROGELIO L. SINGSON

Secretary

Department of Public Works and Highways

Secretary Rogelio L. Singson, in leading the State's engineering and construction arm as its 42nd head, advocates transformation and innovation in governance through transparency and accountability, doing the right project, for the right price and the right quality, and undertaking more public-private partnership (PPP) projects.

He has extensive experience in both government and private sector in the field of privatization and public-private partnership, management of tollroads and expressways, water and power utilities privatization, airports, seaports and resorts. He was the President and Chief Executive Officer of Maynilad Water Services, Inc. after its re-privatization from July 1, 2007 to June 30, 2010 under new owners, the DMCI- Metro Pacific Consortium. He also served in various senior positions such as Senior Vice President for Business Development, Citadel Holdings, Inc. from July 2002 to May 2007; Chairman & President of Basis Conversion & Development Authority from July 1998-February 2002; and Chairman of the Board of John Hay Poro Point Development Corporation.

His other past involvements in the public sector includes serving as Executive Director of the Coordinating Council of the Philippine Assistance Program which coordinate and monitor the official development assistance project and programs from May 1991 to November 1992; and Assistant Cabinet Secretary under the Office of the President Corazon C. Aquino from July 1987 to May 1991.

He obtained his Bachelor of Science degree in Industrial Engineering from the University of the Philippines in 1971 and attended Master's Program in Public & Business Management at the De La Salle University. He also attended various trainings abroad on Public-Private Partnership, privatization and Build Operate Transfer (BOT) Schemes.

Profile of the Guest Speaker



HONORABLE MARIO G. MONTEJO
Secretary
Department of Science and Technology

Secretary Mario G. Montejo, a mechanical engineer and technopreneur, was sworn into office by President Benigno S. Aquino III on 30 June 2010.

He believes that the use of science and technology is always a sound business model for the improvement of the individual and society in terms of improved processes, products, services. His motto, 'Local technology works!' affirms a belief in the creativity of Filipinos particularly the Philippine scientific community.

He has a substantial background in engineering design and innovation spanning 22 years. Among the technology solutions and innovations he developed were the first locally fabricated equipment for making water well screens; manufacturing of steel pole accepted by Meralco, NPC, and NEA; and for making gabions used for slope protection, which the NIA used extensively. He also designed the first motorized zipline in the world. His other recent innovation is the first locally developed robotic carpark located in Frontera Verde, Tiendesitas in Pasig City.

Secretary Montejo earned his Bachelor of Science major in Mechanical Engineering from the University of the Philippines Diliman in 1975, and placed 6th in the 1975 Mechanical Engineering Board Examination.

For his numerous accomplishments, he was selected as the 2011 UP Alumni Association (UPAA) Distinguished Alumni in Science and Technology. The UP College of Engineering has named him one of the "100 Outstanding Alumni Engineers of the Century" during the Centennial celebration of the University of the Philippines in 2010.

His previous awards include Outstanding Alumni for Professional Achievement-Tau Alpha Fraternity, UP College of Engineering (2002); Outstanding Alumnus-UP College of Engineering (2000); and Gold Medal Award for Creative Research-Filipino Inventors Society (1989).

Before joining the government service, Secretary Montejo was president of several engineering related firms along with the more recent ecotourism-related company. His extensive and successful private sector background is viewed as a valuable advantage in improving the delivery of DOST services.

He has reshaped DOST policies that now define its focus and development programs to address Pressing National Problems, Development of Appropriate Technologies to Create Growth in the Countryside, Improvement of Industry Competitiveness, Enhancement of Delivery of Government and Social Services, and to Build and Enhance Capacity in Emerging Technologies.

Executive Summary of Papers

THE COUNTRY'S WATER RESOURCES AND ISSUES

Fernando P. Siringan

The Philippines is endowed with freshwater resource mainly due to the high amount of rainfall. As of 2009, 57% of the country's freshwater resource is used for power generation, 34% for irrigation, 4% for industrial use, and just about 3% is for household use. Groundwater is the main source of potable water for most municipalities, surface and groundwater are tapped by a considerable number, and a few rely solely on surface water. Salt water intrusion, lowering of the piezometric level and ground subsidence are some of the effects of over-exploitation of groundwater, which has been occurring in several places in the country. In Metro Manila, Bulacan and Pampanga, over-extraction of groundwater has led to subsidence that can be several centimeters per year. Subsidence has enhanced the frequency and magnitude of floods in those areas.

Pronounced seasonal variations and geographic distribution often result in water shortages in urban areas especially during the dry season. During droughts, when the amount of rainfall is less than what is expected, the problem expands and may become severe. Deforestation and land conversions have certainly contributed to the decline in groundwater and consequently of river discharge during the dry season. Pollution caused mainly by untreated wastewater from agricultural, industrial and municipal sources is the major reason for the decreased availability and access to safe water for drinking from both surface- and groundwater resources.

In addition to the above issues, population growth will certainly put greater pressure to the potable water resources of the country; some projections indicate doubling of the present population by 2050. As such, management of the freshwater resource will become even more critical. A direction that should be considered by the local and national government is increasing the use of surface water as source of potable water. This will give the country a greater motivation in the cleaning up of our rivers and lakes, and in protecting our watersheds. Efforts should include increasing our ability to store surface- and rainwater. Given the potential of more acute droughts and the possibility of disruptions in water conveyances, the groundwater reserve can be set aside as emergency supply. This would require extraction not exceeding the safe yield, increasing recharge, and protecting it from contamination. Strategies can also be put in place to reduce the demand for freshwater by other uses such as having more efficient power generating plants and irrigation practices. Lastly, water conservation should also become part of our culture.



Academician Fernando P. Siringan is currently a Professor at the Marine Science Institute of the University of the Philippines Diliman. A major thrust of his research is deciphering environmental changes and their drivers at geologic to historical time-scales. The need to understand coastal flooding and erosion, harmful algal blooms, and degradation of coral reefs got him involved in groundwater research. He obtained his Ph.D. degree at Rice University in Texas.



Academician Christopher C. Bernido is a physicist, who is presently the President of the Central Visayan Institute Foundation (CVIF). Together with his wife, Maria Victoria, they were given the Gawad Haydee Yorac Award by Meralco and UP in 2009, and the Ramon Magsaysay Award in 2010. He obtained his Ph.D. in Theoretical Physics from the State University of New York at Albany (SUNYA), USA.



Dr. Regina C. So is an Associate Professor at the Ateneo de Manila University. Her research area is on the preparation of novel functionalized materials for natural products separation, environmental and biomedical sensors and devices. She is presently working on the use of molecularly imprinted polymers (MIPs) as functional materials. Her group also prepares fluorescent films and modified-cationic polythiophenes for the fabrication of sensors for tuberculosis detection. She finished her Ph.D. in Organic Chemistry from the University of Connecticut, USA.

WATER FOR FOOD SECURITY IN THE PHILIPPINES

Rodel D. Lasco

Agriculture is the main user of water in the Philippines. About 50% of the 3 million ha of lands that could be irrigated are with access to irrigation. In this paper, we review the status of the country's irrigation systems, including the challenges and opportunities for the irrigation sector and the relationship of water and agriculture and food production system.

In the first part of the paper, we discuss the key initiatives of government and academic institutions in ensuring that adequate water is available for agriculture. The National Irrigation Administration (NIA) is pursuing irrigation modernisation schemes. These include: (1) Water supply augmentation by dam heightening, drainage reuse, construction of interim water reservoirs and establishment of reservoir irrigation systems; (2) Water supply conservation by canal lining, intermittent irrigation and irrigation delivery suspension; (3) Planning database improvement by parcellary map upgrading and establishment of hydro-meteorological stations; (4) Operating skill enhancement by technology module piloting; (5) Silt intrusion control by the construction of silt stilling basins, ensuring proper dam operations, slope stabilisation and watershed reforestation; and (6) Flood devastation control by drainage way clearing and construction of flood protection dikes, flood diversion ponds, afflux dikes and spur dikes (to protect scouring of riverbanks).

NIA is also trying to expand irrigated areas and improve irrigation performance. The key technology-based interventions (TBIs) undertaken to address these thrusts include: (1) canal offtake retrofitting (COR) to increase irrigated area by alleviating water distribution inequity; (2) cropping pattern optimisation (CPO) to increase cropping intensity by having 1-2 more rice crops in 2 years; and (3) sustainable irrigated agriculture (SIA) to increase *palay* yield by realising more crops at less water/production input.

The main activities of the Bureau of Soils and Water Management (BSWM) include: water-saving technologies (alternate wetting and drying), improved irrigation methods for high-valued commercial crops such as overhead irrigation and localised or drip irrigation by wetting certain portions of the soil only and improved drainage system for excess water such as facilities for the timely release of storm water during rainy season.

These technologies are crucial in water efficiency, which is defined as the reduction of waste, not restriction of usage, while obtaining the desired results or level of service or production with the least necessary water. When translated to agriculture, it is obtaining the desired level of production with the least water necessary. To attain water security, programs are needed on excess water management, water supply augmentation and conservation, water use efficiency improvement, water quality protection and management, and wastewater treatment and re-use. Specifically, there is a need for proper monitoring and regulation of the development and utilisation of water resource. The element of accountability and self-regulation should be instilled in all water users so that they would be encouraged to engage in good farming practices. The concepts of water re-use and recycling should be mainstreamed. Finally, collaboration is needed between the stakeholders and water availability and demand should be looked in the context of a watershed.

Another approach to attain water security is by developing technologies and plant varieties to cope with water stress including drought, flooding and salinity. An economical and sustainable adaptation strategy is the use of varieties with high yield potential under favourable condition and those with good yield potential under stress conditions. Some of the research and development issues identified were: (1) understanding mechanisms of resistance; (2) marker-assisted plant breeding; (3) genetically modified organisms (GMOs); and (4) collaboration with international agencies.

To keep water flowing in the lowlands, the protection and wise management of watersheds is crucial. In the Philippines, major watersheds have been facing threats due to deforestation and removal of natural vegetation, unregulated land conversion and pollution. Some of the indirect threats include: (1) population growth and development; (2) increase of population density; (3) land tenure insecurity; (4) poverty and absence of viable livelihoods; (5) poor infrastructure or the lack of good roads and markets; (6) insufficient capital assets reflected in the failure of watershed users to adopt conservation technologies; (7) complicated institutions as shown by overlapping and competing mandates; (8) undervaluation of watershed resources; and (9) absence of land use and management plans.

To conserve watersheds in the country, the following are recommended: enhancement of the ability of watershed managers and planners, establishment of a network of learning watersheds in strategic locations as regional focal venues for research and capability building programs, rationalisation of research, development and technology transfer programs for the achievement of enduring positive changes in watershed management, enhancement of information, education and communications (IEC) campaigns, establishment of mechanisms for monitoring, accounting, evaluation and valuation of resources and services, enhancement of policy studies and development for the facilitation of state and non-state driven modes of watershed governance, rationalisation of policy and institutional climate for the promotion of science-based management of watersheds, mandatory formulation of integrated watershed management plan for all priority watersheds and vigorous restoration of degraded forests in watersheds.

There is still room for improvement, particularly on irrigation technology, crop varieties, farming systems and land area covered for irrigation. Further, the link between natural support systems and water supply is crucial. Last but not least, governance barriers must be addressed to ensure water and food security in the country.



Academician Rodiel D. Lasco is the Philippines Coordinator of the World Agroforestry Centre (ICRAF) since April 2004, a center devoted to promoting "tree on farms". He has nearly 30 years of experience in natural resources and environmental research, conservation, education and development at the national and international level. His work has focused on issues related to natural resources conservation, climate change and land degradation. He earned his Ph.D. in Forestry from the University of the Philippines Los Baños.



Academician Ruben L. Villareal is an accomplished plant breeder, widely recognized for his pioneering work on the development of heat-tolerant tomatoes for lowland tropics both at the University of the Philippines Los Baños (UPLB) and at the Asian Vegetable Research and Development Center (AVRDC) in Taiwan where he served as the Center's first senior vegetables breeder. He is likewise credited, together with National Scientist Ricardo M. Lantican, for the first original publication on inheritance of traits through the cytoplasm, specifically the association of southern leaf blight disease of corn with the Texas' cytoplasm, which observation the US maize breeders ignored to their chagrin a decade later. He obtained his Ph.D. in Horticulture from Rutgers – The State University of New Jersey, USA.



Dr. Edilberto D. Redoña is the Global Coordinator of the International Network for Genetic Evaluation of Rice (INGER), the world's flagship network for rice varietal testing for biotic and abiotic stresses based at the International Rice Research Institute (IRRI). Concurrently also a Senior Rice Breeder at IRRI, he initiated a new international rice variety development effort for tolerance to high temperature stress to mitigate the negative effects of climate change. He holds a Ph.D. in Genetics from the University of California Davis.

WATER SUPPLY AND SEWERAGE, FLOOD CONTROL AND DRAINAGE: MANAGING WATER IN BOTH SCARCITY AND EXCESS

Leonardo Q. Liongson

This paper presents (1) a consolidated water situation from the perspective of national water policy-making, planning, regulating and implementing public agencies, local governments, non-governmental organizations, private sector (suppliers and service providers), international financing institutions and other stakeholders — specifically in the areas of water supply and sewerage (sanitation), flood control and drainage (flood management), and integrated water resources management (IWRM); (2) the present policies (laws, rules and regulations) and framework planning documents applicable to the water sectors which guide and dictate the future development targets and investments; (3) the present drivers, challenges, vision, goals, and strategies in the various water sectors; and (4) the priority plans of actions, goals, targets, programs and projects, and their present status.

There are several (at least top 10) water areas of common concern to many stakeholders and to water agencies with specialized and direct mandate and responsibility. The relevant and often inter-related areas of concern, with corresponding priorities and recommendations (to be presented) are as follows: (1). Integrated Water Resources Management (IWRM) — multi-stakeholder dialogues, advocacies, capacity building, information/education/communication; (2). Resource and economic regulation of existing water sources — water laws, water rights, water tariffs; (3). Development of new water sources — surface water (rainfall harvesting, rivers, lakes, dams/reservoirs), ground water (aquifers and springs), desalination, climate change impacts, technologies, service providers; (4). Water conservation and efficiency of use — policies, multi-purpose uses, practices, technologies, urbanization, climate change, watershed management (upland, lowland, coastal), service providers, investments; (5). Wastewater treatment, recovery and reuse - pollution problems, policies, sewerage, technologies, service providers, investments; (6). Flood Management — hazard risk management, structural and non-structural measures, climate change, urbanization, role of science & technology (S&T), investments; (7). Environmental Water Management — policies and programs, uplands (forests, people's rights, recharge areas), lowlands (floodplains, farms, towns and cities), wetlands and coastal areas, issues of biodiversity, climate change and urbanization, investments; (8). River Basin Organizations (RBOs) — role of local governments, national agencies, civil society and other stakeholders, political will, socio-economic priorities; (9). High priority and impact programs — Millennium Development Goals, Road Maps, programs and projects; and (10). Water reforms — legislation, priorities, re-organization, programs, recommendations



Academician Leonardo Q. Liongson is currently a Professor at the Institute of Civil Engineering, University of the Philippines Diliman. He has advised, undertaken and led training, researches and engineering design for government, academe and industry with physical modeling of hydraulic structures, Philippine engineering history, computational flow visualization, computational hydraulics (rivers, lakes/reservoirs, floods and lahar), numerical and analytical groundwater modeling, regional flood frequency analysis, watershed rainfall-runoff modeling, water-quality and sediment transport models. He obtained his Ph.D. in Water Resources Administration in 1976 at the University of Arizona in Tucson, USA.



Acad. Reynaldo B. Veja is currently the President and CEO of the Mapua Institute of Technology, a position he has held since 2000. He was formerly Dean of the University of the Philippines College of Engineering from 1993 to 1997 and Administrator of the Metropolitan Waterworks and Sewerage System (MWSS) from 1997 to 2000. He obtained his Ph.D. in Engineering from the University of California Berkeley, USA.



Dr. Jose Bienvenido Manuel M. Biona is currently an Associate Professor at the Mechanical Engineering Department and a Research Scientist at the Center for Engineering and Sustainable Development Research of the De La Salle University. He obtained his Ph.D. in Mechanical Engineering from the De La Salle University.

WATER RESOURCES: HEALTH AND SAFETY ISSUES

Jaime C. Montoya

Water is the very essence of human life. Humans can survive without food for months but cannot survive without water for more than a week. As such, water is considered a basic human need. The state should therefore ensure the availability and accessibility of safe and clean water for all its citizens that will sustain human needs and activities.

With rapid industrialization and urbanization, together with rapid expansion of human populations, water has become an all important human commodity. Our water resources are continuously being threatened by pollution and contamination mostly resulting from senseless and irresponsible human activities. The effects of climate change have further aggravated this problem. There is therefore the need to continuously address these issues that pose a threat to human health and survival.

Focusing on these water issues that may lead to important health problems, discussions in this paper will highlight the biological and chemical agents that significantly affect water quality and safety that may potentially lead to public health problems. A brief description of local water utilities' mandate and activities will also be done.

Biological Agents that affect water quality and safety

Almost all kinds of microbes can infect and colonize our water supply. From bacteria to protozoal parasites, from viruses to fungi, all these organisms can infect humans through the water supply and lead to both short term and long term sequelae that may be bring deleterious and even life threatening consequences.

The water-related diseases can be classified into four categories:

- a) Waterborne diseases – include infections that are spread through water supplies
- b) Water-washed diseases – include infections spread through lack of water for personal hygiene
- c) Water-vectored diseases – include infections spread by insects that depend on water
- d) Water-based diseases – include infections spread through an aquatic invertebrate host

All of these diseases can be caused by a variety of organisms which by themselves can also cause a combination of these diseases, thereby rendering prevention and control measures more difficult and complicated. Moreover, organisms have developed adaptive mechanisms that enable them to replicate and live in water, even under the most challenging conditions. For example, bacteria can form biofilms that can act as a shield against environmental and human host defenses (Huq et al. 2008). These biofilms that are composed of complex communities of microorganisms, when ingested, can readily cause disease due to the large infective dose delivered (Faruque et al. 2006). This phenomenon, for example, has been demonstrated with *Vibrio cholerae*, the causative agent for cholera. This ability to form biofilms is also responsible for their persistence in the environment. Other bacteria that may cause waterborne diseases are *Aeromonas* and *Plesiomonas*, *Salmonella typhi* and non-typhoidal *Salmonella*, *Shigella* and *Escherichia coli*. The viruses that may also cause waterborne diseases are Rotavirus which is the most common cause of diarrhea in children, Adenovirus, Calicivirus, Norwalk-like virus and Coronavirus.

Among the protozoal agents, the most important are *Entamoeba histolytica* and *Giardia lamblia*. The diseases they cause can have both acute and chronic effects. Studies have shown, for example, that early childhood diarrhea, especially if recurrent, correlates with impaired physical fitness and cognitive dysfunction as well as decreased semantic fluency and retarded growth or reduced height for age.

There is therefore the need to develop and evaluate novel methods of household water treatment as well as effective and reliable surveillance systems for determining and monitoring water pollution and contamination.

Chemical Agents that affect water quality and safety

Rapid increase in population, urbanization and industrialization have threatened the quality of our water supplies. Discharge of waste water as well as agricultural run-offs have caused extensive pollution of water systems. In Metro Manila, for example, some of the river systems are already considered biologically dead and unsafe for human consumption. There is also a significantly higher health risk for people living near dump sites such as the Payatas area.

A recent SWS survey revealed that 50% of respondents believe that water pollution is already a very serious problem. Chemical hazards such as heavy metals like mercury and lead pose important health threats with acute and chronic effects. Chronic exposure to heavy metals can affect several organ systems in the human host. It may lead to anemia, spontaneous abortions and infertility, cancer and even developmental delays in children resulting to low intelligence quotients.

It is therefore important to empower communities through education on water safety, provide access to health and nutrition services as well as encourage good health seeking behaviors and practices in order to promote health and wellness and prevent diseases.

Provision of Safe and Potable Water for Human Consumption

The Local Water Utilities Administration is the government agency tasked to support institutions for the promotion, development and financing of local water utilities. They help ensure that water resources meet the Philippine National Standards for Drinking Water (PNSDW). The PNSDW sets the limits for physical, chemical, biological and radiological parameters for drinking water.

Some of the water quality issues that are being monitored include: iron content; manganese content; turbidity; color; chloride content, limit is 250 ppm; pH; total dissolved solids, limit is 500 ppm; and arsenic.

Water service providers belong to any of three levels: (a) level 1, spring water; (b) level 2, ground water; and (c) level 3, individual distribution through pipes.

Major source of water is ground water at 88%, with combination of ground water and surface water at 7% and surface water at 5%. Ideally each municipality should have at least one water district. There are currently 849 water districts, 490 of which are active. Most of the water districts have complied with and satisfied requirements for safety. Some issues still remain such as the need for more accessible and reliable laboratories and financial support for upgrading and improving equipment.

Actions that have to be taken to address water issues affecting health and safety

Environment and health issues should be mainstreamed into economic development. There should be continuous efforts to promote sustainable and equitable water resources for everyone. There is also a need to build national and local capacity for a more efficient and effective management and monitoring system of waste and water resources. Personal protection from pollution and infections should also be ensured for all. Finally, research and development efforts for a more reliable and safe water supply should be promoted and sustained by concerned agencies.



Dr. Erle S. Castillo is a Consultant of various institutions like the National Poisons Control and Management Center at the Department of Pharmacology and Toxicology of the Philippine General Hospital, Occupational and Environmental Section of the Department of Health, and Fertilizer and Pesticide Authority of the Department of Agriculture. He is a Clinical Toxicologist at the Medical Center Manila and Makati Medical Center and a Clinical Assistant Professor at the UP-PGH Department of Emergency Services. He specializes in Family Medicine and Toxicology.



Academician Jaime C. Montoya is a highly-trained Public Health Expert, Infectious Disease Specialist and researcher with an M.S. and Diploma in Clinical Tropical Medicine from the London School of Hygiene and Tropical Medicine and M.S. in Bioethics from the University of the Philippines College of Medicine. He is certified by both the Royal College of Physicians, London, U.K. and the Philippine Board of Internal Medicine and Infectious Disease specialty with fellowships at the University of California, Davis, Cornell University, New York City, and Brown University, Providence, Rhode Island, U.S.A. He is a Life Fellow of the Philippine College of Physicians, Fellow of the Philippine Society of Microbiology and Infectious Diseases, Royal Society of Tropical Medicine and Hygiene, U.K. and the American College of Physicians.



Dr. Edsel Maurice T. Salvaña is an Associate Professor of medicine at the Philippine General Hospital and is Assistant Director and Research Faculty at the Institute of Molecular Biology and Biotechnology at the National Institutes of Health, UP Manila. He is also an Adjunct Faculty for Global Health at the University of Pittsburgh.

PURIFICATION AND QUALITY OF DRINKING WATER: ISSUES AND CONCERNS

Ernesto J. del Rosario, Veronica P. Migo,
Evangeline M. Clemente and Evelyn Mae Tecson- Mendoza

The major problem of access to safe drinking water by the world's population has been recognized and is part of the United Nations Millennium Development Goal Number 7 with the target: To halve by 2015 the proportion of population without sustainable access to safe drinking water and safe sanitation. Cost benefit analysis of providing safe drinking water by increasing interventions undertaken by the WHO revealed that, worldwide, between \$18.1 billion and \$555.9 billion could be saved if drinking water and sanitation services are improved. Such savings accrue from direct economic benefits of avoiding waterborne illnesses, from indirect benefits due to decrease in work day loss and longer life span, and even non-health benefits. This paper analyzes and discusses the purification processes and quality of drinking water in the country, as well as regulation, issues and concerns.

According to the Local Water Utilities Administration (LWUA), more than 6,280 water service providers (WSPs) provide potable water to the country's total population. The purification processes employed by the WSPs, such as Manila Water Inc. (large scale) and Laguna Water District (medium scale), rely mainly on conventional water purification methods that include coagulation/flocculation, sedimentation and filtration. The chemical disinfectant used is either chlorine (large scale) or chlorine dioxide (medium scale). In view of unresolved issues regarding use of either disinfectant, further evaluation should be done as basis for future recommendation. Bottled water manufacturers use a combination of methods such as filtration, reverse osmosis, ozonation, UV-sterilization and others.

The standards for drinking water quality are defined in the Philippine National Standards for Drinking Water 2007 (DOH Administrative Order No. 2007-2012) which apply to "all waterworks officials, developers and operators of water supply systems both government and private entities, water refilling station operators, water vending machine operators, ice manufacturers, all establishments and institutions that supply or serve drinking water, drinking water laboratories, health and sanitation authorities, the general public and all others concerned." These standards are based on guidelines and/or criteria recommended by the World Health Organization with some modifications that consider national priorities and economic factors. According to PD 198 (1973) which created LWUA, one of the functions of the LWUA is to "monitor and evaluate local water standards." However, bottled drinking water manufacturers must satisfy additional requirements in order to comply with Good Manufacturing Practices since bottled water is considered a food product and is directly regulated by the DOH Food and Drug Administration.

Water service providers (WSPs) are, therefore, required to purify water for distribution to consumers in compliance with specific water quality standards based on physico-chemical and microbiological parameters. However, different quality parameters and frequencies of sampling are applied to municipal drinking water and refilling stations. WSPs such as those outside Metro Manila have shown poor compliance with prescribed standards; this is primarily due to the limited number of certified laboratories, poor sampling procedures and lax enforcement.

It is recommended that existing policies on the quality of drinking water and monitoring procedures be reviewed and harmonized for all WSPs including water districts, bottled drinking water manufacturers, refilling stations and small bottlers. DOH should be empowered, in terms of budget, structure and equipment, to effectively monitor and enforce compliance with quality guidelines, including monitoring of refilling stations which do "bottling" of water, and all bottled water manufacturers. Some refilling station owners perform water sampling which does not provide assurance of sample integrity.

Policies for recognition (more accurate term than accreditation) of water testing laboratories by DOH should be updated, including laboratory space requirement and qualifications of persons certifying reports of analyses and evaluating laboratories. The National Reference Laboratory (East Avenue Medical Center) should provide proficiency testing for physico-chemical

parameters. Proficiency tests are presently done only for microbiological analysis.

For bottled water, the problem of leachate chemicals (such as phthalate) with plastic bottles was identified, as well as the need to develop analytical methods for detecting these contaminants. It is recommended that DOH formulate policies for the proper labelling of bottled water containers as oxygenated, ionized, iodine-fortified, etc.

In addition to providing safe drinking water to its increasing population, the Philippine government should strive to strengthen the regulation of the water service providers in order to ensure that the standards for good quality drinking water are met and sustained.



Academician Ernesto J. del Rosario is currently a *Professor Emeritus* at the Institute of Chemistry, UP Los Baños. He has 123 scientific and publications (including two approved patents), 35 of which are in ISI journals. He and his co-workers have presented scientific/ technical papers in international and local conferences/symposia; these total to 48 and 152 papers, respectively. He has more than 40 awards given by national agencies and professional organizations. He obtained his Ph.D. degree in Physical Chemistry from Cornell University, USA.



Academician Fabian M. Dayrit is a Professor at the Department of Chemistry of Ateneo de Manila University. His research interests include chemistry, biochemistry and analysis of virgin coconut oil and herbal medicines. He obtained his Ph.D. in Chemistry from the Princeton University, USA.



Dr. Alicia M. Aguinaldo is a full Professor of Chemistry at the University of Santo Tomas. Her research interests include the phytochemistry of Philippine plants, and chemistry of microbial metabolites, but her main research interest is the chemistry of natural products from plants and microorganisms that inhibit the growth of *Mycobacterium tuberculosis*.

ECOLOGY AND BIODIVERSITY OF MAJOR INLAND BODIES OF WATER: CHALLENGES AND OPPORTUNITIES

Rhodora V. Azanza

The Philippines is blessed with waters from fresh to marine coming from inland bodies to those that meet the seas and the ocean that bound the archipelago. Abundant rainwater almost regularly comes particularly during the southwest monsoon. In many parts of the country, management of water and associated resources, however, remains a significant concern primarily arising from the conflict of interests in the utilization of these resources. This paper is focused on the review of the biodiversity and environmental status of 3 major fresh water bodies namely; Agusan Marsh, Lake Lanao and Laguna de Bay, and how they relate to the sustainable use of water for the communities' various needs.

Laguna Lake, a multifunction lake is near to a busy metropolis and still productive as a fish culture site. Lake Lanao has also been very useful as a source of sustenance and livelihood aside from serving the other needs of the local community. Agusan marsh, on the other hand, has been considered more recently as an "eco-tourism site".

Knowledge shared through the various NAST Roundtable discussions on the "Ecology and Biodiversity" of these major inland bodies of water are presented; and the challenges and opportunities in relation to the 2012 NAST 34th ASM theme entitled "Philippine Water 2050" are discussed.



Academician Rhodora V. Azanza is internationally-recognized for her researches and extension services in harmful microalgal biology, dynamics and management. She served the University of the Philippines in various academic positions including being the first woman dean of the College of Science for 6 years. She was concurrently the vice-chairman of UNESCO-Intergovernmental Oceanographic Commission (IOC) Panel on Harmful Algal Blooms (IPHAB) and the project leader of IOC's Harmful Algal Blooms in Southeast Asia (HABSEA) Portal and e-learning for 7 years.



Academician Salcedo L. Eduardo is currently Professor 12 at the College of Veterinary Medicine, University of the Philippines Los Banos. He has discovered and named 33 species and three genera of parasites all new to science and established 17 new nomenclatural combinations and two taxa status emendations. The type specimens of these new species were deposited in various museums here and abroad. He holds a Ph.D. from the University of London.



Dr. Mudjekeewis D. Santos is a Scientist I at the Bureau of Fisheries and Aquatic Resources – National Fisheries Research and Development Institute (BFAR-NFRDI) and a faculty (part-time) at the Biology Department of the Ateneo de Manila University. His research interests are in the field of genetics, biotechnology and assessment of aquatic species. Specifically, he is utilizing DNA-based approaches to generate information and technologies for fisheries management and aquaculture productivity in the country. He obtained his Ph.D. from Tokyo University of Marine Science and Technology (TUMSAT), Japan.

TOWARDS GOOD WATER GOVERNANCE IN THE PHILIPPINES

Agnes C. Rola, Juan M. Pulhin, Cristina C. David, Christopher Wensley, Vicente S. Paragas,
Guillermo Q. Tabios III, Joy C. Lizada, Prevelyn G. Gazmen, and Maria Helen F. Dayo

Introduction and Framework of Analysis

As economies develop and population increases, demand for water by industry, commercial, agriculture, and domestic sectors necessarily expand. Globally, the supply of water may not be limited. Water use projection for 2025 revealed that only 10 percent of total renewable water shall have been withdrawn. Yet, there are spatial variations in water supply conditions. In the Asia-Pacific region, only a small portion of the renewable water sources can be tapped. The Philippines, like all other Asian developing countries, has regions and times of the year in which water for specific uses is scarce. Its freshwater ecosystem faces severe problems of pollution and rising costs of accessing potable water supply. Surface water accounts for about three quarters of freshwater supply, but many of the major rivers and lakes, particularly those passing through or close to urban centers, are heavily polluted. This sorry state of the Philippines' water resource condition is influenced by lack of good governance mechanisms. It seems that the water crisis is not a scarcity issue but a governance issue.

Cases all over the world, the Philippines included, have shown that water governance is a very complex process, because of the nestedness and interlocking set of decisions about water. Decisions about policies, laws, institutional structure, incentives, and capacity development are made by a multi-layer of decision-makers: national, regional, local and even ethnic authorities. UNDP (2001) saw governance as: "the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences". The adoption of good water governance will therefore contribute to the sustainable achievement of the country's water needs and the related Millennium Development Goals (MDGs) of providing potable water and good sanitation to the poor, and most especially, attainment of food security.

In the Philippines, where the laws on water are numerous, the problem lies in implementing them in a "society with many stakeholders operating in an informal sector and with little or no link to resource governance structures." To move towards good water governance, we can be guided by using a framework of the pillars and principles of governance. Principles of governance include accountability, transparency, effectiveness, efficiency, fairness and equal participation of the women. The three pillars of governance are policy, legal, institutional and regulatory frameworks; planning and decision making process; implementation, enforcement and compliance. There should also be the interaction between pillars and principles of governance.

Current Situation

The Philippine Water Code defines the legal framework for the extraction, allocation, and management of water resources in the country. Currently, the National Water Resources Board (NWRB) implements the Code. Our Water Code is comprehensive, but because water governance is also water politics (Paragas), the implementation of the regulatory policies is very weak. Water governance structure consists of about 30 agencies (the LWUA, NWRB, MWS, etc.) implementing water policies (Paragas, Tabios). Due to fragmented institutions, there is fragmented planning. In addition, lack of reliable data also leads to inadequate decisions.

These unclear institutional responsibilities remain outstanding issues in the management of water resources in the Philippines.

Currently, we need a clear definition of water rights, to use and access, market-based instruments to increase water efficiency, as well as a need for efforts to ensure social equity and address environment concerns. In the Philippines, there is a large proportion of water rights freely held by public institutions, such as the NIA, LWUA, MWSS (David). Building capacity for water rights and water allocations is a challenge and it is very important for developing the institutional and human resources capacity to effectively manage water resources. However, this is frequently hampered by fully funded institutions and limited technical and human resources capacity (Wensley).

Water charges by the NWRB are required for registering the use of ground water surface water. Registration is quite incomplete and the water charges are very low. The problem is the lack of incentive for NWRB to collect the correct fees because these go back to the general fund. There are charges for production and distribution costs but no charges for the scarcity cost (David). Except for the privatized MWSS, there are no environmental cost charges.

At the local level, by law, LGUs can establish water councils or watershed authorities which may not require legislative action. But there were also institutional deficiencies. The Metro Iloilo Water District has a corporate plan that is weakly implemented. There are no proper internal control mechanisms and the employees have low morale because of several legal issues, ineffective staff development and lack of incentives (Lizada). Furthermore, the Iloilo example showed that local community activities for water management are generally fragmented; programs such as tree planting are top down. Watershed conservation projects and activities are uncoordinated, thus unsustainable.

Water conflicts have also been observed in the rural areas, such as in Dolores, Quezon (Dayo). This was not only due to inequity in water delivery by the local water district, but also by the nature of water uses which have significant meaning in their cultural well-being. The issue of water distribution and scarcity is also a political issue in this rural area. On the other hand, there are current initiatives such as the Tubig para sa Barangay by the Manila Water Company that provides water for the low income urban communities. This program provides a model of a community participatory approach to water delivery and access (Gazmen).

Ways to Move Forward

First, in terms of policy, legal, institutional and regulatory framework, there is need to update water-related policies and law. The proposal for a National Water Resources Management Council under the Office of the President is worth considering. There is a need to improve on our economic instruments by considering environmental and scarcity issues and ensuring a more equitable sharing of benefit.

Second, in terms of planning and decision-making processes, more thought about an integrated water resource management approach should be done. There is a need to learn how to plan using watershed as the unit of analysis as what the regional approach in Iloilo is advocating. The center of planning and decision-making is stakeholder participation or what can be termed as adaptive governance. Adaptive governance will take into account the local context as well as the realities, and even the local knowledge systems, such as the symbolic meaning of water to different cultures and communities. There is need to build on success stories and models of citizen participation, as in the Manila Water example.

Lastly, there is need for better implementation of legislation, their enforcement and compliance. This includes, among others, the administration of water resources regions and major river basins. There is need to enforce existing laws, administer appropriately water rights and access especially in their implementation and enforcement. There is a need to cooperate and coordinate among different stakeholders and honest-to-goodness monitoring and evaluation to address violations and malpractices. To do all the above, there is need to build technical and human capacities in good water governance.



Academician Agnes C. Rola is Professor and currently Dean of the College of Public Affairs and Development (CPAf), University of the Philippines Los Baños (UPLB). Her current research interests include economics of sustainable agriculture; rural institutions and agricultural extension; water governance for development and food and water security and environmental interactions. She earned her Ph.D. degree in Agricultural Economics from the University of Wisconsin-Madison, USA.



Academician Allan Benedict I. Bernardo is a University Fellow and Full Professor in De La Salle University, where he maintains active research programs on cognitions about poverty and wealth in Filipinos; social and cultural dimensions of learning, achievement motivation, academic emotions including locus of hope, language and learning in bilinguals. His book, *Literacy and the Mind: The Contexts and Cognitive Consequences of Literacy Practices* (published by UNESCO Institute for Education & Luzac Oriental) has been translated into French and Spanish. He received his Ph.D. in Psychology from Yale University.



Dr. Ronald U. Mendoza is an Associate Professor of Economics at the Asian Institute of Management (AIM), where he also serves as the Executive Director of the AIM Policy Center and Co-Editor of the *Journal of Asian Business*. He has over 12 years of research, policy advisory and applied experience in international development, including over 9 years as an economist at the United Nations. He obtained Masters in Public Administration and International Development (MPA-ID) from the John F. Kennedy School of Government, Harvard University and his M.A. and Ph.D. in Economics from Fordham University.

2012 AWARDEES

MEMBERSHIP TO THE ACADEMY



JOSE B. CRUZ, JR., Ph.D.
Electrical Engineering

University of Illinois. USA. 1959

In recognition of his outstanding accomplishments as a scientist and an educator who has been recognized locally and internationally. His contributions to dynamic game theory, specifically, Stackelberg (Leader-follower) games, have directly resulted in two economists winning the Nobel Prize in economics. This theory can also be applied to disaster science and renewable energy. Moreover, he was credited for his significant scientific and technological contributions to electrical engineering through the development of several methods for the sensitivity analysis of dynamic systems with respect to parameters variations; establishment of the concept comparison sensitivity matrix that captures the effect of feedback on altering the influence of parameter variations on system output errors in multivariable feedback system; and the maintenance of system optimality for a range parameter values even when the feedback control structure is fixed. He was a key member of the Project Advisory Group, which led the development and implementation of the Engineering and Science Education Project (ESEP) of the DOST. He has worked closely with engineering education leaders in the country to promote outcomes-based education and continuous quality improvement processes. His dynamism to strengthen science education has produced many Ph.D. graduates who are now leaders in their fields in the US, and many others who have returned to their respective native countries where they are technology leaders.

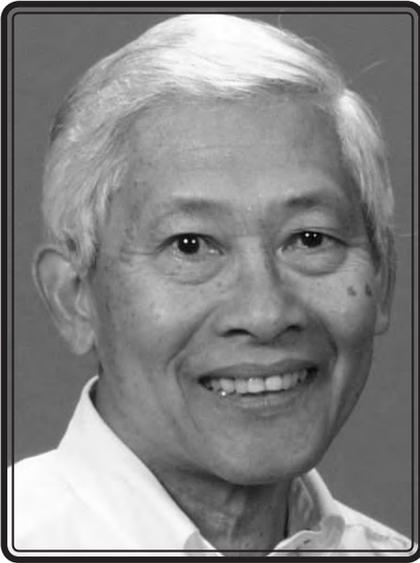


MICHAEL L. TAN, Ph.D.
Anthropology

University of Amsterdam. The Netherlands. 1996

In recognition of his sustained outstanding scientific research, teaching, advocacy and development work that demonstrate the usefulness of social scientific knowledge in advancing translational medicine; particularly in his consistent efforts to revitalize scientific research on and in the use of traditional medicine, to develop rational drug policies, and in understanding the social and behavioral dimensions of HIV/AIDS prevention and of reproductive health promotion. His scholarly work provides the foundation for his social development advocacy and policy development work, which he sustains by ensuring that scientific knowledge is effectively communicated to various stakeholders including policy makers, community development workers, health professionals, and the general public.

CORRESPONDING MEMBERSHIP



ALFONSO H. ALBANO, Ph.D.
Physics

State University of New York. USA. 1969

In recognition of his exemplary contributions to laying the theoretical foundation for the description of transport processes through and along the dividing surface between two dissimilar media and the development and refinement of computational techniques for the analysis of data from complex systems. This has been applied in the analysis of laser data, extracellular recordings from the medicinal leech, human electromyograms (EMG) and electroencephalograms (EEG) and vasomotion data from monkeys, among others. He has been involved in Philippine science as a United Nations Development Programme consultant at the National Institute of Physics, University of the Philippines Diliman, in 1986, then in 1996 at the Centre for Fluid Dynamics, UP Los Baños and at UP Baguio. As a Department of Science and Technology Balik Scientist in 2008 and 2009, he conducted workshops at the Mindanao State University-Iligan Institute of Technology (MSU-IIT) and started mentoring graduate students and conducting collaborative research. In addition to the 58 students he had mentored and graduated in US universities, he has graduated 4 MS students at MSU-IIT and continues his service to the nation in developing much needed human resources in mathematics and physics.



NAST - TWAS PRIZE FOR YOUNG SCIENTIST IN THE PHILIPPINES



JOSE ERNIE C. LOPE, Ph.D.
Mathematics
*Institute of Mathematics,
University of the Philippines Diliman*

For his outstanding results in the general theory of singular partial differential equations in the complex domain, particularly on analytic continuation of solutions to nonlinear PDEs and extensions of Baouendi and Goulaouic's seminal work on Fuchsian PDEs. In the complex domain, the situation is more complicated but mathematically richer, as many real life problems modeled by differential equations yield more insights and solutions when viewed in this context. In recognition of his significant research and publications in numerical mathematics and modeling that cover a variety of applications including electrical impedance tomography, models of malaria transmission, and analysis of beam strengths. And for his mentorship of graduate students, involvement in teacher-training and extension work, and implementation of collaborative projects with local and international agencies.

OUTSTANDING YOUNG SCIENTISTS

MICHELLE GRACE V. PARASO, Ph.D.

Environmental Science

University of the Philippines Los Baños

In acknowledgment of her important researches that established the link between animal health and environmental health issues, including aquatic exotoxicology that determined the impact of environmental pollutants on fish health and the identification of hotspots of livestock and poultry concentration as well as potential disease and pollution risks in Laguna province allowing for targeted interventions.

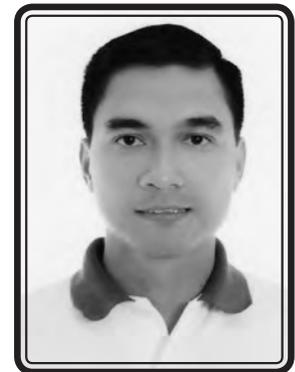


DINDO AGUSTIN A. TABANAO, Ph.D.

Applied Plant Sciences

Philippine Rice Research Institute

In recognition of his important research activities which made significant impacts in the fields of genetics and plant breeding in the Philippines and in other countries. As pioneer in the use of molecular marker data in rice, he was able to establish kinship or coefficient of co-ancestry of rice breeding populations, thereby increasing selection efficiency. Leading the marker-assisted breeding program of the Philippine Rice Research Institute, they are able to produce high yielding rice varieties with resistances to biotic and abiotic stresses. Furthermore, his research on the genetic variance in maize that postulated theoretical and empirical evidence that non-additive genetic effects cause unexpected increase in genetic variance even under inbreeding has gained both national and international recognition.



WILFREDO A. DUMALE, JR., Ph.D.

Biological and Environmental Engineering

Nueva Vizcaya State University

In recognition of his significant contributions in the field of soil science in relation to the environment, particularly the turnover of stable soil organic carbon to atmospheric carbon dioxide (CO₂) and lime as major source of CO₂ evolution in limed acid soils, allowing the partitioning of the contribution of agricultural ecosystems to global warming. His academic activities also include serving as research adviser to soil science students and as editor as well as reviewer of peer reviewed scientific journals in soil science.



THOMAS EDISON E. DELA CRUZ, Dr. Rer. Nat.

Mycology

University of Santo Tomas

In recognition of his significant contributions in the study of fungal diversity in the country in particular on the under-explored myxomycetes, dictyostelids, fruticose lichens, mangrove fungi and marine fungi. He isolated novel natural products that can be developed into new drugs. His research study also depicted the role marine fungi play in ice-ice disease formation among cultivated seaweeds. This information could be useful in devising control measures for this disease. His research projects on myxomycetes and dictyostelids, as well as on the fruticose lichens revealed many new records for the country updating the records to 130 including one species new to science and three new species of dictyostelids.



MARCOS B. VALDEZ, JR., D. Agr. Sc.
Animal Genetics
De La Salle University

In recognition of his outstanding work in the establishment of several inbred lines of chickens which are currently used as general experimental animals in the fields of biomedicine, transgenic research, immunology, and population studies; elucidation of sex determination in *Aves* which is a major contribution to address the declining population of specialized avian stocks; and for his study on sex reversal of chicken which is a viable technique to preserve the germline of these stocks and can be applied in the conservation of wild endangered species.



LESLIE MICHELLE M. DALMACIO, Ph.D.
Molecular Biology and Biotechnology
University of the Philippines Manila

In recognition of her significant researches focusing on the human microbiome and probiotics studies which helped elucidate the community structure and role of these microorganisms in health and disease. Her involvement in the studies of probiotic bacteria, their isolation, identification, and utilization through metagenomics led to the discovery of microorganisms and potential probiotics missed out by previous culture-based studies that were present in some of our traditional fermented foods. Her molecular epidemiology study on an emerging hepatitis virus, Hepatitis G, showed co-occurrence of this infectious agent with Hepatitis B or C in the country, warranting an improvement in the screening of blood and blood products for blood banking. Furthermore, her epidemiological study on lymphatic filariasis with the National Filaria Elimination Program of the Department of Health contributed updated Philippine data to the Federation of Asian Parasitologists.



GEMMA TERESA T. NARISMA, Ph.D.
Atmospheric Science
Ateneo de Manila University

In recognition of her outstanding researches on the influence of land cover on climate and regional climate modeling. These are important in understanding the complex forces that drive anthropogenic climate change and in assessing the impacts of global climate change, especially on a climate-sensitive agricultural archipelago like the Philippines where impacts of global warming need to be known and anticipated. Her research outputs have been published in international journals and contribute significantly to public policy formulation and implementation on adaptation or disaster risk reduction measures.





BERNARD JOHN V. TONGOL, Ph.D.
Engineering [Applied Chemistry]
University of Santo Tomas

In recognition of his outstanding contributions in the field of electrochemical surface science, specifically on the electrochemical scanning tunnelling microscopy studies of electroactive polymers and oligomers of thiophenes on gold single crystal electrode. He continues his pioneering study on the development of single crystal electrodes as substrates for nanomaterials which could be metallic nanoparticles with electrocatalytic properties dispersed on poly(3,4-ethylenedioxythiophene) and carbon-based materials including graphene which are very relevant to fuel cell applications. His researches have been published in high-impact international journals. Moreover, he has selflessly shared his expertise through his excellent mentoring of undergraduate and graduate students whose theses have merited awards.



DERRICK ETHELBHART C. YU, Ph.D.
Chemistry
De La Salle University

In recognition of his outstanding research contributions in inorganic and organic metallic chemistry, specifically, in the design and synthesis of partially-oxidized metallophthalocyanines with axial ligands useful in the development of non-volatile computer memory and his one-step synthesis method enabling facile reproduction of promising molecular conductors. The latter created a new paradigm in molecular engineering of magnetic molecular conductors resulting in materials property controllability and optimization, while maintaining stable intrinsic electronic and magnetic properties. Further, his research on ligand-based computational drug design has brought about basis and considerations for designing potential drug molecules for cancer and diabetes. Early on, he has shown dedication in bringing science closer to the people by contributing to S&T development through education and creating public awareness that development in the country is hinged highly on S&T.



RONALD U. MENDOZA, Ph.D.
Economics
Asian Institute of Management

In recognition of his long-term research initiatives which focus on Philippine competitiveness, the requirements for inclusive growth, and the connection between political dynasties and development. He has enriched academic research with the experience gained from assignments undertaken in various emerging economies for different agencies of the United Nations. He has built over 12 years of research, policy advisory and applied experience in international development, including almost a decade as an economist with the United Nations. He has also established an extensive policy research and publications record in top caliber economics and policy journals.

NAST TALENT SEARCH FOR YOUNG SCIENTISTS IN THE PHILIPPINES



MARIO A. TAN, Ph.D.
Pharmaceutical Sciences
University of Santo Tomas

FIRST PRIZE

Outstanding scientific and technological contribution entitled:
"Isolation and Total Syntheses of Two New Alkaloids, Dubiusamines-A and -B, from *Pandanus dubius*"



DAHLIA C. APODACA, Ph.D.
Chemistry
University of the Philippines Diliman

SECOND PRIZE

Outstanding scientific and technological contribution entitled:
"Electropolymerized Molecularly Imprinted Polymer Films of a Bis-Terthiophene Dendron: Folic Acid Quartz Crystal Microbalance Sensing"



MARCOS B. VALDEZ, JR., Ph.D.
Animal Genetics
De La Salle University

THIRD PRIZE

Outstanding scientific and technological contribution entitled:
"Differential Development of Sex-related Characters of Chickens from the GSP and PNP/DO Inbred Lines after Left Ovariectomy"

NAST - HUGH GREENWOOD ENVIRONMENTAL SCIENCE AWARD

VIRGINIA C. CUEVAS, Ph. D.

Botany

Institute of Biological Sciences

University of the Philippines Los Baños



In recognition of her significant contributions in the development of technologies that help attain agricultural sustainability that contributed to environmental conservation and protection; for using her knowledge of basic ecology to develop composting technologies that help attain agricultural sustainability; for example, the *Trichoderma harzianum* Rifai Activator, which was used as an inoculant in the in-situ composting technology that significantly improved growth performance of the biofuel crop *Jatropha curcas*, and which can also decontaminate Cu-contaminated soils with mine tailings, hence, became the basis for the rehabilitation of the agricultural lands damaged by mine tailings in Mankayan, Benguet and Cervantes, Ilocos Sur. Her *Trichoderma* microbial inoculants (TMI) provided benefits to various crops as biofertilizer, biological control agent, crop promoter, and as activator for composting, all of which resulted in the significant improvement of the financial status of farmers.

NAST - LELEDFI AWARD FOR OUTSTANDING RESEARCH IN TROPICAL MEDICINE

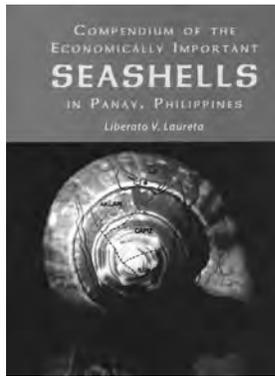


The Long-term Impact of Population-Based
Chemotherapy on Infection, Transmission
and Morbidity

by

REMEGIO M. OLVEDA, M.D.
Research Institute for Tropical Medicine

OUTSTANDING BOOK AWARD



Compendium of the Economically Important Seashells in Panay, Philippines
(by Liberato V. Laureta) ISBN 978-971-542-576-6
Published by The University of the Philippine Press, 2008

OUTSTANDING SCIENTIFIC PAPERS

Biological Sciences Division

“The Indo-Pacific *Gemmula* species in the subfamily Turrinae:
Aspects of field distribution, molecular phylogeny, regular anatomy and feeding ecology”
(by Francisco M. Heralde III, Yuri I. Kantor, Mary Anne Q. Astilla, Arturo O. Lluisma,
Rollan Geronimo, Porfirio M. Aliño, Maren Watkins, Patrice Showers Corneli,
Baldomero M. Olivera, Ameurfina D. Santos and Gisela P. Concepcion)
ISSN 2094-2818 *Philippine Science Letters* 3(1):21-34 2010

“Proto-ubiquitin: A Bayesian prediction of an ancient protein during the prokaryotic-eukaryotic transition”
(by Custer C. Deocaris, Lovette F. Cunanan, Richelda A. Galapia and Marla A. Endriga)
ISSN 0031-7683 *Philippine Journal of Science* 140(1):105-113 2011

Chemical, Mathematical, and Physical Sciences Division

“Mesoporous hybrid organosilica materials functionalized with biphenyl moiety”
(by Eduardo R. Magdaluyo Jr., Raymond V. Rivera Virtudazo, Leonard P. Dela Cruz,
Emily V. Castriciones, and Herman D. Mendoza)
ISSN 0031-7683 *Philippine Journal of Science* 138(1):5-11 2009

Social Sciences Division

“Household out-of-pocket health spending, health insurance coverage,
and children’s school attendance in the Philippines”
(by Joseph J. Capuno, Stella A. Quimbo, Carlos Antonio R. Tan and Aleli D. Kraft)
ISSN 1655-1516 *The Philippine Review of Economics* 56(2):155-181 2009

“The functional specification of the wage-experience relationship and
male wage inequality in the Philippines: A Decomposition Analysis”
(by Lawrence B. Dacuycuy)
ISSN 0116-7111 *DLSU Business and Economics Review* 18(2):31-54

34TH ASM COMMITTEES

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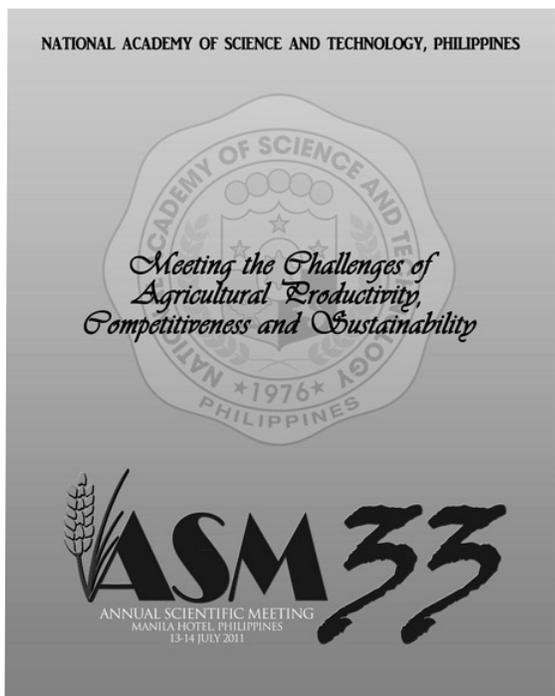
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33RD ANNUAL SCIENTIFIC MEETING

Meeting the Challenges of Agricultural Productivity, Competitiveness, and Sustainability
13-14 July 2011



The National Academy of Science and Technology, Philippines held its 33rd Annual Scientific Meeting (ASM) on 13-14 July 2011 at the Manila Hotel. Revolving Around the theme *Meeting the Challenges of Agricultural Productivity, Competitiveness, and Sustainability*, the 2011 ASM followed up and built upon the Philippine Agriculture 2020, from the 2005 ASM, a strategic plan developed out of a series of consultations and workshops convened by the Academy among the various stakeholders of the agriculture and fisheries sector.

Through a series of roundtable discussions, the Academy examined and discussed critical issues and concerns vital to the ability of a modern agricultural sector to meet the challenges of greater productivity, enhanced global competitiveness and sustainability and resilience in the face of deteriorating and declining availability of natural resources as well as climate change. The outcomes of these RTDs were presented and discussed in the 33rd ASM Plenary Sessions.

The Honorable Senator Francis N. Pangilinan, Chairman of the Senate Committee on Agriculture and Food and the Committee on Social Justice and Rural Development keyed the event. He recognized the importance of science and technology in the development of the

country and challenged the men and women of science to look for solutions on the country's problem on food security. Experts on the abovementioned fields shared their insights and experiences in the seven plenary sessions of the meeting. In Plenary Session 1, Acd. Emil Q. Javier, NAST President, discussed *Philippine Agriculture 2020: A Strategy for Poverty, Reduction, Food Security, Competitiveness, Sustainability, and Justice and Peace*. Acd. Rafael D. Guerrero III, on the other hand, talked about *Managing Our Marine Frontier: Challenges and Opportunities* for Plenary Session 2. This was followed by Plenary Session 3, *Further Intensification of Agriculture: A Must to Meet the Challenges of Agricultural Productivity, Sustainability, and Competitiveness*, delivered by Acd. Ruben L. Villareal. During Plenary Session 4, CM Reynaldo L. Villareal discussed *How Sustainable is Organic Agriculture?* while in Plenary Session 5, Acd. Arsenio M. Balisacan talked



about *Strengthening Agricultural Supply Chains in the Country*. Acd. Rodel D. Lasco in Plenary Session 6 discussed *Sustaining Ecological Services for Agricultural Productivity, Sustainability, and Competitiveness*. In Plenary Session 7, Dr. Marlowe U. Aquino led the discussion on the *Imperatives of Extension, e-Information, Communication, and Statistics in Agricultural Development*.

The 33rd ASM was organized by the Academy with the assistance from donors and sponsors. More than 700 scientists and researchers from key institutions and agencies attended the event. The 2011 Annual Scientific Meeting was organized by the NAST Agricultural Sciences Division and was co-chaired by National Scientist Dolores A. Ramirez an Academician Emil Q. Javier.

Part of the two-day program was the recognition ceremonies for the following awards: Investiture of the new Academicians, Outstanding Young Scientist (OYS), TWAS Prize for Young Scientists in the Philippines, NAST Talent Search for Young Scientists, Outstanding Scientific Papers, Outstanding Books and Monographs, NAST-Hugh Greenwood Environmental Science Award, and NAST-LELEDFI Award for Outstanding Research in Tropical Medicine.

The 33rd Annual Scientific Meeting of NAST aimed to provide analyses and science-based solutions/policy recommendations to the government, the private sector and society at large on the modernization and further development of Philippine agriculture.

The resulting recommendations of this year's Annual Scientific Meeting were summarized into the Resolutions on Meeting the Challenges of Agricultural Productivity, Competitiveness, and Sustainability, which were presented by NAST President Acd. Emil Q. Javier to DOST Secretary Engr. Mario G. Montejo and DA Secretary Proceso Alcala through Bureau of Agricultural Research Director Nicomedes P. Eleazar. The Academy trusts that the results of the 2011 ASM would be considered by the current administration as a guide to assist concerned departments and agencies in preparing and implementing the roadmap for the agricultural sector.



EXECUTIVE COMMITTEE

(CY 2009 - PRESENT)



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Chair, Biological Sciences Division



National Scientist MERCEDES B. CONCEPCION
Vice President
Chair, Social Sciences Division



Academician EVELYN MAE TECSON-MENDOZA
Secretary
Chair, Chemical, Mathematical and Physical Sciences Division



National Scientist DOLORES A. RAMIREZ
Member
Chair, Agricultural Sciences Division



Academician CEFERINO L. FOLLOSCO
Member
Chair, Engineering Sciences and Technology Division



Academician QUINTIN L. KINTANAR
Member
Chair, Health Sciences Division

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NAST MEMBERS (1978-2011)

Year Elected as Academician	Name	Field of Specialization
1978	+Paulo C. Campos, M.D.*	Nuclear Medicine
1978	+Alfredo V. Lagmay, Ph.D.*	Experimental Psychology
1978	+Cecilio F. Lopez, Dr. Phil.	Philippine Linguistics and Oriental Studies
1978	+Tito A. Mijares, Ph.D.	Statistics
1978	+Juan S. Salcedo, Jr., M.D., D.Sc.*	Nutrition and Public Health
1978	+Alfredo C. Santos, Dr. Phil.*	Physical Chemistry
1978	+Dioscoro L. Umali, Ph.D.*	Genetics and Plant Breeding
1978	+Carmen C. Velasquez, Ph.D.*	Parasitology
1978	+Gregorio T. Velasquez, Ph.D.*	Phycology
1978	+Gregorio Y. Zara, D. Sc.*	Engineering and Inventions
1979	+Encarnacion A. Alzona, Ph.D.*	Philippine History
1979	+Teodoro A. Agoncillo, Litt.D. (h.c.)*	Philippine History
1979	+José Encarnación, Jr., Ph.D.*	Economics
1979	+Pedro B. Escuro, Ph.D.*	Genetics and Plant Breeding
1979	+Raymundo A. Favila, Ph.D.	Mathematics
1979	+Francisco M. Fronda, Ph.D.*	Animal Husbandry
1979	Bienvenido O. Juliano, Ph.D.*	Organic Chemistry
1979	+Melecio S. Magno, Ph.D.	Physics
1979	+Fe V. del Mundo, M.D., M.A.*	Pediatrics
1979	+Geminiano T. de Ocampo, M.D.*	Ophthalmology
1979	+Eduardo A. Quisumbing, Ph.D.*	Plant Taxonomy, Systematics and Morphology
1979	+Jose N. Rodriguez, M.D.	Leprology
1979	+Casimiro del Rosario, Ph.D.*	Physics, Astronomy and Metrology
1980	+Luz Oliveros-Belardo, Ph.D.*	Pharmaceutical Chemistry
1980	+Magdalena C. Cantoria, Ph.D.	Botany
1980	+Emerita V. de Guzman, Ph.D.	Plant Physiology
1980	+Conrado S. Dayrit, M.D.	Pharmacology, Cardiology
1980	+Francisco O. Santos, Ph.D.*	Human Nutrition and Agricultural Chemistry
1980	+Joventino D. Soriano, Ph.D.	Cytogenetics and Mutation Research
1980	Clara Y. Lim-Sylianico, Ph.D.*	Biochemistry and Organic Chemistry
1981	Clare R. Baltazar, Ph.D.*	Systematic Entomology
1981	+Julian A. Banzon, Ph.D.*	Biophysical Chemistry
1981	+Amando M. Dalisay, Ph.D.	Economics
1981	+Benjamin D. Cabrera, M.D., M.P.H.	Medical Parasitology and Public Health
1982	Emil Q. Javier, Ph.D.	Plant Breeding and Genetics
1983	Gelia T. Castillo, Ph.D.*	Rural Sociology
1983	Jose O. Juliano, Ph.D.	Nuclear Chemistry and Physics
1983	+Hilario D. G. Lara, M.D., Dr. P.H.	Public Health
1983	Bienvenido F. Nebres, S.J., Ph.D.*	Mathematics
1983	+Faustino T. Orillo, Ph.D.	Mycology
1983	+Jose R. Velasco, Ph.D.*	Plant Physiology
1985	Quintin L. Kintanar, M.D., Ph.D.	Environmental Medicine
1985	+Quirino O. Navarro, Ph.D.	Nuclear Chemistry
1985	+Gregorio F. Zaide, Ph.D.	History
1987	Solita F. Camara-Besa, M.D., M.S.	Biochemistry
1987	Filomena F. Campos, Ph.D.	Plant Breeding/Cytogenetics

+ *deceased*

* *National Scientist*

Year Elected as Academician	Name	Field of Specialization
1987	Lourdes J. Cruz, Ph.D.*	Biochemistry
1987	+Edito G. Garcia, M.D.	Medical Parasitology
1987	+Carmen Ll. Intengan, Ph.D.	Nutrition
1987	Dolores A. Ramirez, Ph.D.*	Biochemical Genetics
1987	Benito S. Vergara, Ph.D.*	Plant Physiology
1987	+Prescillano M. Zamora, Ph.D.	Plant Anatomy-Morphology
1988	Ricardo M. Lantican, Ph.D.*	Plant Breeding
1990	+Leopoldo S. Castillo, Ph.D.	Animal Science
1990	Apolinario D. Nazarea, Ph.D.	Biophysics
1990	Ruben L. Villareal, Ph.D.	Horticulture
1992	Mercedes B. Concepcion, Ph.D.*	Demography
1992	Ernesto O. Domingo, M.D.*	Internal Medicine/Gastroenterology
1992	Rafael D. Guerrero III, Ph.D.	Fisheries Management
1992	Evelyn Mae T. Mendoza, Ph.D.	Biochemistry
1993	Ramon F. Abarquez, Jr., M.D.	Cardiology
1993	Salcedo L. Eduardo, Ph.D.	Veterinary and Medical Parasitology
1993	Edgardo D. Gomez, Ph.D.	Marine Biology
1993	Teodulo M. Topacio Jr., Ph.D.*	Veterinary Medicine
1994	+Perla D. Santos Ocampo, M.D., FPPS, FAAP*	Pediatrics
1995	+Ledivina V. Cariño, Ph.D.	Sociology and Public Administration
1995	Raul V. Fabella, Ph.D.*	Economics
1995	William G. Padolina, Ph.D.	Phytochemistry
1996	Veronica F. Chan, Ph.D.	Microbiology
1996	+Andrew Gonzalez, F.S.C, Ph.D.	Linguistics
1999	Onofre D. Corpuz, Ph.D.*	Political Economy and Government
2000	Filemon A. Uriarte Jr., Ph.D.	Chemical Engineering
2001	Ceferino L. Follosco, Ph.D. (h.c.)	Mechanical, Electrical, & Agricultural Engineering
2001	Angel L. Lazaro III, Ph.D.	Civil Engineering
2001	William T. Torres, Ph.D.	Computer Science
2001	Reynaldo B. Veal, Ph.D.	Marine Transportation System, Naval Architecture
2002	Romulo G. Davide, Ph.D.	Plant Pathology
2002	Asuncion K. Raymundo, Ph.D.	Microbial Genetics/Plant Pathology
2004	Ramon C. Barba, Ph.D.	Horticulture
2004	Angel C. Alcala, Ph.D.	Vertebrate Systematics and Ecology
2005	Caesar A. Saloma, Ph.D.	Physics
2006	Eliezer A. Albacea, Ph.D.	Computer Science
2006	Thelma E. Tupasi, M.D.	Infectious Diseases
2007	Christopher C. Bernido, Ph.D.	Theoretical Physics
2007	Leonardo Q. Liongson, Ph.D.	Water Resources Administration/Hydrology
2007	Allan Benedict I. Bernardo, Ph.D.	Cognitive Psychology
2008	Libertado C. Cruz, Ph.D.	Reproductive Biotechnology
2008	Gisela P. Concepcion, Ph.D.	Marine Science
2008	Gavino C. Trono, Ph.D.	Marine Botany
2008	Jose Maria P. Balmaceda, Ph.D.	Mathematics
2008	Alvin B. Culaba, Ph.D.	Mechanical Engineering
2008	Jaime C. Montoya, M.D., M.S.	Infectious Diseases
2008	Carmencita D. Padilla, M.D., MAHPS	Human Genetics
2008	Arsenio M. Balisacan, Ph.D.	Economics

+ deceased

* National Scientist

Year Elected as Academician	Name	Field of Specialization
2009	Rodel D. Lasco, Ph.D.	Forestry
2009	Eufemio T. Rasco Jr., Ph.D.	Plant Breeding
2009	Rhodora V. Azanza, Ph.D.	Botany
2009	Fabian M. Dayrit, Ph.D.	Chemistry
2010	Marco Nemesio E. Montaña, Ph.D.	Biological Chemistry
2010	Fernando P. Siringan, Ph.D.	Geology
2010	Guillermo Q. Tabios III, Ph.D.	Civil Engineering
2010	Antonio Miguel L. Dans, M.D.	Clinical Epidemiology
2011	Ernesto J. Del Rosario, Ph.D.	Chemistry
2011	Aura C. Matias, Ph.D.	Industrial Engineering
2011	Agnes C. Rola, Ph.D.	Agricultural Economics

CORRESPONDING MEMBERS

2003	Jose B. Cruz, Jr., Ph.D.	Electrical Engineering
2003	Amador C. Muriel, Ph.D.	Physics
2003	Eduardo A. Padlan, Ph.D.	Biophysics
2004	Baldomero M. Olivera, Ph.D.	Biochemistry
2006	Reynaldo L. Villareal, Ph.D.	Plant Breeding/Plant Pathology
2007	Liwayway M. Engle, Ph.D.	Genetics
2009	Manuel M. Garcia, Ph.D.	Microbiology
2010	Kelvin S. Rodolfo, Ph.D.	Marine Geology
2011	Eduardo R. Mendoza, Ph.D.	Mathematics

HONORARY MEMBER

2000	+Norman E. Borlaug, Ph.D. <i>1970 Nobel Peace Prize Laureate</i>	Agronomy/Plant Breeding
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+ *deceased*
* *National Scientist*

OUTSTANDING YOUNG SCIENTISTS (1980-2011)

Year Awarded	Name	Field of Specialization
1980	Ernesto J. del Rosario, Ph.D. <i>(Elected Academician, 2011)</i>	Chemistry
1980	Salcedo L. Eduardo, Ph.D. <i>(Elected Academician, 1993)</i>	Veterinary and Medical Parasitology
1980	Rafael D. Guerrero III, Ph.D. <i>(Elected Academician, 1992)</i>	Fisheries Management
1980	Rufino H. Ibarra, Ph.D.	Physics
1980	Florian M. Orejana-Ward, Ph.D.	Fish Processing and Quality Control
1980	Ely Anthony R. Ouano, Ph.D.	Environmental Engineering
1980	Ernesto M. Pernia, Ph.D.	Economic Demography
1980	Alberto Romualdez, Jr., M.D.	Medicine
1980	Thelma E. Tupasi-Ramos, M.D. <i>(Elected Academician, 2006)</i>	Infectious Diseases
1980	Victoria A. Vicente-Beckett, Ph.D.	Chemistry
1981	Romeo M. Bautista, Ph.D.	Economics
1981	Paciente A. Cordero, Jr., Ph.D.	Marine Biology
1981	Lourdes J. Cruz, Ph.D. <i>(Elected Academician, 1987 and Conferred the Rank and Title of National Scientist, 2006)</i>	Biochemistry
1981	Severino V. Gervacio, Ph.D.	Mathematics
1981	Esperanza A. Icasas-Cabral, M.D.	Cardiology
1981	Ernesto P. Lozada, Ph.D.	Agricultural Engineering
1981	Manolito G. Natera, Ph.D.	Physics
1982	Carmelo A. Alfiler, M.D.	Pediatric Medicine
1982	Rodolfo P. Cabangbang, Ph.D.	Agronomy
1982	Virgilio G. Enriquez, Ph.D.	Psychology
1982	Alejandro N. Herrin, Ph.D.	Demographic Economics
1982	Jose G. Marasigan, Ph.D.	Mathematics
1982	William G. Padolina, Ph.D. <i>(Elected Academician, 1995)</i>	Phytochemistry
1982	Percy A. Sajise, Ph.D.	Ecology
1982	Benito L. Tanhehco, M.D.	Biomedical Engineering
1983	Ponciano S.M. Halos, Ph.D.	Plant Pathology
1983	Remigio M. Olveda, M.D.	Parasitic Diseases
1983	Vicente B. Paqueo, Ph.D.	Human Resource Economics
1983	Luzvisminda U. Rivero, Ph.D.	Chemistry
1984	William T. Chua, M.D.	Cardiovascular Medicine
1984	Reynaldo E. dela Cruz, Ph.D.	Forestry
1984	Evelyn Mae T. Mendoza, Ph.D. <i>(Elected Academician, 1992)</i>	Biochemistry
1984	Roger R. Posadas, Ph.D.	Physics
1984	Eufemio T. Rasco, Ph.D. <i>(Elected Academician, 2009)</i>	Plant Breeding
1984	Filemon A. Uriarte, Jr., Ph.D. <i>(Elected Academician, 2000)</i>	Chemical Engineering
1985	William D. Dar, Ph.D.	Agriculture
1985	Alumanda M. dela Rosa, Ph.D.	Radiation Chemistry

Year Awarded	Name	Field of Specialization
1985	Ann Inez N. Gironella, Ph.D.	Statistics
1985	Jose A. Magpantay, Ph.D.	Physics
1985	Corazon M. Raymundo, D.Sc.	Population Science
1985	Mediadora C. Saniel, M.D.	Epidemiology
1985	Amaryllis T. Torres, Ph.D.	Psychology
1985	Regalado G. Zamora, Ph.D.	Animal Science
1986	Edwin A. Benigno, Ph.D.	Entomology
1986	Ida F. Dalmacio, Ph.D.	Food Microbiology
1986	Ma. Concepcion C. Lizada, Ph.D.	Biochemistry
1986	Ernesto S. Luis, Ph.D.	Food Chemistry
1986	Manolo G. Mena, Ph.D.	Metallurgy
1986	Glorina N. Pocsidio, Ph.D.	Zoology
1986	Danilo M. Yanga, Ph.D.	Physics
1987	Ruperto P. Alonzo, M.A.	Economics
1987	Dante B. Canlas, Ph.D.	Economics
1987	Rene P. Felix, Ph.D.	Mathematics
1987	Miguel D. Fortes, Ph.D.	Marine Plant Ecology
1987	Ruben M. Gapasin, Ph.D.	Plant Pathology
1987	Wilfredo I. Jose, Ph.D.	Chemical Engineering
1987	Felino P. Lansigan, Ph.D.	Statistics
1987	Reynaldo C. Mabesa, Ph.D.	Food Science
1987	Manuel F. Montes, Ph.D.	Economics
1987	Linda S. Posadas, Ph.D.	Physics
1988	Francisco M. Basuel, Ph.D.	Animal Science
1988	Ma. Cynthia Rose B. Bautista, Ph.D.	Sociology
1988	Manuel M. Lantin, Ph.D.	Plant Breeding
1988	Rolando E. Ramos, Ph.D.	Mathematics
1988	Polly W. Sy, Ph.D.	Mathematics
1988	Benito C. Tan, Ph.D.	Botany
1989	Efren C. Abaya, Ph.D.	Electrical Engineering
1989	Candida B. Adalla, Ph.D.	Entomology
1989	Christopher C. Bernido, Ph.D. <i>(Elected Academician, 2007)</i>	Physics
1989	Virginia C. Cuevas, Ph.D.	Botany
1989	Mary Ann D. Lansang, M.D.	Clinical Epidemiology
1989	Alfinetta Fermina B. Zamora, Ph.D.	Agronomy
1990	Ambrosio Raul R. Alfiler, M.S.	Entomology
1990	+Adelina A. Barrion, Ph.D.	Insect Genetics
1990	Manuel M. Dayrit, M.D.	Epidemiology and Public Health
1990	Emmanuel M. Lagare, Ph.D.	Mathematics
1990	Rodel G. Maghirang, M.S.	Vegetable Breeding
1990	Roberto N. Padua, Ph.D.	Theoretical Statistics
1990	Lilian F. Pateña, M.S.	Plant Tissue Culture
1990	Manuela Fe H. Tarroja, Ph.D.	Physics
1990	Wilfred U. Tiu, Ph.D.	Parasitology/Immunology
1991	Victor B. Amoroso, Ph.D.	Botany
1991	Alberto T. Barrion, M.S.	Entomology
1991	Ma. Cecilia Gastardo-Conaco, Ph.D.	Psychology
1991	Emerenciana E. Ballelos-Duran, Ph.D.	Biophysics
1991	Edwino S. Fernando, M.S.	Plant Taxonomy
1991	Ma. Socorro H. Gochoco-Bautista	Economics
1991	Joseph Anthony Y. Lim, Ph.D.	Economics

+ *deceased*

Year Awarded	Name	Field of Specialization
1991	Florentino C. Sumera, Ph.D.	Chemistry
1991	Violeta N. Villegas, Ph.D.	Fruit Breeding and Genetics
1992	Arsenio M. Balisacan, Ph.D. <i>(Elected Academician, 2008)</i>	Economics
1992	Rhodora A. del Rosario, M.D.	Health Science
1992	Portia G. Lapitan, M.S.	Forest Biology
1992	Luz R. Nochefranca, Ph.D.	Mathematics
1992	Valentino C. Perdido, M.S.	Crop Science
1992	Caesar A. Saloma, Ph.D. <i>(Elected Academician, 2005)</i>	Applied Physics
1992	Irene M. Villaseñor, Ph.D.	Chemistry
1992	Ma. Helena T. Yap, Ph.D.	Marine Biology
1993	Josephine U. Agravante, Ph.D.	Postharvest Horticulture
1993	Ma. Alicia M. Aguinaldo, Ph.D.	Chemistry
1993	Porfirio Alexander M. Aliño, Ph.D.	Marine Biology
1993	Angelina M. Bacala, Ph.D.	Physics
1993	Severino S. Capitan, Ph.D.	Animal Physiology/Nutrition
1993	Emmanuel S. de Dios, Ph.D.	Economics
1993	Gerardo C. Janairo, D. Nat. Sci.	Chemistry
1993	Shirley R. Tiong-Palisoc, Ph.D.	Physics
1993	Graciano P. Yumul, Jr., D. Sc.	Geology
1994	Teresita H. Borromeo, M.S.	Plant Breeding
1994	Cherrie L. Bunag-Pascual, Ph.D.	Chemistry
1994	Sergio S. Cao, Ph.D.	Mathematics
1994	Elda B. Esguerra, Ph.D.	Postharvest Horticulture
1994	Gil S. Jacinto, Ph.D.	Marine Chemistry
1994	Marie Antonette Juinio-Menez, Ph.D.	Marine Biology
1994	Terencio D. Lacuesta, Ph. D.	Physics
1994	Manuel L. Logroño, Ph.D.	Plant Breeding and Genetics
1994	Desiree I. Menancio-Hautea, Ph.D.	Plant Genetics and Molecular Biology
1994	Cecilia P. Reyes, Ph.D.	Entomology
1995	Abundio A. Balgos, M.D.	Pulmonary and Internal Medicine
1995	Jose Maria P. Balmaceda, Ph.D. <i>(Elected Academician, 2008)</i>	Mathematics
1995	Allan Benedict I. Bernardo, Ph.D. <i>(Elected Academician, 2007)</i>	Cognitive Psychology
1995	Armando C. Crisostomo, M.D.	Colon and Rectal Surgery
1995	Maribel L. Dionisio-Sese, Dr. Sc.	Biophysics
1995	Zenaida N. Ganga, Ph.D.	Plant Breeding
1995	Randy A. Hautea, Ph.D.	Plant Breeding
1995	Antonio Carlos Laurena, Ph.D.	Agricultural Chemistry
1995	Merlyn S. Mendioro, Ph.D.	Genetics
1995	Fidelina B Natividad-Carlos, Ph.D.	Economics
1996	Antonio L. Acedo, Ph.D.	Horticulture
1996	Jezie A. Acorda, Ph.D.	Veterinary Medicine
1996	Eliezer A. Albacea, Ph.D. <i>(Elected Academician, 2006)</i>	Computer Science
1996	Carmelita A. Belda-Baillie, Ph.D.	Zoology
1996	Jose E. Hernandez, Ph.D.	Plant Breeding and Genetics
1996	Eduardo C. Lim, M.D.	Immunology
1996	Jose M. Oclarit, Ph.D.	Applied Biochemistry
1996	Jossie M. Rogacion, M.D.	Pediatrics Nutrition and Gastroenterology

Year Awarded	Name	Field of Specialization
1996	Roland V. Sarmago, Ph.D.	Physics
1996	Tessa T. Torres-Edejer, M.D.	Clinical Economics
1997	Rhodora R. Aldemita, Ph.D.	Botany
1997	Orville L. Bondoc, Ph.D.	Animal Breeding/Genetics
1997	Leonorina G. Cada, Ph.D.	Chemistry
1997	Antonio Miguel L. Dans, M.D., M.S. <i>(Elected Academician, 2010)</i>	Clinical Epidemiology
1997	Ricardo T. Jose, Ph.D.	History/Area Study
1997	Rodel D. Lasco, Ph.D. <i>(Elected Academician, 2009)</i>	Forestry
1997	Damasa M. Magcale-Macandog, Ph.D.	Botany
1997	Blessilda P. Raposa, Ph.D.	Mathematics
1997	Cesar L. Villanoy, Ph.D.	Physical Oceanography
1997	Edward H.M. Wang, Ph.D.	Orthopedics
1998	Vermando M. Aquino, Ph.D.	Plant Pathology
1998	Philbert S. Bonilla, Ph.D.	Plant Physiology
1998	Mark J. Encarnación, Dr. Techn.	Technical Mathematics
1998	Mario R. Festin, M.D.	Obstetrics and Gynecology
1998	Ma. Emma Concepcion D. Liwag, Ph.D.	Psychology
1998	Ronald R. Matias, Ph.D.	Zoology
1998	Jaime C. Montoya, M.D. <i>(Elected Academician, 2008)</i>	Microbiology
1998	Felix P. Muga II, Ph.D.	Mathematics
1998	Edilberto D. Redoña, Ph.D.	Genetics
1998	Ma. Jamela R. Revilleza, Ph.D.	Biochemistry
1999	Vicente Y. Belizario, Jr., M.D.	Tropical Medicine/Hygiene
1999	Merdelyn T. Caasi-Lit, Ph.D.	Plant Science/Entomology
1999	Sergio R. Canoy, Jr., Ph.D.	Mathematics
1999	Cesar G. Demayo, Ph.D.	Entomology/Genetics
1999	Danilo B. Largo, Ph.D.	Aquatic Environmental Science
1999	Bernadette D.L. Libranda-Ramirez, Ph.D.	Immunology
1999	Eric R. Punzalan, Ph.D.	Chemistry
1999	Leocadio S. Sebastian, Ph.D.	Plant Breeding
2000	Rafael C. Bundoc, M.D.	Orthopedics
2000	Arnel N. del Barrio, Ph.D.	Ruminant Nutrition
2000	Ireneo L. Lit, Jr., M.S.	Entomology
2000	Pablito M. Magdalita, Ph.D.	Plant Breeding
2000	Francisco A. Magno, Ph.D.	Political Science
2000	Roberto M. Malaluan, Dr. Engineering	Chemical Engineering
2000	Perry S. Ong, Ph.D.	Behavioral Ecology and Evolutionary Biology
2000	Ishmael D. Ordoñez, Ph.D.	Chemistry
2000	Ricardo Jose D.L.T. Quintos II, M.D.	Vascular Surgery
2000	Jose Ramon T. Villarin, S.J., Ph.D.	Atmospheric Physics
2001	Lemnuel V. Aragonas, Ph.D.	Marine Biology
2001	Conrado H. Balatero, Ph.D.	Plant Breeding
2001	Edward F. Barroga, Ph.D.	Veterinary Oncology
2001	Christina A. Binag, Ph.D.	Chemistry
2000	Dindo M. Campilan, Ph.D.	Communication and Innovation Studies
2001	Albert A. Gapud, Ph.D.	Physics
2001	Ma. Antonia E. Habana, M.D., M.S.	Epidemiology
2001	Patricio P. Palmes, M.D.	Internal Medicine
2001	Simeona V. Siar, Ph.D.	Plant Breeding

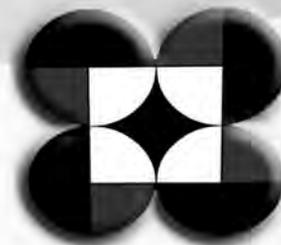
Year Awarded	Name	Field of Specialization
2001	John Paul C. Vergara, Ph.D.	Computer Science and Applications
2002	Renato A. Avenido, Ph.D.	Agricultural Sciences
2002	Peter S. Guzman, Ph.D.	Plant Breeding
2002	Raymund C. Sison, Ph.D.	Computer Science
2002	Arnel A. Salvador, Ph.D.	Physics
2002	Eva Maria C. Cutiongco, M.D.	Genetics
2002	Maria Lourdes de Leon-Matsuda, M.D.	Surgery
2002	Queena N. Lee-Chua, Ph.D.	Psychology
2003	Nathaniel C. Bantayan, Ph.D.	Forestry Engineering
2003	William L. delos Santos, Ph.D.	Agronomy and Soils
2003	Ma. Corazon A. de Ungria, Ph.D.	Molecular Biology
2003	Evelyn Grace T. de Jesus-Ayson, Ph.D.	Zoology
2003	Agnes T. Paras, Ph.D.	Mathematics
2003	Carla B. Dimalanta, Ph.D.	Geology
2003	Mary Ann A. Endoma, Ph.D.	Chemistry
2003	Jesus N. Sarol, Jr., M.D.	Epidemiology
2003	Jose Alberto S. Reyes, Ph.D.	Psychology
2004	Glenn B. Gregorio, Ph.D.	Genetics
2004	Rio John T. Ducusin, Ph.D.	Veterinary Science
2004	Cynthia P. Saloma, Ph.D.	Physiology
2004	Wenresti G. Gallardo, Ph.D.	Marine Science
2004	Jean O. Loyola, Ph.D.	Mathematics
2004	Erwin P. Enriquez, Ph.D.	Physical Chemistry
2004	Raymond R. Tan, Ph.D.	Mechanical Engineering
2004	Marie Carmela M. Lapitan, M.D.	Urology
2004	Jonna DLP. Estudillo, Ph.D.	Economics
2004	Ma. Joy V. Abrenica, Ph.D.	Economics
2005	John Donnie A. Ramos, Ph.D.	Molecular Biology/Immunology
2005	Julie F. Barcelona, Ph.D.	Botany
2005	Ricardo C.H. del Rosario, Ph.D.	Mathematics
2005	Mario Juan A. Aurelio, Ph.D.	Structural Geology and Tectonics
2005	Luis Francisco G. Sarmenta, Ph.D.	Electrical Engineering, Computer Science
2005	Felix Eduardo R. Punzalan, M.D.	Cardiology
2005	Ronaldo B. Mactal, Ph.D.	History
2005	Ma. Regina M. Hechanova, Ph.D.	Industrial/Organizational Psychology
2006	Ma. Genaleen Q. Diaz, Ph.D.	Genetics
2006	Grecebio Jonathan D. Alejandro, Ph.D.	Botany
2006	Arturo O. Lluisma, Ph.D.	Biology
2006	Jose Ernie C. Lope, Ph.D.	Mathematics
2006	Vincent Ricardo M. Daria, D. Eng'g.	Applied Physics
2006	Maricor N. Soriano, Ph.D.	Applied Physics
2006	Lenora C. Hernandez, M.D.	Respiratory Health and Emergency Care
2006	Jericho Thaddeus P. Luna, M.D.	Obstetrics and Gynecology
2006	Windell L. Rivera, Ph.D.	Medical Science
2006	Rollin P. Tabuena, M.D.	Pulmonary Medicine
2007	Willie P. Abasolo, Ph.D.	Agriculture
2007	Christian Joseph R. Cumagun, Ph.D.	Agriculture
2007	Arnold V. Hallare, Dr rer nat	Ecotoxicology
2007	Ephrime B. Metillo, Ph.D.	Zoology
2007	Drexel H. Camacho, Ph.D.	Chemistry
2007	Laura T. David, Ph.D.	Physical Oceanography
2007	Joseph Auresenia, Ph.D.	Chemical Engineering

Year Awarded	Name	Field of Specialization
2007	Paulito P. Palmes, D. Eng'g.	Information and Computer Science
2007	Eduardo C. Ayuste Jr., M.D.	Clinical Surgery
2007	Czarina A. Saloma-Akpedonu, Ph.D.	Sociology
2008	Constancio A. Asis Jr., Ph.D.	Agriculture
2008	Hayde F. Galvez, Ph.D.	Agriculture
2008	Antonio A. Alfonso, Ph.D.	Plant Biology
2008	Arvin D. Diesmos, M.S.	Wildlife Ecology and Environmental Sciences
2008	Carlo Mar Y. Blanca, Ph.D.	Physics
2008	Roberto B. Corcino, Ph.D.	Mathematics
2008	Jaderick P. Pabico, M.S.	Computer Science
2008	Dennis S. Mapa, Ph.D.	Economics
2008	Edsel L. Beja Jr., Ph.D.	Economics
2009	Antonio G. Lalusin, Ph.D.	Plant Breeding
2009	Ronald D. Villanueva, Ph.D.	Marine Science
2009	Lucille C. Villegas, Ph.D.	Microbiology
2009	Julius M. Basilla, Ph.D.	Mathematics
2009	Melito A. Baccay, Dr. of Engineering	Civil Engineering
2009	Ma. Stephanie Fay S. Cagayan, M.D.	OB-Gyne and Trophoblastic Diseases
2009	Leoncio L. Kaw, M.D.	Surgery
2009	Lawrence G. Dacuycuy, Ph.D.	Economics
2009	Stella Luz A. Quimbo, Ph.D.	Economics
2010	Von Mark V. Cruz, Ph.D.	Plant Breeding
2010	Roel R. Suralta, Ph.D.	Agricultural Sciences
2010	Gayvelline C. Calacal, M.S.	Molecular Biology
2010	Rachel June Ravago-Gotanco, M.S.	Molecular Biology and Biotechnology
2010	Eric A. Galapon, Ph.D.	Physics
2010	Fredegusto Guido P. David, Ph.D.	Biomedical Engineering
2010	Alvin R. Caparanga, Ph.D.	Environmental Engineering
2010	Allan A. Sioson, Ph.D.	Computer Science and Applications
2010	Maria Pura R. Solon, M.D., M.S.	Tropical Medicine and International Health
2010	Edsel Maurice T. Salvaña, M.D., DTM&H	Tropical Medicine
2010	Mary Janet M. Arnado, Ph.D.	Sociology
2011	Nathaniel C. Añasco, Ph.D.	Fisheries Science
2011	Claro N. Mingala, Ph.D.	Infectious Diseases
2011	Mudjekeewis D. Santos, Ph.D.	Applied Marine Biosciences
2011	Waren N. Baticados, Ph.D.	Veterinary Science
2011	Juan Carlos T. Gonzalez, M.S.	Zoology
2011	Regina C. So, Ph.D.	Organic Chemistry
2011	Christopher P. Monterola, Ph.D.	Physics
2011	Joseph M. Pasia, Ph.D.	Social and Economic Sciences
2011	Allan N. Soriano, Ph.D.	Chemical Engineering
2011	Jose Bienvenido Manuel M. Biona, Ph.D.	Mechanical Engineering
2011	Carlo P. Magno, Ph.D.	Philosophy in Educational Psychology

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For more information, please contact:

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Department of Science and Technology

National Committee on Biosafety of the Philippines

The National Committee on Biosafety of the Philippines (NCBP) is the lead authority that harmonizes and coordinates inter-agency and multi-sector efforts on biosafety-related undertakings. It is composed of the Secretaries of the Departments of Science and Technology, Agriculture, Health, Environment and Natural Resources, Foreign Affairs, Trade and Industry, and Interior and Local Government, with the DOST Secretary as the permanent Chair. It also has members from the scientific and research community, consumer and industry groups, and the civil society.

Created through Executive Order No. 430 and strengthened by Executive Order No. 514, the NCBP is conferred with key

functions under existing laws: biosafety policy, accountability, scientific, and capacity-building, thus, enabling them to develop biosafety policies and coherent scientific, technical and procedural standards significant to achieving decisions that promote and ensure biosafety in the country.

The executive issuances were released to respond to the challenges posed by the use of modern biotechnology and to enhance the country's existing National Biosafety Framework. It likewise delineated the responsibilities of other government agencies involved in regulating the use of genetically-modified organisms (GMOs), specifically, the DOST, DA, DENR

and DOH, to manage and carry out risk assessment to address the growing concerns over the potential impacts of modern biotechnology to the environment, human, and animal health. The agencies are expected to convene their respective biosafety committees in accordance with their mandates, to handle GMO applications from scientific research to eventual propagation and commercialization.

Procedural guidelines have already been developed and are currently under review to achieve a seamless regulatory structure.

Visit the NCBP website at <http://www.ncbp.dost.gov.ph> for further information.



BCH
PILIPINAS

Biosafety Clearing-House of the Philippines

To learn more about country decisions and risk assessment on GMOs intended for food, feed, and processing, visit the BCH Pilipinas at <http://bch.dost.gov.ph>.

The Cartagena Protocol on Biosafety, as stated in its Article 20, has set grounds for establishing the Biosafety Clearing-House (BCH) to facilitate its implementation across countries. The BCH is a knowledge and information exchange tool that contains pertinent biosafety-related information, and also functions as a platform to discuss and share experiences of countries in implementing the Protocol.

Being a signatory to the Protocol, the Philippines had set up the BCH Pilipinas in 2008 that serves as a 'one-stop shop' where users can easily search and retrieve biosafety-related information. It also forges collaboration among regulatory agencies and their partners in extending information services for the benefit of public and private research institutions, civil society organizations, and other stakeholders.

Information available in the BCH Pilipinas includes pertinent laws and regulations governing LMOs, country decisions on LMOs, links to existing biosafety-related websites and databases of agencies and institutions engaged in modern biotechnology and biosafety.



DOST-Biosafety Committee

By virtue of E.O. 514, the DOST created its biosafety committee (DOST-BC) to take the lead in ensuring that biosafety policies, measures, guidelines and decisions are made on the basis of scientific information that is of the highest quality, multi-disciplinary, peer-reviewed, and consistent with international standards. The DOST-BC is mandated to handle applications of GMOs under laboratory and confined field trials.

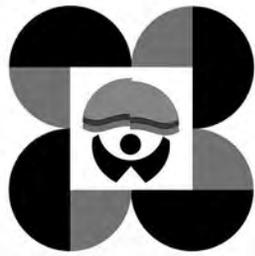
The DOST-BC employs its authority and performs its functions, concurring to the requirements of transparency and public participation. To access information on approved GMOs for contained use under the DOST-BC, visit <http://dost-bc.dost.gov.ph>.

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CONGRATULATIONS ON THE 34TH NAST ANNUAL SCIENTIFIC MEETING

PHILIPPINE WATER 2050



The Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) is committed to build the capacities of Southeast Asian institutions working in agriculture and rural development to contribute to poverty reduction and food security. Its priority themes are natural resource management and agricultural competitiveness. The Center is currently led by Dr. Gil C. Saguiguit, Jr.

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Clive James
ISAAA Founder
& Board Chair

www.isaaa.org

ISAAA'S NICHE

ISAAA is a not-for-profit international organization that shares the benefits of crop biotechnology to various stakeholders, particularly resource-poor farmers in developing countries, through knowledge sharing initiatives and the transfer and delivery of proprietary biotechnology applications. ISAAA's global knowledge sharing network and partnerships in the research and development continuum, provide a powerful combination of science-based information and appropriate technology to those who need to make informed decisions about their acceptance and use. In addition, an array of support services completes the holistic approach to agricultural development and ensures effective implementation and timely delivery of crop biotechnologies. These services include capacity building for policy makers and scientists; regulatory oversight on such issues as biosafety and food safety; impact assessment, and science communication.

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ILRI Campus
Old Naivasha Road
Uthiru, Nairobi 00605
Kenya
africenter@isaaa.org

ISAAA AmeriCenter
105 Leland Lab
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The BCP, a duly registered non-stock, non-profit membership association, is a broad-based multi-sectoral coalition of advocates for the safe and responsible use and advancement of modern biotechnology in the Philippines. Our members are representatives from academe, farmers' organizations, industries, church, media and the science community.

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To contribute to national development goals of eradicating poverty, achieving food security, improving health and sustaining the environment by harnessing the actual and potential benefits of modern biotechnology through its safe and responsible use.

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