



MAHIDOL  
UNIVERSITY  
*Wisdom of the Land*

2010

2010  
Research at MU



True success is not in  
in its application to the



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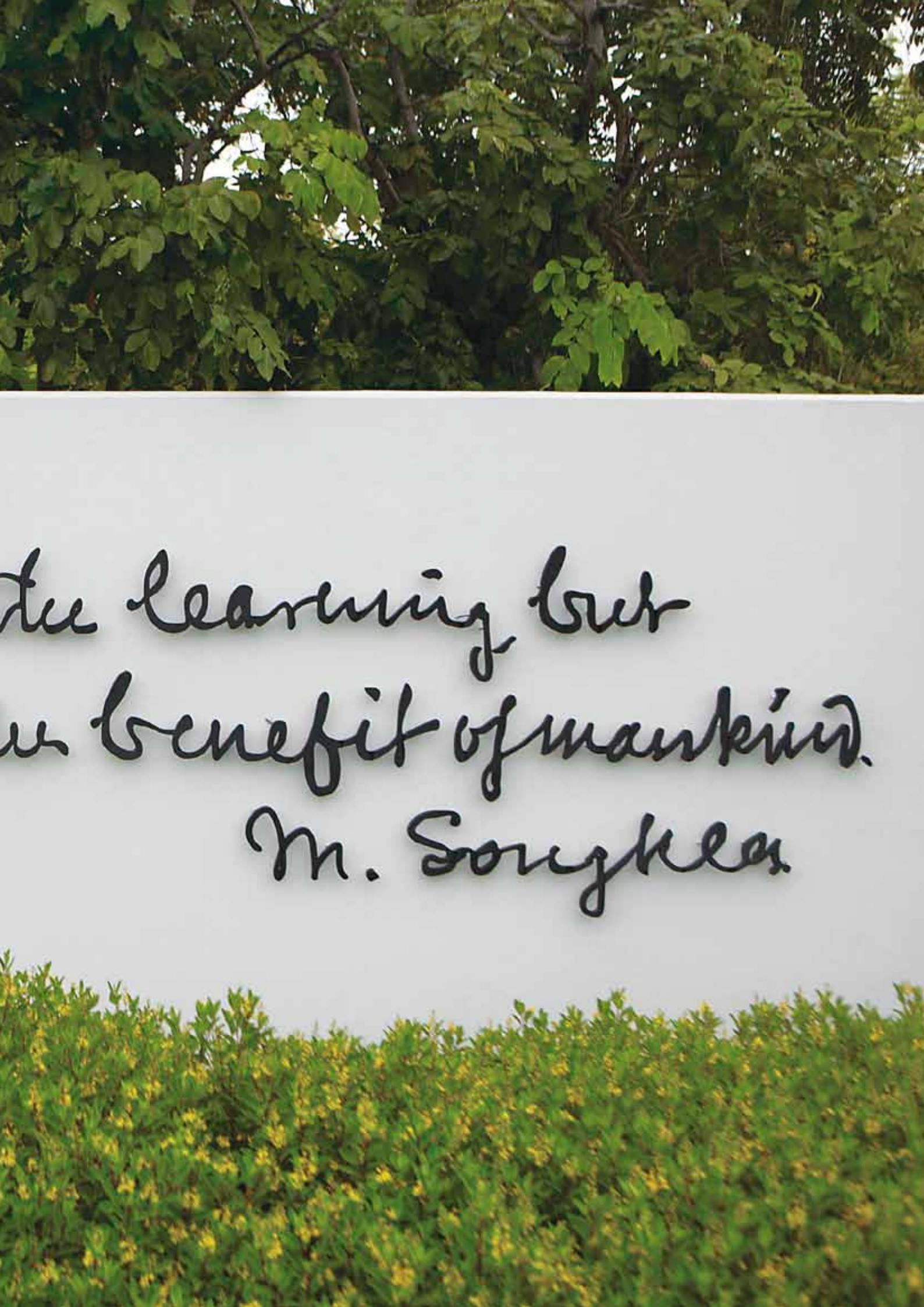
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the learning but  
the benefit of mankind.

M. Songkla.

# Mahidol University Research Policy 2008-2011

Mahidol University Research Strategic plan 2008-2011 was approved by the University Council in May 2008, following extensive discussion, analysis and consultation with staff and our stakeholders. The plan is an ambitious articulation of our vision to be a world-class institution. The research strategic objectives will be pursued through:

1. Recruiting and retaining high quality researchers, continually improve staff's research capability by providing a professional development program with the aim to improve their research output and peer esteem.
2. Creating an environment and infrastructure that fosters and supports high quality research across the full range of disciplines in the university.
3. Supporting multidisciplinary research by building of research teams and encouraging co-operation between faculties and research institutes so as to maximize mutual benefit.
4. Promoting research expertise of the university to external parties, both local and international, including industry, while adhering to the principles of academic freedom and institutional autonomy.
5. Providing intellectual property management and encourage commercialization of innovation.
6. Ensuring that research funding and expenditure maximize the advancement of university strategic objectives.
7. Developing and maintaining an information and communications strategy, both internally and externally, to support access needs for research and learning. Encouraging dissemination and contribution of research innovation and applications to public.



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# 1. Message from the President

Since its inception, Mahidol University has developed into the most eminent research university in Thailand. Our determination is to create an environment and atmosphere that inspires learning, spearheads research and encourages breakthrough innovation. Strong emphasis is also placed on research collaboration with the public and private sectors in Thailand, as well as with foreign institutions. Today, the University has expanded from its initial identity as a prominent institute of medical science to a university that encompasses cutting-edge research in life sciences, physical sciences, as well as in social sciences, arts and humanities.



In the past decade, researchers of Mahidol University have demonstrated their exceptional research capabilities. The number of papers published has steadily increased. Most importantly, in terms of quality, Mahidol University's publications have been cited the most number of times among the Thai universities, both each year and cumulatively. Indeed, in 2005, the Office of the Commission on Higher Education of Thailand ranked Mahidol University as the top university for both research and teaching in Thailand. In addition, this year, the Thailand Research Fund, a government funding agency attached to the Prime Minister's Office, has recognized the University's research strength in the fields of life science, physical science, medicine, health science and biotechnology. As a result, Mahidol University received the certificates of endorsement for the highest rating for its research output in those fields.

Having been selected as one of the 9 higher education institutions eligible for the National Research University Project, Mahidol University is currently committed to contribute to social well-being and creating innovation, in addition to our traditional roles of providing the highest quality education, research and public services. With our finest scholars, excellent faculty and government support, we continue to excel and dedicate ourselves to develop innovative solutions to Thailand's most daunting challenges and to provide great benefits for the global community, the task of which is our attempt to achieve our goal to be the "Wisdom of the Land".

As President of Mahidol University, I am proud to lead this outstanding and forward-looking institution.

A handwritten signature in black ink, appearing to read "P. Sakol".

Clinical Professor Piyasakol Sakolsatayadorn, M.D.  
President



True success is not in the learning but  
in its application to the benefit of mankind.

M. Songkla

## 2. Where we come from...

## ...What we want to achieve

Mahidol University originates from Thailand's first hospital, Siriraj Hospital, founded by H.M. King Chulalongkorn in 1888; the hospital's medical school was granted its first medical qualification in 1893. The University was founded as the University of Medical Sciences in 1943, and renamed with great honor by H.M. King Bhumibol Adulyadej in 1969, after his father H.R.H. Prince Mahidol of Songkla, who is widely regarded as the 'Father of Modern Medicine and Public Health in Thailand'.

While retaining its strengths in medical sciences, Mahidol University has now developed into a prestigious multi-disciplinary institution. The University is located in 2 main areas of Bangkok (Bangkok Noi and Phayathai), and presently has its headquarters in Salaya, Nakorn Pathom Province. It is also expanding to other parts of the country, with campuses in Kanchanaburi, Nakhon Sawan and Amnaj Charoen, undergoing various stages of development. Currently, Mahidol is comprised of 17 Faculties (engaged in both teaching and research), 7 Institutes (focusing mainly on research), and 6 Colleges (focusing mainly on teaching). It offers degree programs in a wide range of disciplines, including medicine, science, public health, nursing, pharmacy, dentistry, engineering, environment, veterinary science, sports science, information and communication technology, management, social sciences and humanities, innovative learning, music and the arts. Presently, the University employs 3,271 academic staff, 146 of whom are full professors, more

than any university in Thailand. In addition, there are some 29,319 students, 1,566 at the doctoral degree level, 6,443 at the master's degree level, 18,004 at the bachelor degree level and 358 at the diploma and certificate level.

With its goal of being the "Wisdom of the Land", Mahidol University has continuously strived for educational excellence, outstanding research, leadership in healthcare services and a global outlook. Thus, Mahidol University was the top among Thai Universities in the Times Higher Education World University Rankings 2010-2011 (ranked at 306). The University was the first in Thailand in QS Asian University Ranking 2010 (ranked at 28) but was the second in the QS World University Rankings 2010 (ranked at 228). Mahidol University's particular strength lies in research, which is demonstrated by its ranking in 2008-2010 as the only Thai university in the Top 500 Universities in the Performance Ranking of Scientific Papers for World Universities of the Higher Education Evaluation and Accreditation Council of Taiwan. Mahidol staff members have not only won numerous awards at the national level, including 20 Outstanding Scientist of Thailand Awards, but also several awards at the international level, including three Magsaysay Awards, the Ramsar Wetland Conservation Award, the CIPL Award for Language Preservation and the Rolex Award for Enterprise. In addition, Mahidol's strong commitment to globalization enabled the University to win the Prime Minister's Award for Export for International Educational Services in 2006.



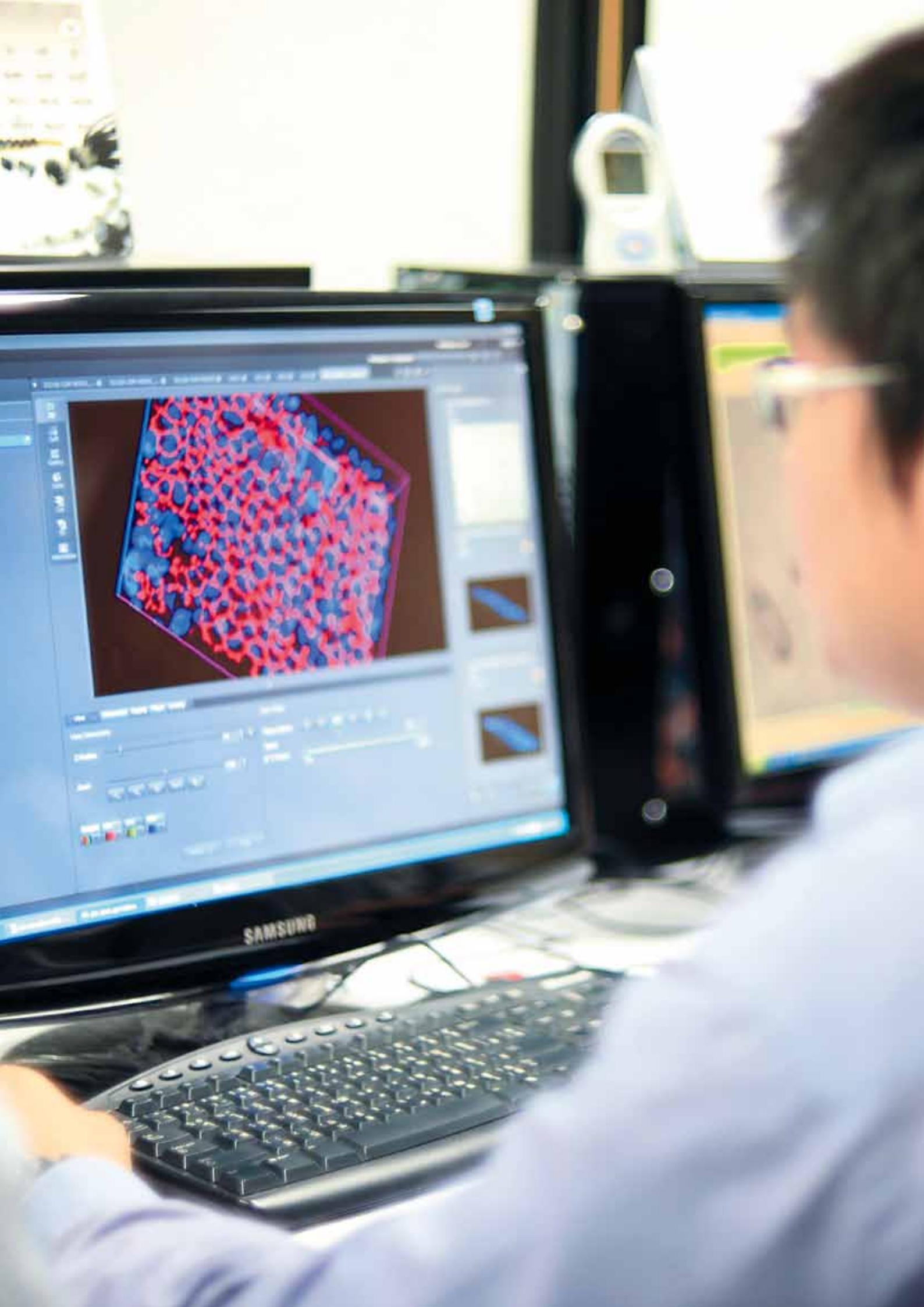
## MU Research Culture

Since the establishment of Mahidol University, a vibrant research culture has been created and maintained within each faculty and institute. The University has a long and distinguished history of discovering new knowledge and Mahidol staff members are committed to pursuing that knowledge for the benefit of the society. Mahidol University also encourages students and research fellows to conduct research at the early stages of their careers since we believe that research provides the training ground for tomorrow's leaders. Most research at Mahidol aims to develop innovative solutions to Thailand's most immediate challenges, from improving social well-being to addressing the energy needs of tomorrow. These research endeavors are enhanced through creative collaboration with leading research institutes and consortia around the world.





*"Research at MU enjoys an international reputation, attracts high quality staff and students, and helps to generate major funded projects"*



### 3. National Research University (NRU)

#### Research Clusters: Challenge for Interdisciplinary and Multidisciplinary Research

Since social problems of today do not conform to the academic categories of yesterday, Mahidol University believes that real progress requires a new level of cooperation among faculties in the full range of disciplines represented on campus. In response to the recent National Research University Project of the Ministry of Education, Mahidol has established 9 research centers and clusters in 2010 based on its strength and identity. These new interdisciplinary research initiatives have been identified and are breaking down traditional academic boundaries, bringing together collaborative teams of experts to address major social issues, including human health, environmental sustainability, aging society, as well as international peace, and security.





## National Research University (NRU) Project

### 4 Research Clusters

1. Cardiovascular and Metabolic Diseases
2. Research Innovation on Social Sciences, Education and Environment for Healthy Thais
3. Health Logistics
4. Music Therapy

### 5 Research Centers

1. Center for Emerging and Neglected Diseases Research
2. Center for Research in Complex Systems Sciences
3. Center for Thalassemia Research
4. Center for Aquatic Animals Research
5. Center for Biopharmaceutical Development and Innovative Therapy





# 4. 2010 Mahidol University Quality Research



**Positively Selected G6PD-Mahidol Mutation Reduces *Plasmodium vivax* Density in Southeast Asians**  
Chalisa Louicharoen, *et al.*  
*Science* 326, 1546 (2009);  
DOI: 10.1126/science.1178849

REPORTS

## Positively Selected *G6PD-Mahidol* Mutation Reduces *Plasmodium vivax* Density in Southeast Asians

Chalisa Louicharoen,<sup>1,2\*</sup> Etienne Patin,<sup>3\*</sup>† Richard Paul,<sup>1‡</sup> Issarang Nuchprayoon,<sup>4</sup> Bhee Witoonpanich,<sup>1</sup> Chayanon Peerapittayamongkol,<sup>3§</sup> Isabelle Casademont,<sup>1‡</sup> Thanyachai Sura,<sup>5</sup> Nan M. Laird,<sup>6</sup> Pratap Singhasivanon,<sup>7</sup> Lluís Quintana-Murci,<sup>3||</sup> Anavaj Sakuntabhai<sup>1,5‡||</sup>

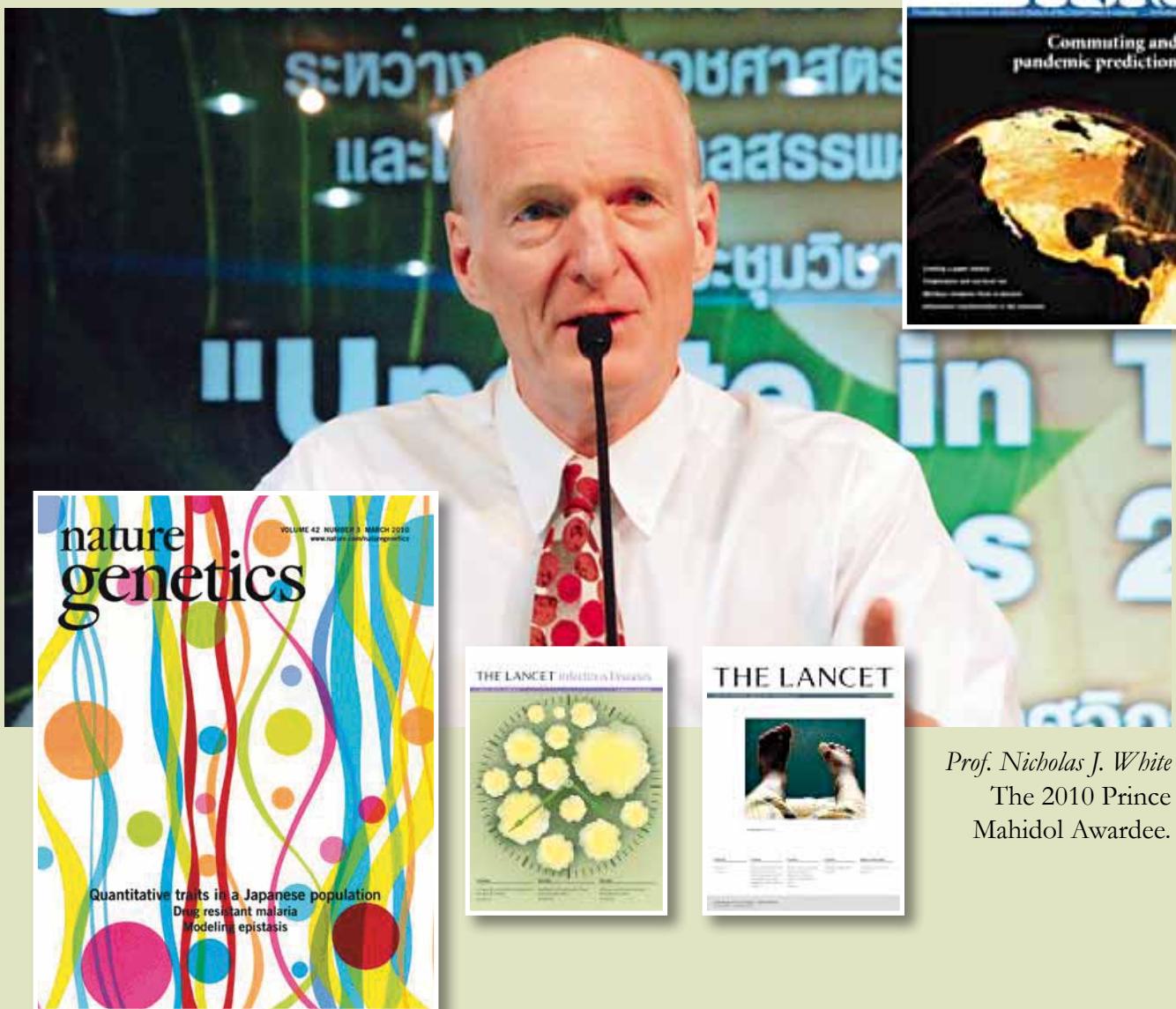
Glucose-6-phosphate dehydrogenase (G6PD) deficiency—the most common known enzymopathy—is associated with neonatal jaundice and hemolytic anemia usually after exposure to certain infections, foods, or medications. Although *G6PD*-deficient alleles appear to confer a protective effect against malaria, the link with clinical protection from *Plasmodium* infection remains unclear. We investigated the effect of a common *G6PD* deficiency variant in Southeast Asia—the *G6PD-Mahidol*<sup>487A</sup> variant—on human survival related to *vivax* and *falciparum* malaria. Our results show that strong and recent positive selection has targeted the Mahidol variant over the past 1500 years. We found that the *G6PD-Mahidol*<sup>487A</sup> variant reduces *vivax*, but not *falciparum*, parasite density in humans, which indicates that *Plasmodium vivax* has been a driving force behind the strong selective advantage conferred by this mutation.



Prof. Anavaj Sakuntabhai



Prof. Thanyachai Sura



Prof. Nicholas J. White  
The 2010 Prince  
Mahidol Awardee.



### “Rating 5/5”

The Thailand Research Fund recognizes MU quality research output in Science, Medicine, Health Science and Biotechnology.



Science and  
Biotechnology



Medicine



Health Science



*Prof. Punnee Pitisuttithum*

“The Thai study is already a winner in that researchers now have a population of patients who are protected against infection with HIV after inoculation; they can begin to analyze the patients’ immune responses more closely to tease out the elusive factors that shielded them from HIV. That’s more than the last promising vaccine provided.” (*Time Magazine October 22, 2009*)



*“Mahidol University actively participates in the largest ever conducted AIDS vaccine field trial”*



## 5. Independent Laboratories, Institutes and Centers

Independent laboratories, institutes and centers currently account for about 75% of Mahidol's research volume, involving approximately 1,200 faculty members, together with a number of research and technical staff members, post-doctoral fellows and graduate students. For more than 30 years, researchers at Mahidol have made important discoveries on the mechanism and management of world-wide infectious diseases. In malaria research, Mahidol researchers were not only the first to raise awareness of falciparum drug-resistance but also the first to introduce the use of artesunate-mefloquine drug combination. Extensive research on viral diseases include person-to-person transmission of avian influenza, the spread of the zoonotic disease through bird migration using global positioning technology, the development of vaccine against viral infections including a Phase III HIV-1 vaccine trial which showed 31.2% protective efficacy. In terms of genetic diseases such as thalassemia, Mahidol researchers have pioneered the understanding of the molecular mechanisms of alpha- and beta-thalassemia disease, discovered novel mutations and improved prenatal diagnosis of thalassemia, leading to the world's first cord blood transplantation as a novel method of intervention.

In the sciences, Mahidol university has helped introduce novel technologies to Thailand, including genetic engineering, protein crystallography and SNPs technology. Research on shrimp, starch and soy sauce biotechnology, and rubber technology has also made major impacts on Thailand's industries and experts. Mahidol researchers also play important roles as key persons responsible for the environmental conversation in the ASEAN Community through the formation of wetland management networking. On the conversation of hornbills, research at Mahidol also received worldwide recognition through mobilizing local communities to become involve in preserving vanishing wildlife for posterity.

In social science and humanities, Mahidol researchers are leaders in many research topics such as bi-lingual primary education in southern Thailand, Tai language and culture, gender, cross-border migration and human rights, child labor, and HIV/AIDS among migrant workers in the Thailand's border provinces. Our social science researchers have been recognized internationally in the field of human rights, peace building and national reconciliation of Thailand, such that Mahidol University was chosen by the ASEAN University Network (AUN) to be the AUN Resource Center for Human Rights.



# Protein and Proteomics Research

## I. Medical Proteomics Unit, Office for Research and Development Faculty of Medicine, Siriraj Hospital

This laboratory focuses mainly on medical proteomics. There are three main groups of research projects carried by this laboratory including; i) Technical development of proteomic methodology, ii) Renal and urinary proteomics and, iii) Proteomics applied to human diseases. All these projects aim to better understand

## II. Center of Excellence on Protein Structure and Biochemistry Faculty of Science

Since 2001, Laboratory of Mechanistic Enzymology have gained international recognition for their work on reaction mechanisms of flavin- and PLP-dependent enzymes. This is the first group of researchers in Thailand to employ pre-steady state kinetics in conjunction with other techniques such as steady-state kinetics, thermodynamics,



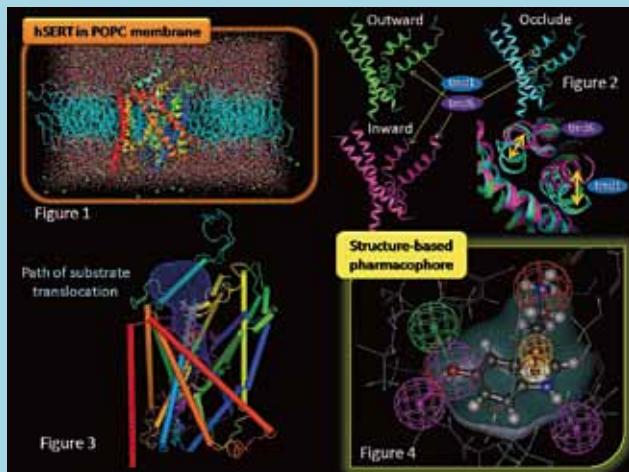
pathophysiology and pathogenic mechanisms of diseases, identify new therapeutic targets, and establish novel biomarkers for earlier diagnostics.

various spectroscopic techniques, molecular dynamics simulations and site-directed mutagenesis to further the scientific understanding of how nature controls reactions of selected groups of enzymes. A thorough understanding of enzyme catalysis can help scientists design better enzymes for applications in biotechnological processes, sensors or diagnostic tools for analytical purposes, or for designing better enzyme inhibitors for therapeutic purposes.

# In Silico Modeling and Drug Design

## Franco-Thai Molecular Modeling Unit (FTMMU)

### Faculty of Pharmacy



Human serotonin transporter (hSERT) is a subject of intense research due to its ability to serve as a target of therapeutic drugs such as anti-depressants. The hSERT homology model was built using the leucine transporter as a template and then embedded in an explicit solvated POPC-lipid membrane bilayer. The conformational plasticity of hSERT models was successfully detected during translocation of serotonin (5-HT) from extracellular to cytoplasmic sites using the targeted molecular dynamics. The road map of the translocation pathway of 5-HT could be elucidated and illustrated as the structure-based pharmacophore of binding interactions. The outcome of research may help in developing new SERT ligands devoid of any side-effects, thus representing a major priority in the treatment of 5-HT pathologies.

# Development of Diagnostic Tools and Bioactive Compounds for Biomedical Applications

## Faculty of Medical Technology



The project aspires to utilize appropriate knowledge and technology for developing tools, innovation and technology on the basis of self-sufficiency which can be used for medical diagnosis and detection as well as other areas of biomedical applications in an efficient manner. In addition, separation and design of bioactive compounds for the purpose of adding values to natural products or synthetic compounds for future therapeutic applications and health supplementations is also conducted in a holistic approach.

The project encompasses the following 3 key areas: (i) promoting the advancement of basic research for development of diagnostic and detection tools based on molecular biology, genetics, proteomics, metabolomics and molecularly imprinted polymers, (ii) discovery of bioactive compounds from natural sources and biomaterials as well as the design and synthesis of novel bioactive compounds by integrating chemical synthesis with data mining and computational simulations (e.g. computational chemistry, molecular docking, molecular dynamics, structure-activity relationship). Such synergistic approaches could efficiently be employed for drug design, predicting biomolecular mechanisms and understanding the pertinent structure-activity relationships of biomedical important bioactive compounds (e.g. antioxidants, anti-microbial, anti-parasitic, anti-cancer, etc.), (iii) development of a diagnostic tool based on biosensors, microelectronics or image processing for biomedical applications.



Latex - Crypto Antigen Detection Kit

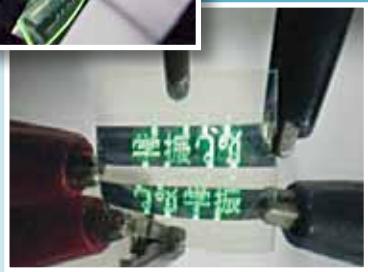
# Nanotechnology and Nanoscience



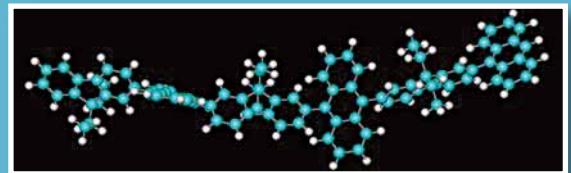
Hybrid electronics for nano-device applications



Device fabrication for organic light emitting device (OLED)



Measurement of flexible substrate devices



Material synthesis and design

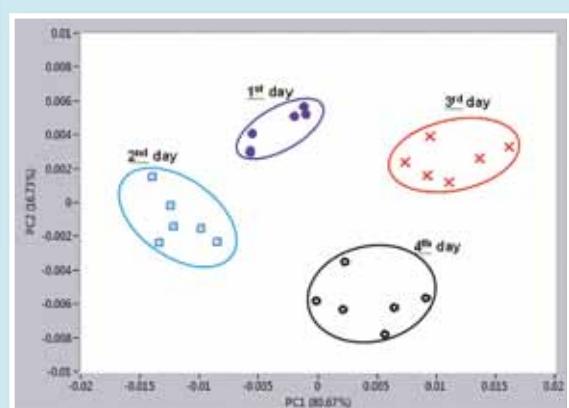
## I. Center of Excellence in Nanotechnology and Nanoscience Faculty of Science

With nanotechnology approach, development of electronic device has been performed by using hybrid materials between organic and inorganic semiconductors. Electrical conduction in the single molecular level enables advantage over conventional silicon wafer devices and the flexible substrate is the unique device architecture for hybrid devices demonstrated in organic light emitting device (OLED) and organic field effect transistor (OFET).



E-Nose for amine sensing to detect smell from sundried snakeskin gourami on different days.

The machine is developed for SME to control the fish quality for marketing.





## II. Research on Drug Nanodelivery Faculty of Pharmacy

Research on nanotechnology at Faculty of Pharmacy involves the development of nano-sized delivery systems containing encapsulated, dispersed, adsorbed or conjugated drugs. Nanoscale drug delivery systems have ability to improve the pharmacokinetics and increase biodistribution of therapeutic agents to target organs, which will result in improved efficacy. Using the nanocarriers, drug toxicity can be reduced as a consequence of preferential accumulation at target sites and lower concentration in healthy tissues. Many nanocarriers have the desirable advantages of improving drug solubility, increasing stability of therapeutic agents and improving safety when using biocompatible materials. For instance, the nanocomplexes of trimethyl chitosan and insulin can protect insulin degradation from enzymatic presence in digestive tract and possessed mucoadhesive property, which can be used for oral and nasal delivery of insulin. The nano-structured lipid carriers (NLC) of coenzymes Q10 increased and sustained the drug release through skin due to the adhesion and occlusion effects which are useful for dermal delivery.

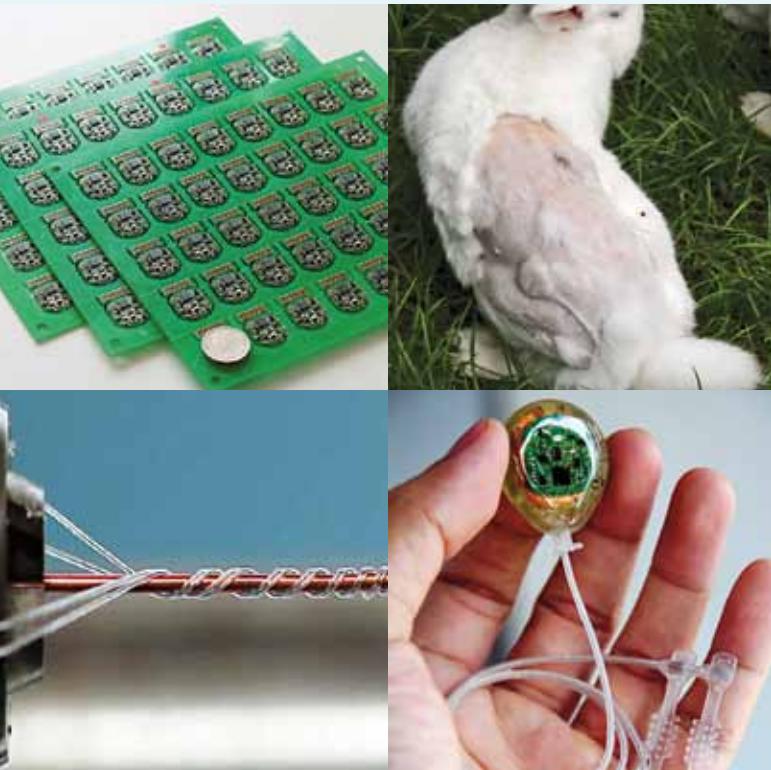
## III. Biopolymers and Nanoscale Engineering for Drug Delivery and Molecular Imaging Laboratory (BioNEDD Lab), Faculty of Engineering

One mission of BioNEDD lab is to develop nanoparticles that can be detected by imaging techniques such as MRI and SPECT, once injected inside the body. These nanoparticles not only visualize cancer cells *in vivo* but can also selectively deliver anticancer drugs to these cancer cells. They are conceptually designed based on a clear understanding of cancer biology and polymer science, making “Theranostic Nanomedicine” for cancer chemotherapy.



# Biomedical Engineering

Faculty of Engineering

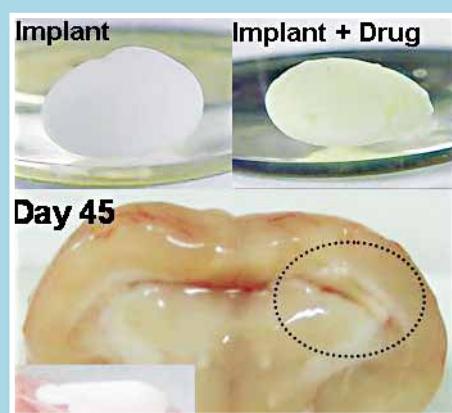


An electrical stimulation of neuromuscular system is a promising treatment for neurological disorders that cannot be cured by existing medication. Examples of such treatments include cochlear implant, Parkinson's disease, epilepsy, chronic pain, and etc. The principle of these treatments is to electrically stimulate a targeted muscle or nerve using an implantable nerve stimulator. This technology, however, does not exist in Thailand due to the lack of fundamental knowledge and the unaffordable cost of the imported devices.

Mahidol University researchers have been developing implantable nerve stimulator technology for the country. We are the only group in Thailand initiated by an interdisciplinary effort among 6 faculties, namely, Engineering, Science, Veterinary Science, Medicine at both Ramathibodi and Siriraj Hospitals, and the Golden Jubilee Medical Center. The safety and functionality of the developed device were already verified in animals. One-hundred clinical trials are intended between 2011-2012 for epilepsy, Parkinson's disease and diaphragm pacing. The developed technology will be affordable for Thais and, more importantly, will initiate electrical stimulation research in Thailand.

## Minimum invasive delivery of SN-38 for high-grade gliomas therapy via injectable implant drug delivery system

The injectable polymer implants were developed for malignant gliomas treatment. This drug delivery system was designed so that it can solidify in situ upon intracranial injection, allowing the formation of small or irregular shapes after solidification. An anticancer drug, SN-38, which has very poor water solubility and severe side effects but high therapeutic efficacy, was encapsulated in the polymer gels. The implants were then injected intra-cranially in rat brains to assess the systemic and neurologic reactions. The polymer solution at the injection stage was well-tolerated, as confirmed by the healing action (fibrosis tissue) in high body weight murines 30 days after treatment. These implants will definitely be a useful approach in developing drug delivery systems that can bypass the blood brain barrier such as implantable controlled release systems.



(Top) Implants with 0 and 30% SN-38 loading in PBS, pH 7.4 and 37°C after formation in vitro. (Bottom) Photographs of a brain cross section through the injection site. The dotted circular line shows the location of polymeric gels solidifying inside the brain.

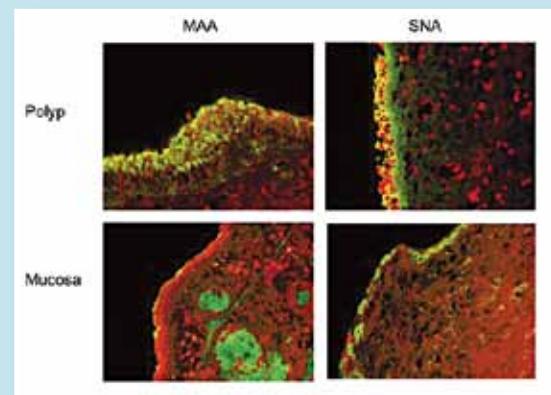
# Emerging Virus Infection: Avian Influenza

Faculty of Medicine, Siriraj Hospital



The Influenza Cooperative Research Center (ICRC) was established at the Department of Microbiology, Faculty of Medicine, Siriraj Hospital, in 2006. The center has served as the central virology laboratory for clinical trials conducted at clinic sites in Thailand, in collaboration with the Southeast Asian Infectious Clinical Research Network which is sponsored by the U.S. National Institute of Health. In addition, ICRC has functioned as the administrative office in a cooperative project entitled "Avian influenza-A study at human and animal interface". This project is a joint investigation among Mahidol University (Faculty of Medicine at Siriraj Hospital, Faculty of Veterinary Science and, Faculty of Science), the Bureau of Epidemiology (BOE), Ministry of Public Health, and the U.S. based Westat under the sponsorship of the U.S. Center for Disease Control and Prevention. A satellite telemetry technique has been recently introduced to study the role of migratory birds in avian influenza spread.

**"Allergy and viral infection may be more interrelated than we thought."**

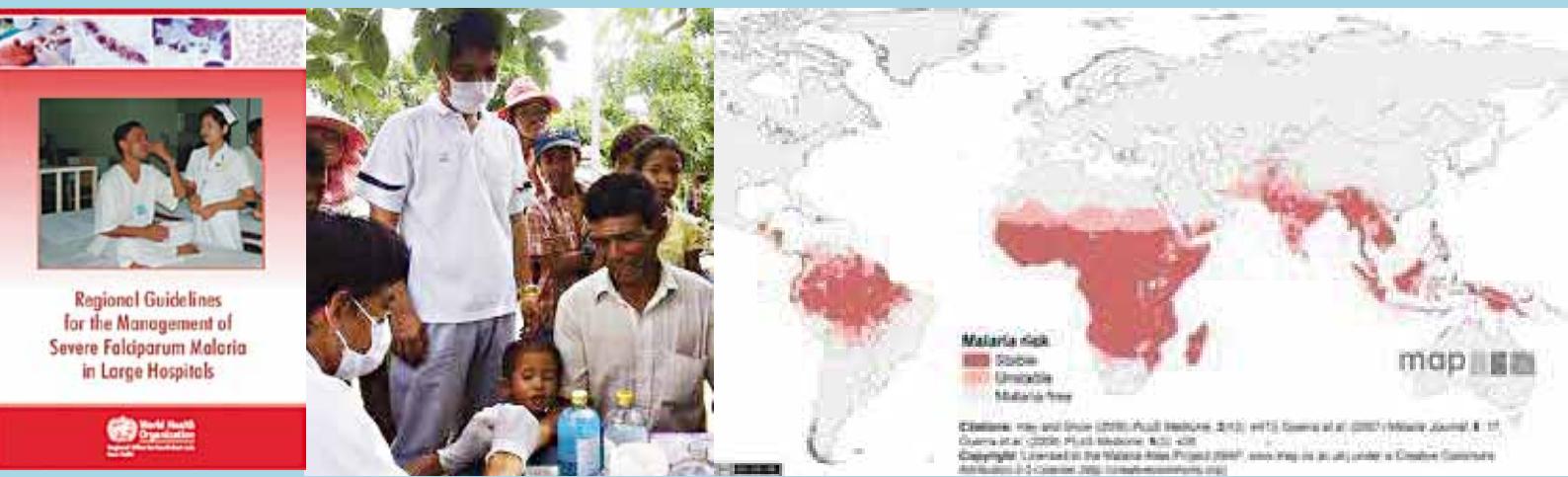


In a recent publication in the journal "PLOS One" (Suptawiwat et al, 2010), it was shown that sialic acids, which are the receptors for influenza viruses, are up-regulated on the mucosal surface of human nasal polyps. As shown in the figure, sialic acids stained green by specific lectins (MAA and SNA), are more abundant on the mucosal surface of nasal polyps (above) as compared to normal nasal mucosa (below). This up-regulation can lead to more effective *in vitro* infection by influenza viruses.

# Treatment of Malaria and Molecular Mechanisms in Drug Resistance

## Bangkok Hospital for Tropical Diseases

### Faculty of Tropical Medicine



Malaria is the most important parasitic infection in the world since the disease causes the highest morbidity and mortality. The unexpected emergence of falciparum malaria parasite resistance to chloroquine, the main effective medicine, was first reported in 1965 by the late Professor Tranakchit Harinasuta of the Faculty of Tropical Medicine, Mahidol University.

Since then the faculty has provided a significant contribution to new global antimalarial treatment recommendations. A combined drug therapy had been used instead. In 1992, the late

Professor Sornchai Looareesuwan and his team first reported an excellent efficacy of artemisinin combination therapy (Artesunate and Mefloquine) for the treatment of uncomplicated falciparum malaria. Currently, it is recommended by the World Health Organization for the treatment of malaria worldwide.

There was great optimism about the possibility of eradicating the disease in Thailand until major obstacles to complete success were recognized. Another intensifying parasite resistance to newer drugs has now emerged and newer antimalarial





drugs are urgently needed. Therefore, other alternatives have been evaluated at the Faculty Hospital. These include Artemether-Lumefantrine, Artesunate and Azithromycin, Dihydroartemisinin-Napthoquine-Trimethoprim, Dihydroartemisinin-Piperaquine, Artesunate-Pyronaridine, Artelorane-Piperaquine, Artemisone-Mefloquine, Atovaquone-Proquanil, Fosmidomycin and Clindamycin.

For the treatment of vivax malaria, the optimal dose of Primaquine and alternative hypnozoitocidal drugs such as Tafenoquine and Elubaquine were also studied. Regarding the severity of the disease, the studies were supported by the guidelines for the clinical management of malaria.

Apart from clinical drug trials, researchers at Mahidol University, in collaboration with Oxford University scientists, attempt to understand the molecular mechanisms underlying drug resistance of both types of malaria parasites. Molecular epidemiologic study, biochemistry and

identification of genetic mutation in various candidate genes are employed to elucidate the mechanisms. In 2010, two scientists from Mahidol-Oxford Tropical Medicine Research Unit (MORU), namely, Prof. Nicholas J. White and Assistant Prof. Mullika Imwong received international and national awards for their work on epidemiologic study of malaria.

While Mahidol University is at the global forefront of clinical testing of treatment modalities, including the management of severe disease, the Ministry of Public Health took a global lead in field evaluation and deployment of new medications. Evidence-based treatment policy became the hallmark of Thailand's antimalarial programme, and proved a model for many malarious countries around the world.

# Conservation Biology

Faculty of Science and Institute for Molecular Bioscience



## Gibbons and Elephants

In response to the loss of biodiversity, active research has been carried out to conserve and repopulate endangered species in Thailand. Research in the Conservation Genetics and Ecology Group has been focusing on two issues: the biology of wild elephants in the Salaka Phra Wildlife Sanctuary, Kanchanaburi, and white-handed gibbons (*Hylobates lar*) in Khao Yai National Park. The research on elephants seeks to determine their population size and distribution, using microsatellite DNA analysis from DNA traces in fresh dung. Determination of the genetic variability of the population is presently being performed.





(Male (left) and female (right) of Great Hornbills at the nest tree)

The work on gibbons seeks to understand the diet and foraging behavior of the animals in the canopy, where they find fruits such as wild rambutan and figs. Mahidol's biologists wish to understand how their diet changes with the seasons and from year to year, and determine how they find their preferred food. Another site is the Lum Nam Pai Wildlife Sanctuary in Mae Hong Son Province, where local communities have been involved in order to conserve existing populations of white-handed gibbons and restore their diminishing numbers. Shan, Karen, Lahu Nyi and Yananese (Chin Ho) are examples of these local ethnic groups.

## Hornbills

Other than a continuation on the long-term study on breeding biology and ecology and seed dispersal services of hornbills, researchers at the Department of Microbiology, Faculty of Science, carried out community-based research on conservation of hornbills both at the Khao Yai National Park and in southern Thailand. An additional project, sponsored by P'T Exploration and Production Co. Ltd., is to determine important areas where hornbills utilize their habitats at two world heritage sites, Dong-Phayayen-Khao Yai and the Western Forest Complexes. Ten of the three largest species at these two sites were tagged with GPS satellite transmitters: Great (*Buceros bicornis*), Wreathed (*Rhyticeros undulatus*) and Rufous-necked Hornbills (*Aceros nipalensis*).



## Magnetotelluric: Probing the Earth with Electromagnetic Waves

### Geophysics Research Group, Department of Physics

### Faculty of Science

Magnetotelluric (MT) is a technique that uses natural electromagnetic to probe the subsurface structure. This technique can be used at various depths from a few ten meters to a hundreds kilometers depending on the frequency the electromagnetic waves. MT has many applications from searching for shallow ground water level, ore, geothermal reservoirs, faults to deep magma reservoir beneath volcanoes, among many examples.

A field survey is conducted in Kanchanaburi province by the MU geophysics researchers. Magnetometers to measure magnetic fields and electrodes to measure electric fields are laid at the locations of interest. The equipment can be installed at one location, at various points along the line or profile, or at various locations covering large region, depending on which dimension (1-D, 2-D or 3-D survey) the variation of the Earth's

structure is probed and investigated. After acquiring the data, data processing is conducted to get rid of man-made noise. A ratio of electric field to magnetic field is converted into a resistivity as a function of frequencies or periods. An inversion program is then used to convert resistivity into a function of depth before using it for interpretation.

The Geophysics Research Group of Mahidol University is at the forefront of the world in developing inversion programs for analyzing magnetotelluric data. The inversion programs using various techniques for both 2-D and 3-D interpretations are developed and widely distributed. The number of citations of the two publications below reflects our strength in this research field.



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Physics of the Earth and Planetary Interiors 150 (2005) 3–14

PHYSICS  
OF THE EARTH  
AND PLANETARY  
INTERIORS  
[www.sciencedirect.com/science/jol/pepi](http://www.sciencedirect.com/science/jol/pepi)

## Three-dimensional magnetotelluric inversion: data-space method

Weerachai Siripunvaraporn<sup>a,\*</sup>, Gary Egbert<sup>b</sup>, Yongwimon Lenbury<sup>c</sup>,  
Makoto Uyeshima<sup>d</sup>

<sup>a</sup> Department of Physics, Faculty of Science, Mahidol University, Rama VI Road, Ratchathewi, Bangkok 10400, Thailand

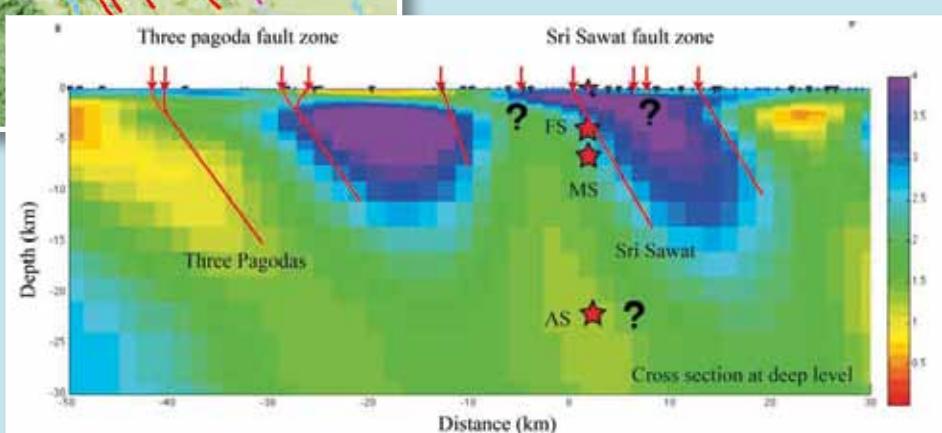
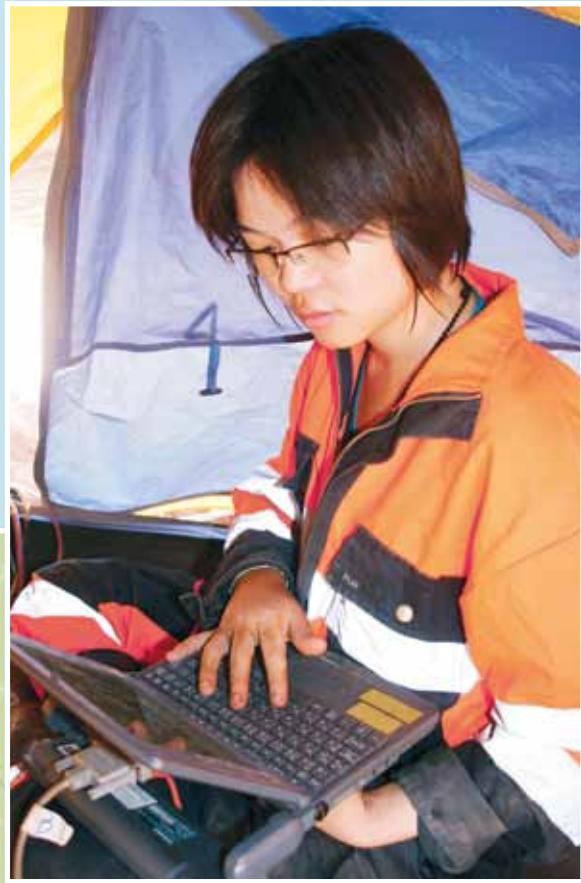
<sup>b</sup> College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331, USA

<sup>c</sup> Department of Mechanics, Faculty of Science, Mahidol University, Rama VI Road, Ratchathewi, Bangkok 10400, Thailand

<sup>d</sup> Earthquake Research Institute, University of Tokyo, 1-1-1 Bunkyo, Bunkyo-ku, Tokyo 113-0033, Japan

Received 28 January 2003; accepted 14 August 2003

- Siripunvaraporn W., G. Egbert, Y. Lenbury and M. Uyeshima. 2005. Three-Dimensional Magnetotelluric: Data Space Method, *Physics of the Earth and Planetary Interiors*, 150, 3-14. (46 citations; SCOPUS)
- Siripunvaraporn W., and G. Egbert. 2000. An Efficient Data-Subspace Inversion for Two Dimensional Magnetotelluric Data, *Geophysics*, 65, 791-803. (115 citations; SCOPUS)



# Tai Language and Culture

Institute for Language and Cultural of Asia



Fieldwork at a Southern Zhuang village in Jingxi, Guangxi, PR China



Meeting Chinese administrators, Minority Language Commission of Guangxi Zhuang Autonomous Region, PR China

Our researchers seek to understand the origin of the Thai language and culture by investigating languages of the Tai-Kadai ethnic group in China, who still maintained their ancient linguistic and cultural identity. This enables us to better understand the unique aspects of the proto-Tai language as well as how certain characteristics of the Tai-Kadai languages in each group have changed from region to region. The linguistic evidence of this research also supports the claim of the original homeland of Thai people, in that

the general direction of Tai population migration is from the Guangxi-Guizhou border, southwestward toward Vietnam and Thailand. This research project is a collaborative effort between Chinese and Thai academics at the Research Institute for Languages and Cultures of Asia. The collaboration promoted better understanding between the two countries, which is expected to lead to industrial and socio-economic cooperation in the region.



# Promotion of interdisciplinary social science communication and collaboration

Faculty of Social Sciences and Humanities



The mission of the Faculty of Social Science and Humanities at Mahidol University is to promote research encompassing the wide range of skills and perspectives that are needed to solve complex Thai social problems. This year, the Faculty is the leader in the formation of a new university research cluster that fosters communication and collaboration across the full range of social science, humanities, and other disciplines. This enables the faculty members to conduct high-quality multidisciplinary studies. Majority of the research projects conducted are being funded by the Thai government agencies. The followings are those carried out during the year 2010-2011:

- Evaluation of the efficiency and people's satisfaction on the performance of police stations (supported by the Research Division, Office of Police Strategy, the Royal Thai Police)

- Analysis of legalization, decriminalization, and harm reduction in the development of Thai policy on narcotic drugs (supported by the Office of the Narcotics Control Board, Ministry of Justice)
- Development of cultural sensitive and context-specific intervention to prevent HIV among young men who have sex with men (supported by the National Institutes of Health, U.S.A.)
- Professional ethics (supported by the Thailand Research Fund)
- Evaluation on Thailand Reform Assembly (supported by the Office of Thailand Reform)
- Analysis of factors behind opposition to construction plans for power plants and other energy infrastructure (supported by the Ministry of Energy).

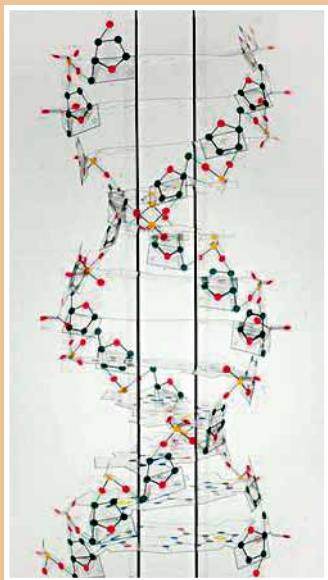


## 6. Integrated Research and Teaching



As a research-led university involved in teaching, Mahidol University established the Institute for Innovative Learning in 2002 in response to problems of learning/teaching at all levels in the educational system, especially in science. The institute has focused on improving science education skills of teachers and university instructors who will be the potential leaders of tomorrow. At the same time, the institute has developed novel teaching materials for schools and universities, and has played an important role in science education through involvement in workshops and training courses.

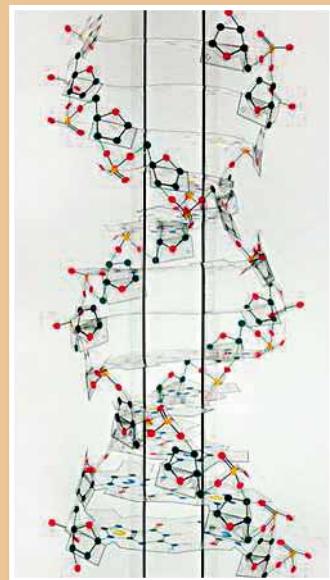
(a) a right-handed B-form



(b) a right-handed A-form and

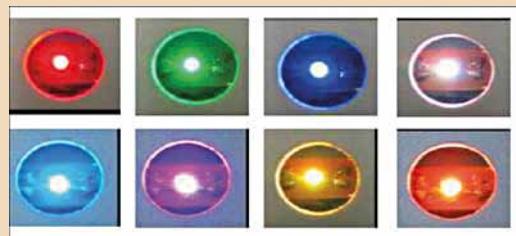
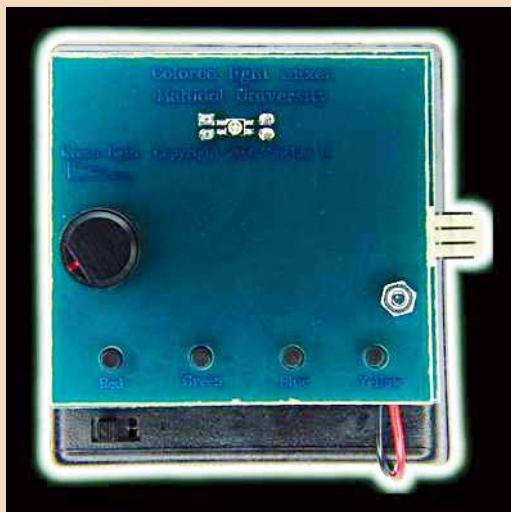


(c) a left-handed conformation.



### Physical models of DNA made from computer-printed transparency film cut-outs.

Building a physical model of DNA help students understand how each chemical component fit together to form DNA. The model was constructed using computer-printed transparency film cut-outs. These models allow students to learn the 3D molecular organization of DNA.



## An innovative teaching apparatus for improving student understanding of colored-light mixing:

A colored-light mixer was developed to help students observe colors generating directly from three primary colors of light (red, green, and blue). It is composed of packed tiny light-emitting diodes (LEDs) combined with an intensity-varying circuit, generating various colors ranging from yellow to orange and pale blue to cyan. This apparatus received the “Inventor Award” in 2010 from the National Research Council of Thailand and was published in the Physics Education journal.



## A species identity of novel fighting fish caught from central Thailand:

Mahachai fighting fish (*Betta* sp. *Mahachai*), which resides only in brackish areas of Samut Sakhon, Samut Songkhram and Samut Prakarn Provinces, was originally classified by our research team using both molecular and morphological taxonomic techniques. The findings, published in the *Journal of Fish Biology*, have implications for commercial and conservation purposes. Furthermore, a part of this scientific result has been implemented as an activity in an undergraduate life-science class for improving conceptual understanding of species and species evolution. For more information, see the *International Journal of Learning*.





## 7. National Centers of Excellence at MU



Mahidol also conducts strong research in physical sciences. From 2003 to 2008, three national Centers of Excellence in Graduate Education and Research programs were established by the Office of the Higher Education Commission, Ministry of Education, with Mahidol University as the lead university: **Chemistry, Environmental Toxicology and Management, and Mathematics.** More than 18 provincial research and teaching universities in Thailand benefit from the networking in graduate education, research collaboration and resource sharing of this program.

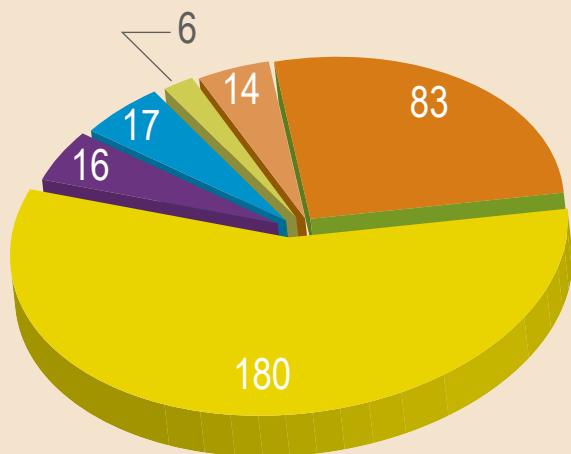
In addition, Mahidol staff from the Physics Department, Faculty of Science, contribute productively to the research output of the **Thailand Center of Excellence for Physics (TheP)**, reflecting their recent top 2008-2009 performance rating announced by the Thailand Research Fund. Each National Center of Excellence also works closely with industry and private sectors to ensure that scientific and technological developments are accessible to a wide range of users for further development into new products, processes, applications, materials or services.

## 8. Public Private Partnership (PPP) and Intellectual Properties

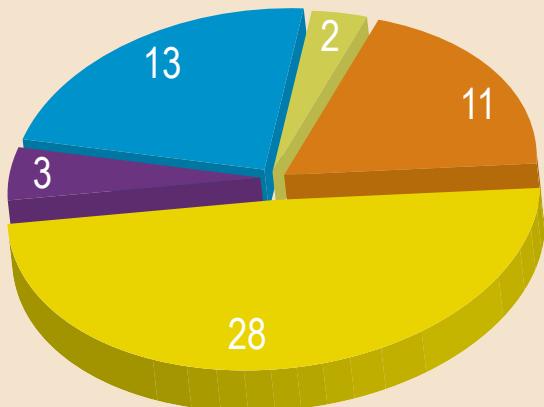
### The Power of Research Partnership



## Intellectual Properties Granted and Registered

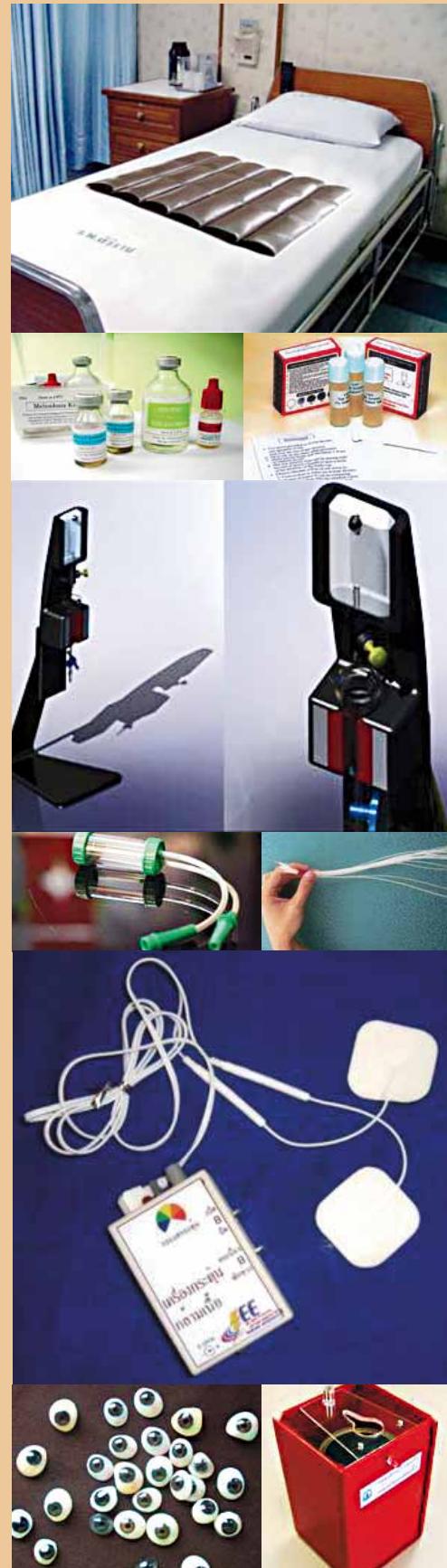


Fiscal Year 1991-2010



Fiscal Year 2010

- Patent
- Copyright
- Trade Secret
- Petty Patent
- Trademark
- Foreign Patent





## 9. New Facilities

### Salaya Central Instrument Facility





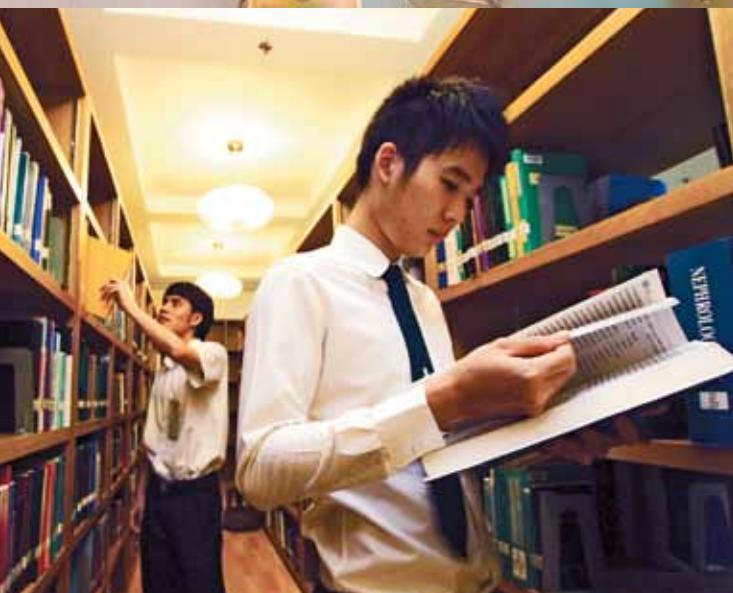
## Libraries and Light

The Mahidol University library system is comprised collectively of the libraries at Salaya campus, Bangkok Noi campus, and Phayathai campus. These important library resource centers cover life sciences, natural sciences, science & technology, and social sciences & humanities, and support graduate students, faculties and researchers in their learning and research. The libraries continue to acquire and provide the best resources among universities in the country. The collection contains some 1 million volumes, 41,000 currently received prints and electronic periodicals,



65,000 textbooks and a growing array of electronic resources, including e-books, e-journals and image databases.

The resources are rendered through network information services used by many researchers across universities in academia and research, and also exist to support the research needs of a wider university audience. The research facilities of the libraries include group study rooms and research carrels.





*Prof. Nicholas J. White*

Prince Mahidol Award 2010 and 2010 Canada Gairdner Global Health Award from The Gairdner Foundation, Canada

Pictures left to right:  
*Dr. Visith Thongboonkerd*  
*Prof. Prasert Auewarakul*  
Awardees of National Outstanding Scientist of Thailand



Pictures left to right:  
*Prof. Virapong Prachayasittikul*  
National Researcher Award in Chemistry and Pharmacology  
*Dr. Visith Thongboonkerd*  
National Researcher Award in Medical Science



*Prof. Somsoinge Burusphat*  
The Thailand Research Fund (TRF) Senior Scholar 2010, Ministry Attached to the Prime Minister's Office



*Prof. Wanpen Chaicumpa*  
Chair professorship 2010, the Office of Commission on Higher Education (CHE), Ministry of Education

*Assoc. Prof. Pimchai Chaiyen*  
TRF-CHE-Scopus Researcher Award 2010  
and Taguchi Prize for Outstanding Research Achievement in Biotechnology 2010



*Asst. Prof. Mallika Immong*  
L'OREAL Award and Fellowship for Women in Science 2010

## 10. Recognition



### University Awards

#### The Highest Number of International Publications

- Prof. Sutat Fucharoen
- Prof. M.R. Jisnuson Svasti
- Prof. Vichai Reutrakul
- Prof. Nicholas J White
- Assoc. Prof. Somnuek Sungkanuparph
- Dr. Visith Thongboonkerd

#### The Highest Citation in Specialized Research Fields

- Prof. Pilaipan Puthavathana
- Prof. Prasert Auewarakul
- Prof. I-Ming Tang
- Assoc. Prof. Weerachai Siripunvaraporn
- Asst. Prof. Tanakorn Osotchan
- Asst. Prof. Teerakiat Kerdcharoen
- Asst. Prof. Toemsak Srihirin

#### Quality Research in Social Science and Humanities

- Prof. Somsonge Burusphat
- Assoc. Prof. Krittaya Achavanitkul

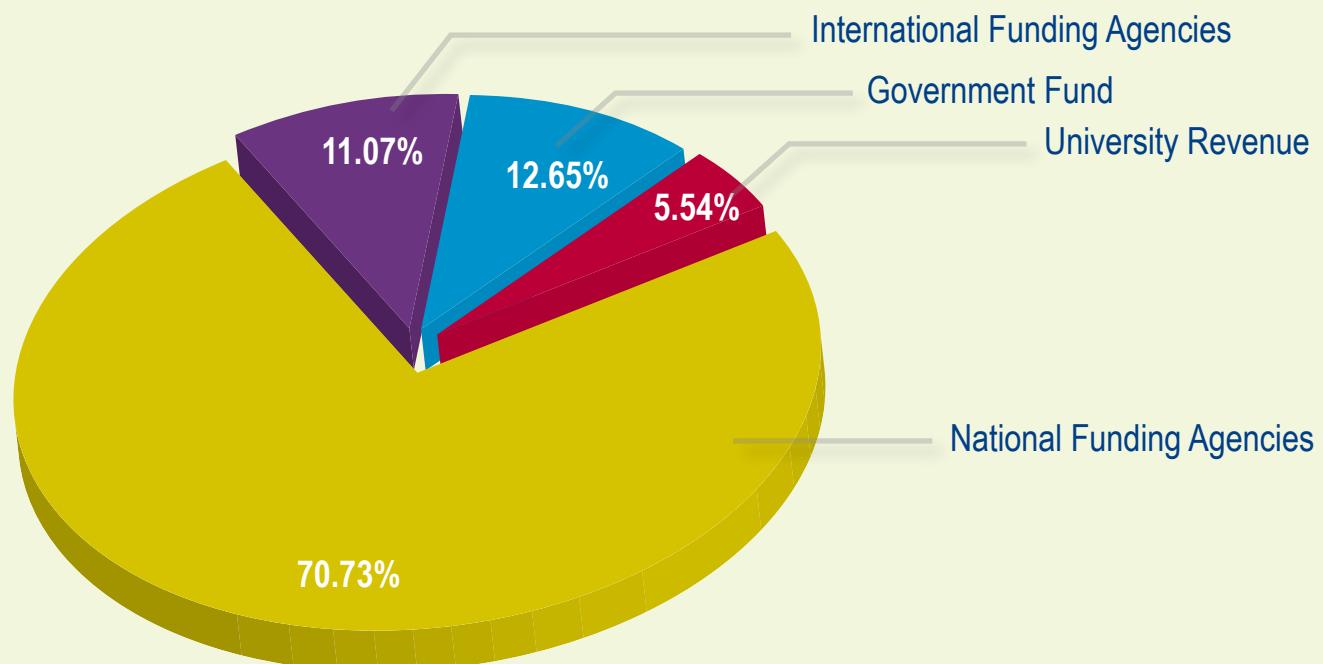
		As of November 2010
		(Unit: Number of students)
<b>STUDENTS</b>		<b>Total</b>
Undergraduate		29,319
Graduate		18,004
International Students		8,009
Other		418
		2,888
<b>FACULTY MEMBERS</b>		<b>(Unit: Number of personnel)</b>
		<b>Total</b>
Local Faculty Member		3,271
International Faculty		3,119
		152
<b>STAFF</b>		<b>(Unit: Number of personnel)</b>
Number of Staff		<b>Total</b>
		28,917
<b>ANNUAL EXTERNAL RESEARCH GRANTS</b>		<b>(Unit: Million Baht)</b>
		<b>Total</b>
		1,103.33
<b>ANNUAL EXTERNAL ACADEMIC SERVICES</b>		<b>(Unit: Million Baht)</b>
		<b>Total</b>
		193.98



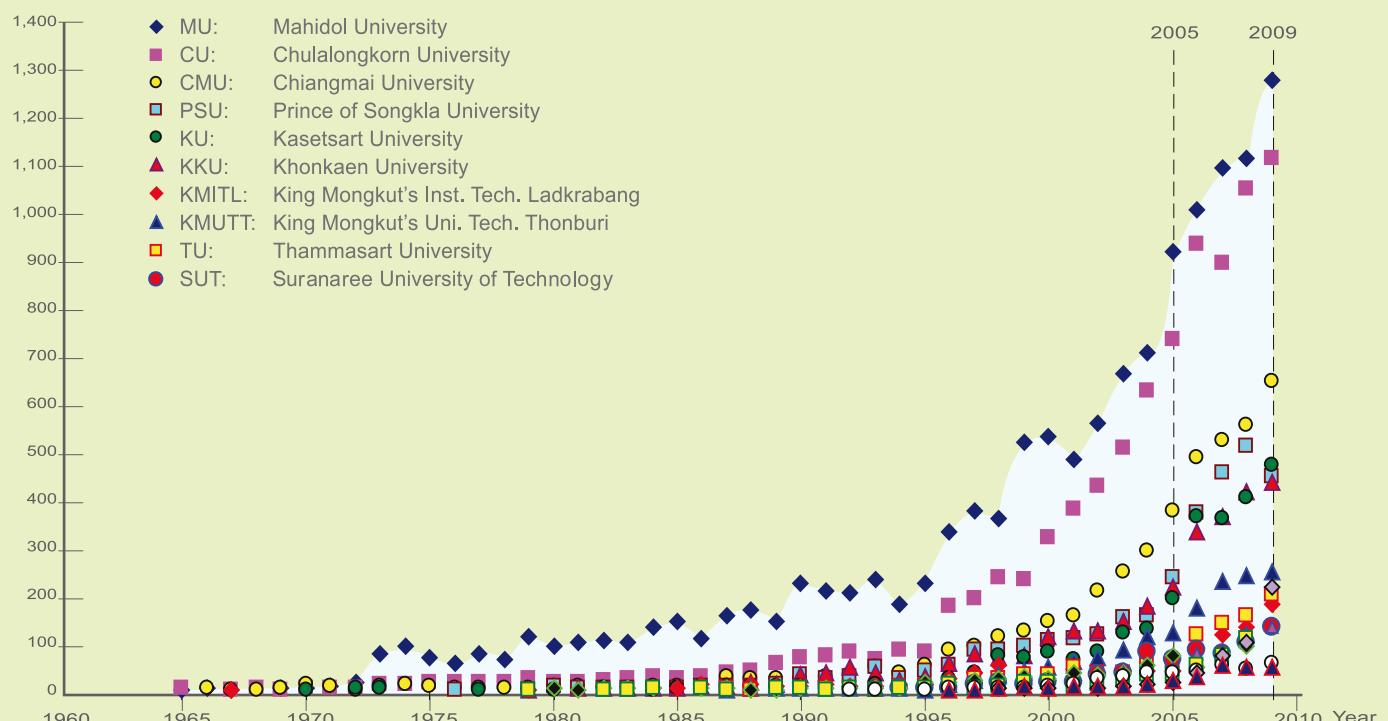
***“Research at MU enjoys an international reputation, attracts high quality staff and students, and helps to generate major funded projects”***

## 11. Vital Statistics

### Mahidol University Research Fund 2010



### International Research Publications Record of Thai Universities in Scopus Database



Source : Office of Higher Education Commission, Ministry of Education

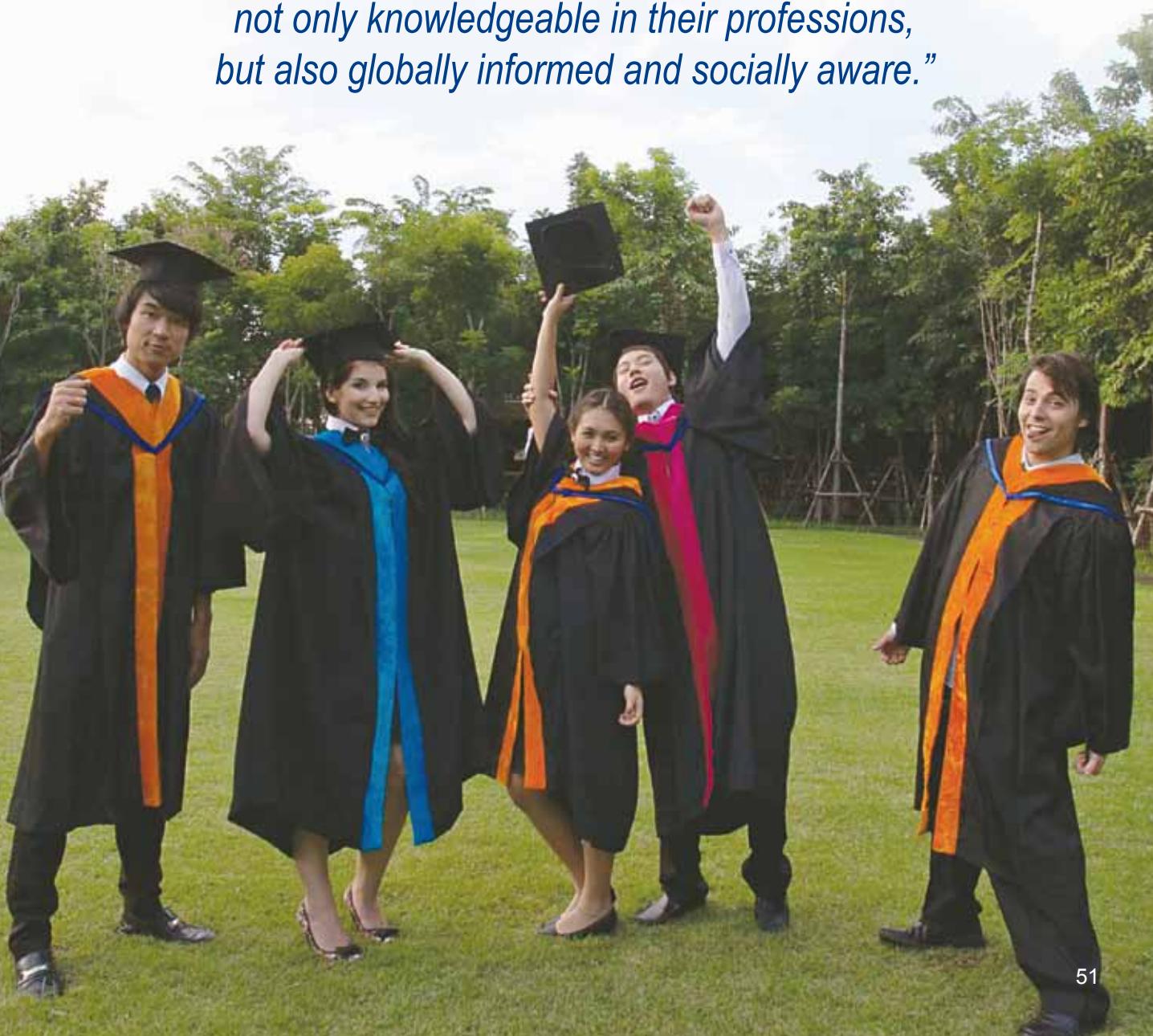


## 12. Looking to the Future

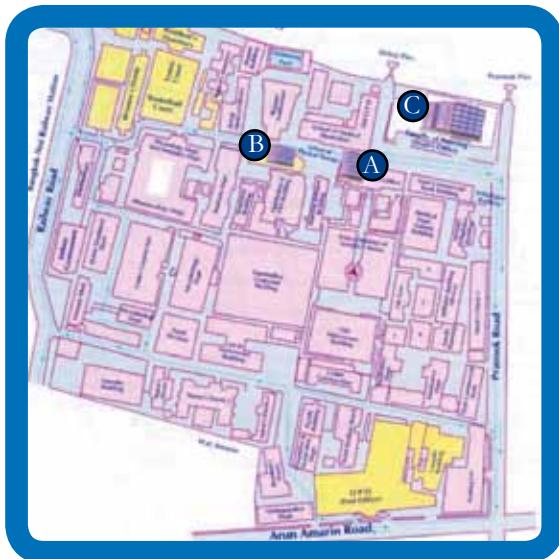


As Mahidol University celebrates the 120<sup>th</sup> anniversary of Siriraj Hospital, the University is mindful of the words of its namesake, H.R.H. Prince Mahidol, that “true success is not in the learning, but in its application to the benefit of mankind.” Thus, with its goal of becoming a world-class university, Mahidol aims to produce graduates who are not only knowledgeable in their professions but also globally informed and socially aware. Research and academic excellence will undoubtedly play a major role in the pursuit of becoming a world-class university. Research will be geared not only towards international publications and awards but also towards developing innovative products and solving social problems. Internationalization is also important for both research and teaching/learning, and we will continue to maintain strong relationship with other universities in the world community, based on friendship, partnership, and mutual benefits. Lastly, Mahidol University will continue to provide world-class healthcare services to the Thai people, as it has done for more than a century, since this is the mission which H.M. King Chulalongkorn entrusted to us.

*“Mahidol aims to produce graduates who are not only knowledgeable in their professions, but also globally informed and socially aware.”*



## 13. Locations and Map



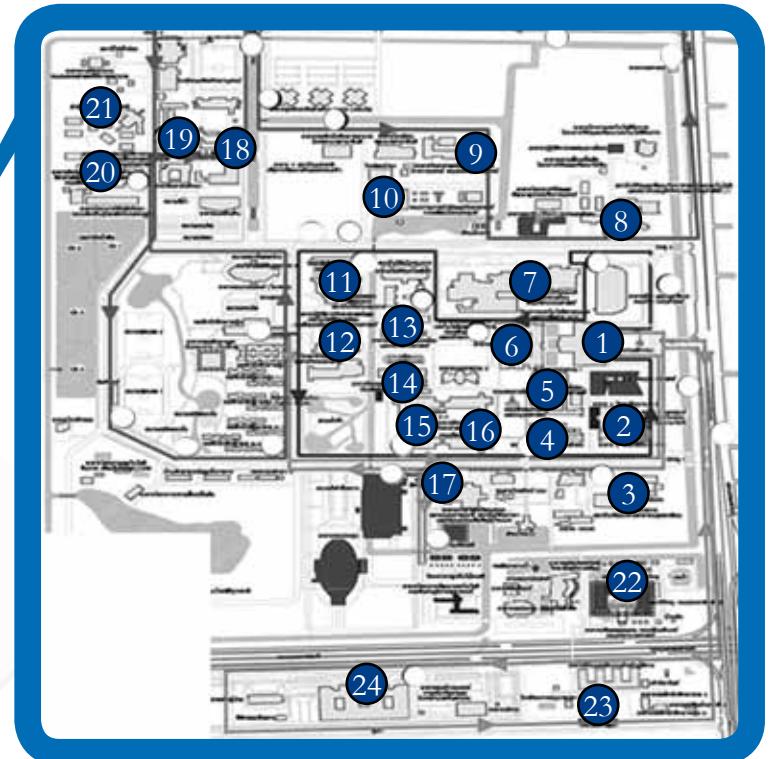
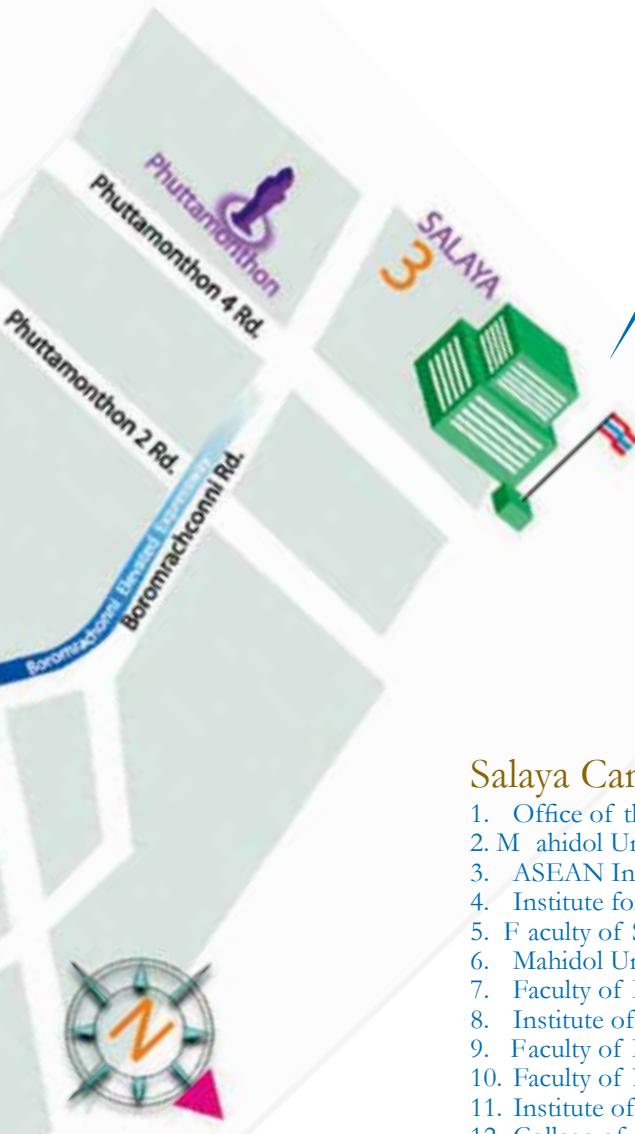
### Bangkok Noi District

- A. Faculty of Medicine Siriraj Hospital
- B. Faculty of Medical Technology
- C. Faculty of Nursing



**μBuilding**  
College of Management





## Salaya Campus

1. Office of the President
2. Mahidol University International College
3. ASEAN Institute for Health Development
4. Institute for Population and Social Research
5. Faculty of Social Sciences and Humanities
6. Mahidol University Library and Knowledge Center
7. Faculty of Engineering
8. Institute of Molecular Biosciences
9. Faculty of Medical Technology
10. Faculty of Physical Therapy
11. Institute of Nutrition
12. College of Sports Science and Technology
13. Faculty of Environment and Resource Studies
14. Faculty of Graduate Studies
15. Faculty of Science
16. Faculty of Liberal Arts
17. Research Institute for Languages and Cultures of Asia
18. National Institute for Child and Family Development
19. College of Religious Studies
20. Faculty of Veterinary Science
21. National Laboratory Animal Centre
22. College of Music
23. Ratchasuda College
24. Golden Jubilee Medical Center



## Phayathai Campus

1. Faculty of Public Health
2. Faculty of Tropical Medicine
3. Faculty of Dentistry
4. Faculty of Pharmacy
5. Faculty of Medicine Ramathibodi Hospital
6. Faculty of Science, National Doping Control Centre, Institute for Innovative Learning
7. Computer Center