



# **Research Culture in an Academic Environment**

**H. Kasai**  
**Osaka University**

# Overview

- 1. Internationalization Efforts in Developing a Culture of Research in Osaka University**
- 2. Diversity and Mobility of Students and Academic Staff in Kasai Laboratory**
- 3. Evidence of Research Outcomes**
- 4. CMD: An Illustrative Case of Developing Research Culture in the Academe**

*Whenever I deliver my talk in conferences and workshops abroad, I share to the audience this popular haiku:*

**露の世は露の世ながらさりながら 一茶**

***Tsuyu no yo wa tsuyu no yo nagara  
Sarinagara Issa(1762-1826)***

***This dewdrop world –  
It maybe a dewdrop,  
And yet – and yet –***

***Trans. R. H. Blyth***

露の世は露の世ながらさりながら 一茶

*Tsuyu no yo wa tsuyu no yo nagara*  
*Sarinagara Issa(1762-1826)*

*This dewdrop world –*  
*It maybe a dewdrop,*  
*And yet – and yet –*                      *Trans. R. H. Blyth*

*This has vividly portrayed the reality that life is fleeting and ephemeral as a dewdrop. And yet, by making the best of this short-lived and temporary dewdrop, life would be long enough to fulfill its profound purpose and meaning.*

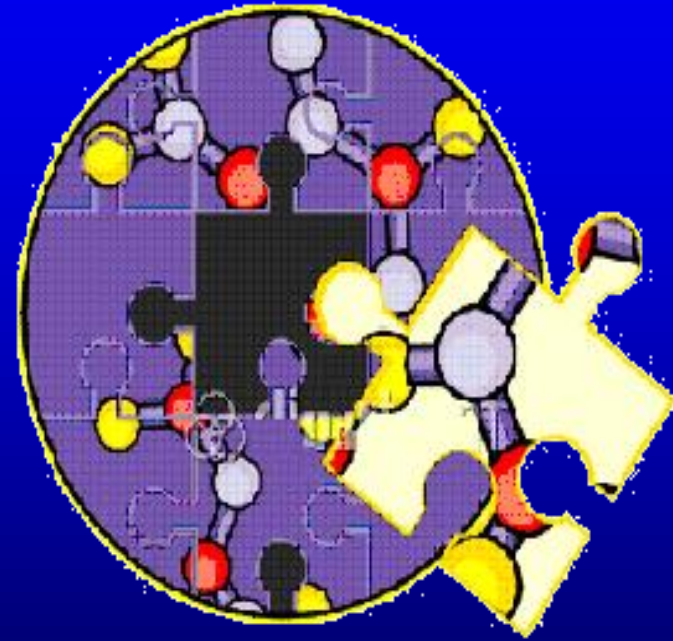
*As a university professor, I have come to realize that one of my major purposes in life is the advancement of science and technology, not only in Japan, but also in other countries, especially those in the South East Asia.*



# Realizing a Knowledge- Networked Asia

# Motivation

- Asians share the same problems
- We have different resources and competencies
- We are naturally an *intricately-linked* network



# Common Problems



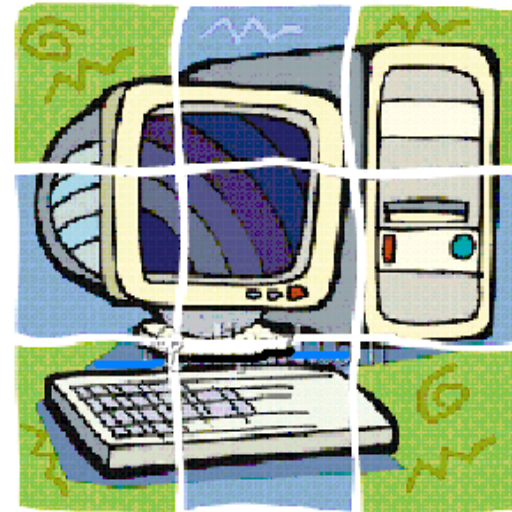
Energy



Environment



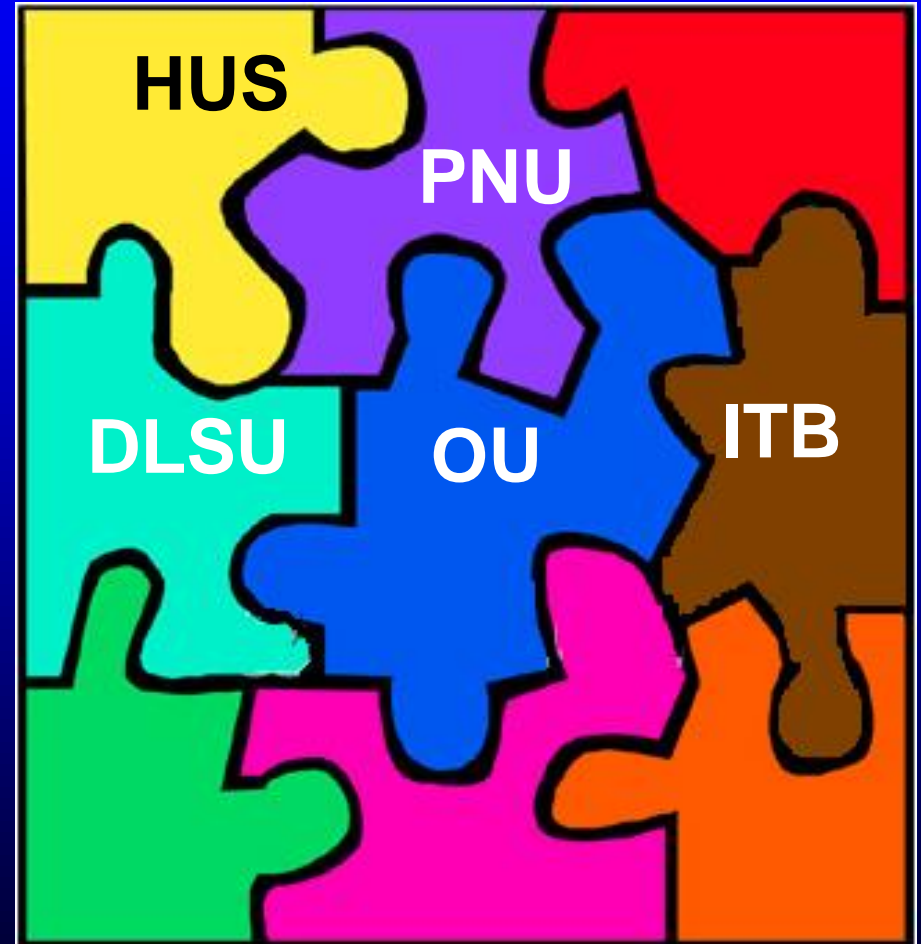
Education



Information

# An Asian Knowledge Network- *Our Vision*

- tolerant and open towards others
- people reach out to others and collectively share experiences
- no distinctions over what might be considered superior or inferior
- foster exchange and understanding between future government leaders, industrialists, tycoons, academic and scientific leaders (our students)





# Internationalization Efforts in Developing a Culture of Research



**CAREN**

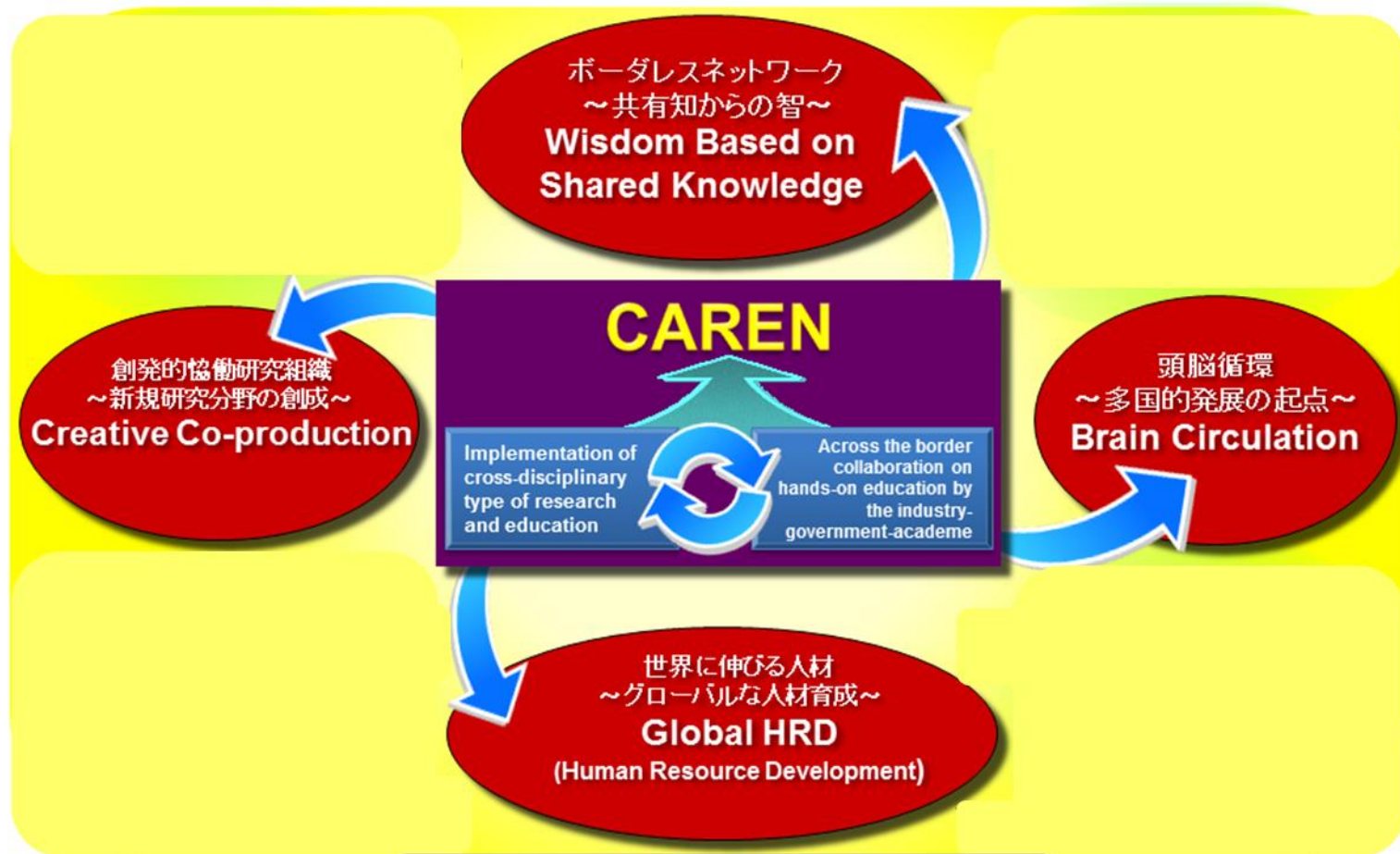
**CAREN**

# Concept of CAREN

Center of Asian Research & Education Network

## CAREN

Osaka University's promotion of international collaboration



# Specific Activities of CAREN

## Osaka University Initiative

Building a structure international education

## International education Building of a network

Creation of a program for general education with foreign universities

Feedback

**CAREN**

Design of a new English-language programs

Realization of shared knowledge

Management of activities for international exchange

Building a network of academic participants from various countries

Formation of research centers, Enhancing flexibility for educational exchanges

# General Idea of CAREN

## CAREN is a leader in global campus

Foreign students

Other country's bridge to Japan

Research and educational programs

A campus where foreign and Japanese students support each other



Osaka University satellite office @ De La Salle University

Japanese students

Plays active role in Japan



Graduated foreign student  
Assistant Professor, University of Fukui

# Ph.D. Graduates from Kasai Laboratory

36 Graduates as of Sept. 2014

Year	Name	Country of Origin	卒業年度	氏名	国籍
2014年度(H26)	Allan Abraham Padama	Philippines	2010年度(H22)	Do Ngoc Son	Vietnam
	Tran Phan Thuy Linh	Vietnam		窪田 善之	Japan
	Febdian Rusydi	Indonesia	2009年度(H21)	尾澤 伸樹	Japan
	Adhitya Gandaryus Saputro	Indonesia	2008年度(H20)	Melanie Yadao DAVID	Philippines
	Ferensa Oemry	Indonesia		Eben Sy Dy	Philippines
	三輪 邦之	Japan	2007年度(H19)	津田 宗幸	Japan
2013年度(H25)	Aspera Susan Meñez	Philippines		Md. Mahmudur Rahman	Malaysia
	Nguyen Tien Quang	Vietnam		Nelson B. Arboleda Jr.	Philippines
	Triati Dewi Kencana Wungu	Indonesia	2006年度(H18)	岸 智弥	Japan
	Abdulla Ali Abdulla Sarhan	Bahrain		Rifki Muhida	Indonesia
	Handoko Setyo Kuncoro	Indonesia	2005年度(H17)	松中 大介	Japan
	國貞 雄治	Japan	2004年度(H16)	信原 邦啓	Japan
2012年度(H24)	Nghiem Hoa Thi Minh	Vietnam	2002年度(H14)	三浦 良雄	Japan
	Escaño Mary Clare Sison	Philippines		長谷川 和彦	Japan
	Wahyu Tri Cahyanto	Indonesia	2001年度(H13)	福井 篤	Japan
	Mohammad Kemal Agusta	Indonesia	2000年度(H12)	坂上 護	Japan
	岸 浩史	Japan	1999年度(H11)	Wilson Agerico DIÑO	Philippines
2011年度(H23)	Roman Tanglaw Abat	Philippines			
	南谷 英美	Japan			

## Diversity of Students and Academic Staff

# Doctoral Thesis: Dynamics of Hydrogen-Solid Surface Reactions (1998)



外国人客員研究員 ディニョ、ウィルソン アジェ  
リコ タン氏が日本物理学会論文賞を受賞



**Wilson Agerico Tan Diño  
(Osaka University)**



## **RIFKI MUHIDA, PH.D.**

**Design and Control of Dynamical Quantum Processes in Ortho-Para H<sub>2</sub> Conversion on Solid Surfaces and Clusters**

**Application:** Hydrogen storage

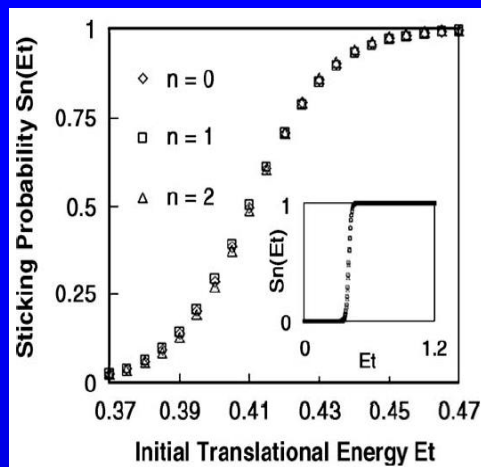
**Graduated:** 2005

**Current:**

Dean of Engineering Faculty,  
Surya University, Indonesia

**(part of his work got two patents)**





## Doctoral Thesis

Quantum Dynamics  
Investigations and First  
Principles Studies of  
Vibrational Effects on  
Hydrogen-Surface Reactions  
(2006)

DLSU

固体表面反応における動的量子過程に関する理論的研究

Dr. Nelson Arboleda





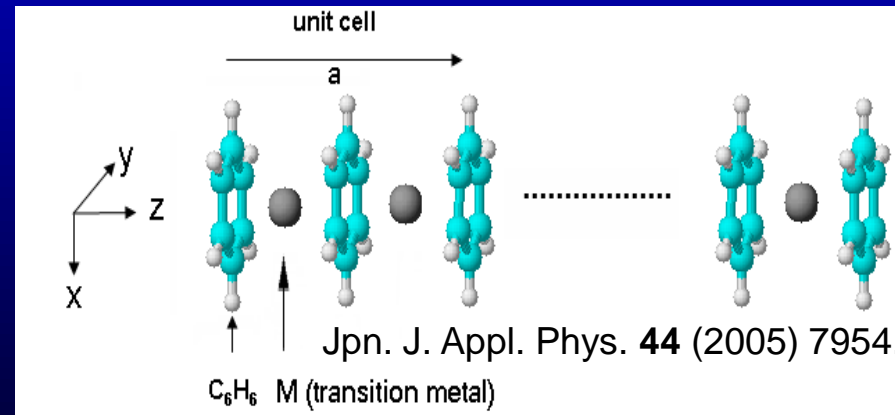


Dr. Rahman Md. Mahmudur  
University Putra Malaysia

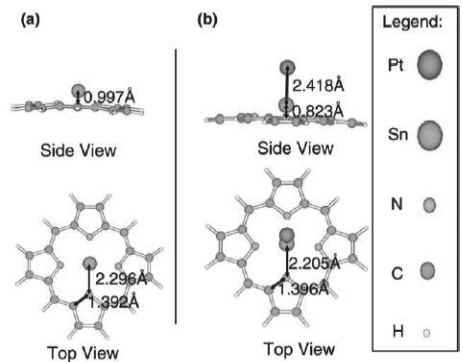
**Doctoral Thesis**

**Theoretical study on the electric  
and magnetic properties of  
one-dimensional carbon  
based nanomaterials with  
transition metal atoms (2006)**

遷移金属原子を含む一次元炭素系  
ナノマテリアルの電氣的・磁氣的  
性質の理論的研究



**Benzene-transition metal  
sandwich chain**



A theoretical analysis on the interaction between Sn (II) porphyrin & Pt and the electronic characteristics of their reaction product

Chemical Physics Letters  
422 (2006) 539–542

**Doctoral Thesis**  
**Density Functional**  
**Investigations on Heme- and**  
**Hydrogenase-based Catalysts**  
**for Potential Fuel Cell**  
**Applications (2007)**

Dr. Eben Dy

National Institute for FCA  
(Canada)

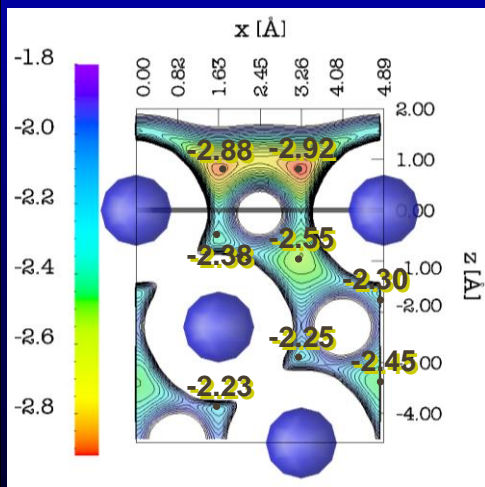




# Dr. Nobuki Ozawa Tohoku University

Quantum states of hydrogen  
motion on the solid surface  
and in the subsurface of  
transition metals

遷移金属表面及び表面内部領域  
における水素原子の量子論的振る  
舞いに関する理論的研究(2008)



The contour plot of the  
adiabatic PES on a cross  
section, cutting thorough  
the top-fcc-hcp-top line,  
for the hydrogen atom  
motion on the Pd(111)  
surface and in the  
subsurface



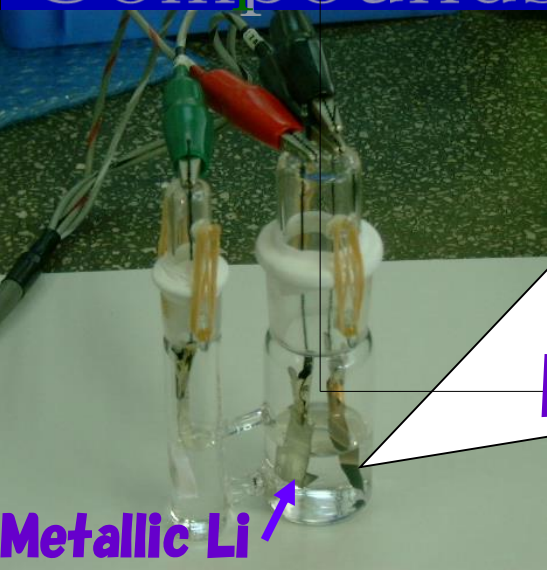
博士論文

第一原理計算による二次電池と燃料電池の電極反応に

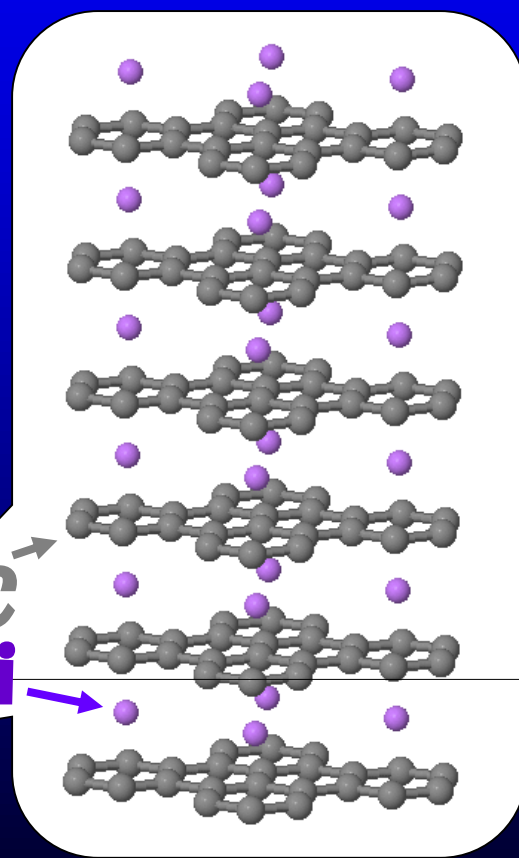
関する理論的研究 (2009)

KEP Co.

Li-Graphite  
Intercalation  
Compounds



Metallic Li



Dr. Yoshiyuki Kubota



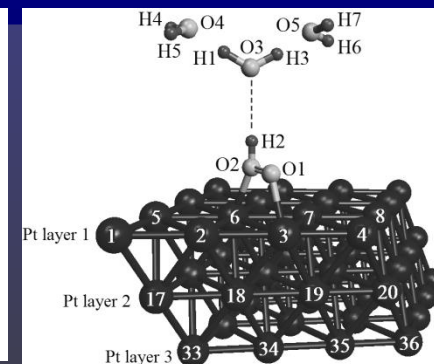
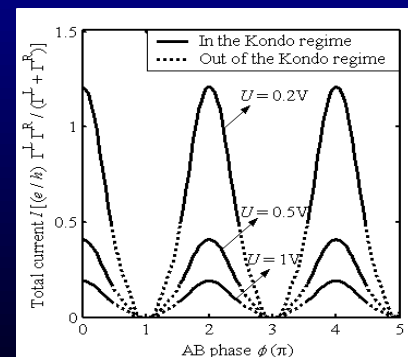
*Dr. Do Ngoc Son*

# VNU Ho Chi Minh

## Doctoral Thesis

Dynamical behaviors of electrons in Aharonov-Bohm interferometer and protons in exchange membrane fuel cell (2009)

1. Electronic transport in the Aharonov-Bohm interferometer
2. Proton transfer in aqueous Nafion membrane
3. Oxygen reduction reaction on catalytic surfaces





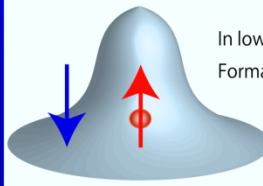
# Dr. Emi Minamitani

Tokyo University

博士論文 磁性ダイマー吸着系における近藤効果と磁氣的相互作用に関する理論的研究(2009)

## Kondo effect

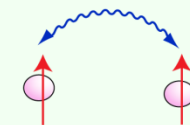
Many body physics problem associated with the interaction between magnetic impurities and conduction electrons



In low temperature ( $\ll T_K$ )  
Formation of Yosida-Kondo singlet

## Interaction between local spins

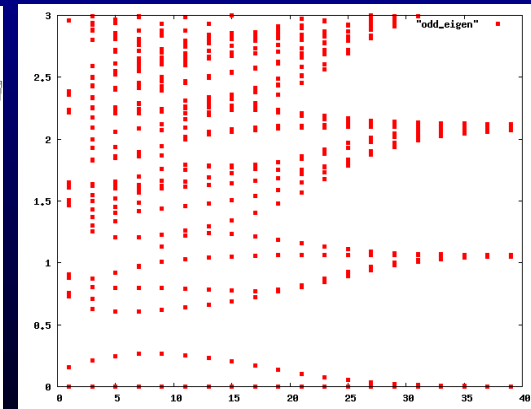
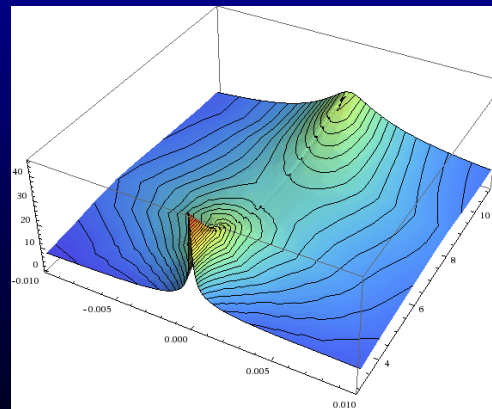
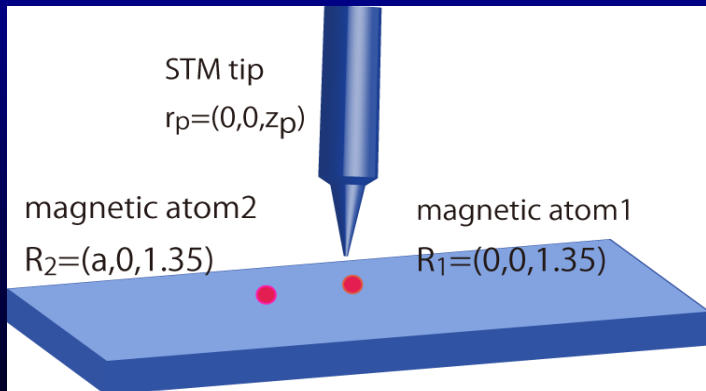
magnetic interaction between local spins may arise from RKKY interaction or direct hopping between d electrons



formation of magnetic order

# Real space observation of Kondo effect and RKKY interaction

# Numerical Renormalization Group



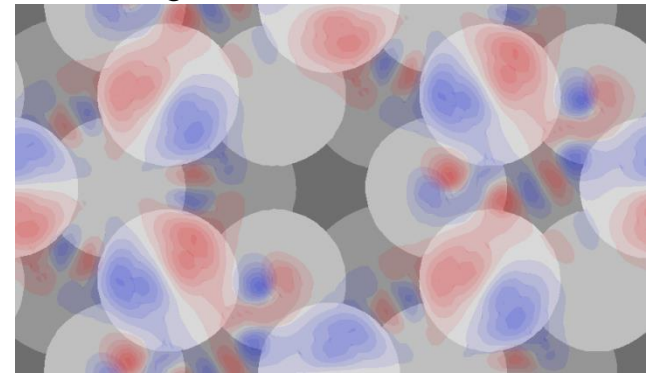


Dr. Tanglaw Roman

University Ulm

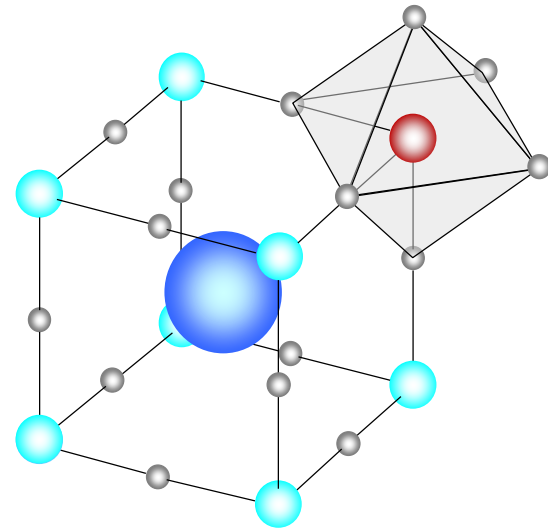
Doctoral Thesis  
Structural and dynamical  
properties of hydrogen in  
graphene and platinum  
surface systems (2009)

Hydrogen atom motion on a highly  
defective Pt surface, showing significant  
delocalization in regions outside a  
vacancy.





Self-forming  
nano-particle catalyst  
without precious metals



Dr. Hirofumi Kishi (2006)

DAIHATSU



## **MOHAMMAD KEMAL AGUSTA, PH.D.**

### **Theoretical Study of Hydrazine Adsorption on Metal Surfaces**

**Application:** Direct hydrazine fuel cells

**Graduated:** 2012

**Current:**

Faculty at Engineering Physics Department,  
Institut Teknologi Bandung, Indonesia.

**(part of his work is used by Daihatsu)**





## **WAHYU TRI CAHYANTO, PH.D.**

**A DFT Study on the Interaction of Hydroperoxo(OOH) and Some Methanol Decomposition Species with Pt and Pt-alloy Surfaces**

**Application:** Direct methanol fuel cells

**Graduate:** 2013

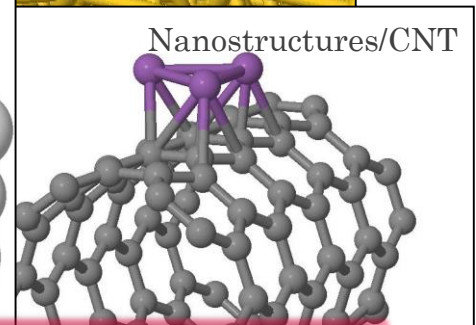
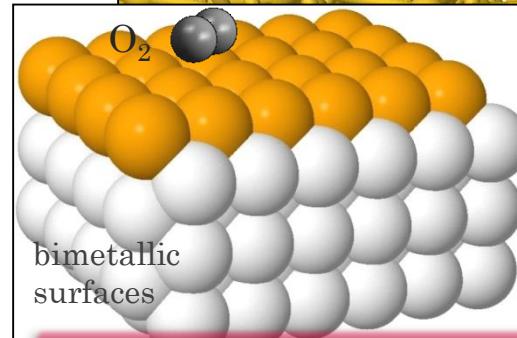
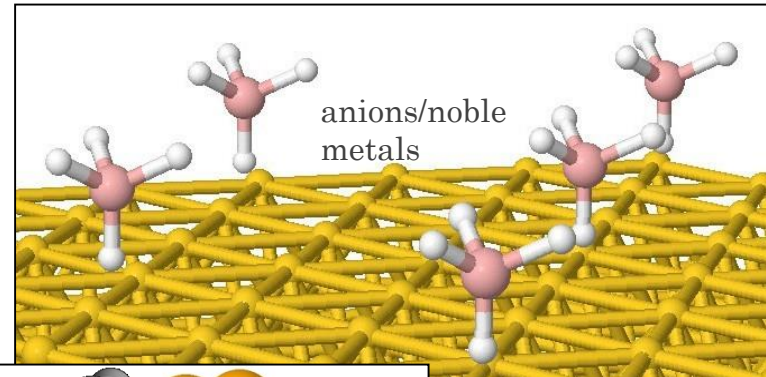
**Current:**

Faculty at Physics Department,  
Universitas Soedierman, Indonesia



# Quantum Simulation and Design of Novel Catalytic Materials for Energy Applications

新規高効率エネルギー技術開発のための量子シミュレーション・マテリアル・デザイン



*"I am working on gas-metal surface interaction and diffusion in nanostructures/CNT composites."*

Dr. Mary Clare Escaño (2012)  
Fukui University

## Magnetic adatoms on a metal surface:

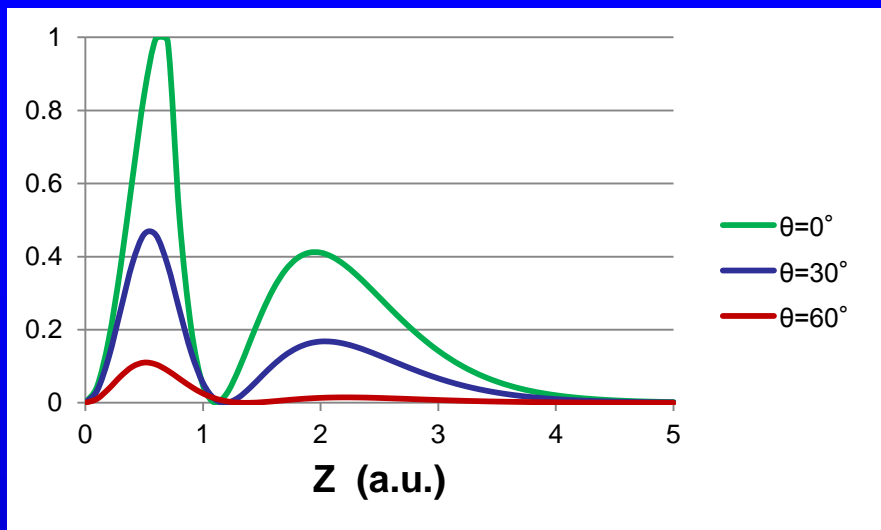
- Kondo effect at  
single adatoms  
+
- RKKY, and direct  
interaction between  
adatoms



Magnetic order?  
Frustration?



Dr. Nghiem Thi Minh Hoa (2012)  
Forschungszentrum Jülich GmbH



Intensity of Fermi contact

# A theoretical study of Ortho-Para conversion of hydrogen molecules

水素分子の  
オルソ-パラ変換の理論的研究

Dr. Yuji Kunisada (2013)  
Hokkaido University





## **HANDOKO SETYO KUNCORO, PH.D.**

**Theoretical Study on Formation, Stability and Reaction of Small Water Clusters**

**Application:** water treatment

**Graduated:** 2013

**Current:**

Faculty at the Center for Ceramics of  
Industrial Ministry, Indonesia

(part of his work is used by Otsuka Chemical Co.  
Ltd.)



# Dr. Abdulla Ali Abdulla Sarhan

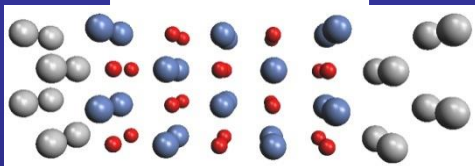
## (2013) Arabian Gulf University

Quantum Computation, Electronic Transport, and First Principles calculations

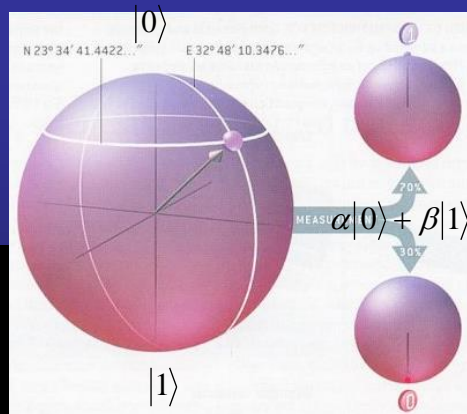
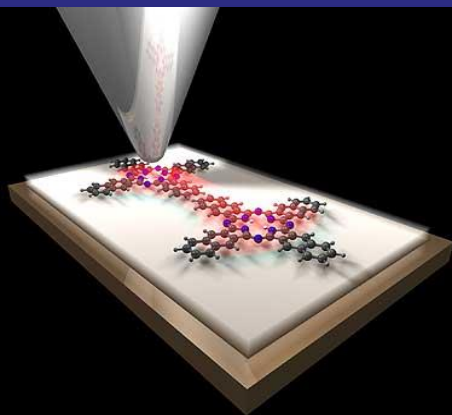
量子計算と電子輸送と第一原理計算

Resistance Random Access Memory

Pt /NiO/Pt



Molecular Switch



A qubit representation by Bloch sphere

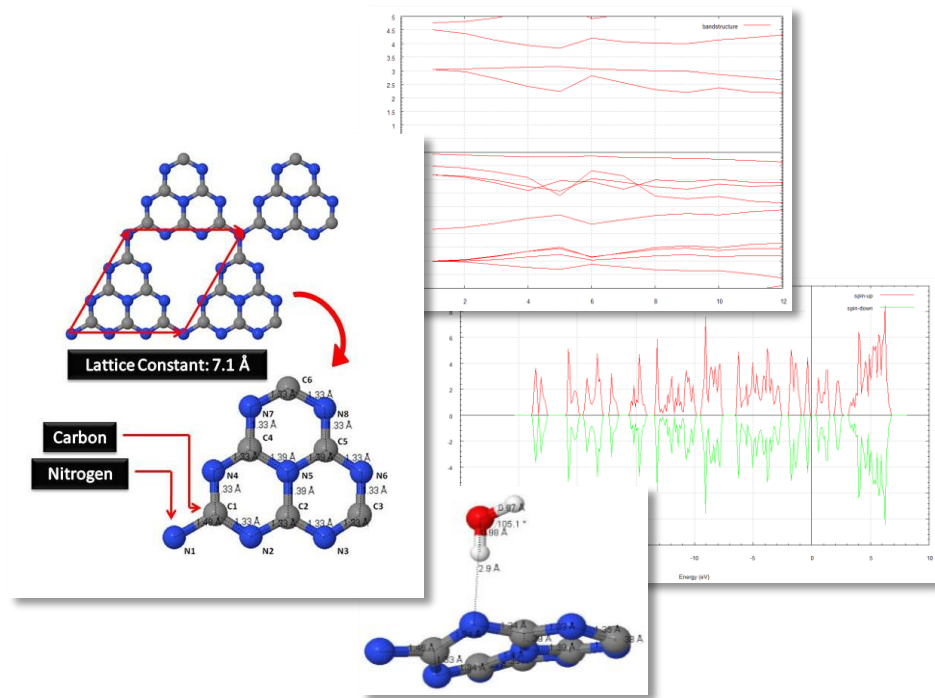






Dr. Susan Meñez Aspera  
(2013) Osaka University

First Principles-Based Studies on  
the Potentials of Graphitic Carbon  
Nitride and other Non-Metal-Based  
Materials as Catalysts for  
Alternative Energy Sources





## **TRIATI DEWI KENCANA WUNGU, PH.D.**

**Theoretical Study on Lithium-Montmorillonite**

**Application:** Lithium-ion battery

**Graduated:** 2013

**Current:**

Faculty at Physics Department,  
Institut Teknologi Bandung, Indonesia

(part of her work is used by the Government  
under ALCA project)



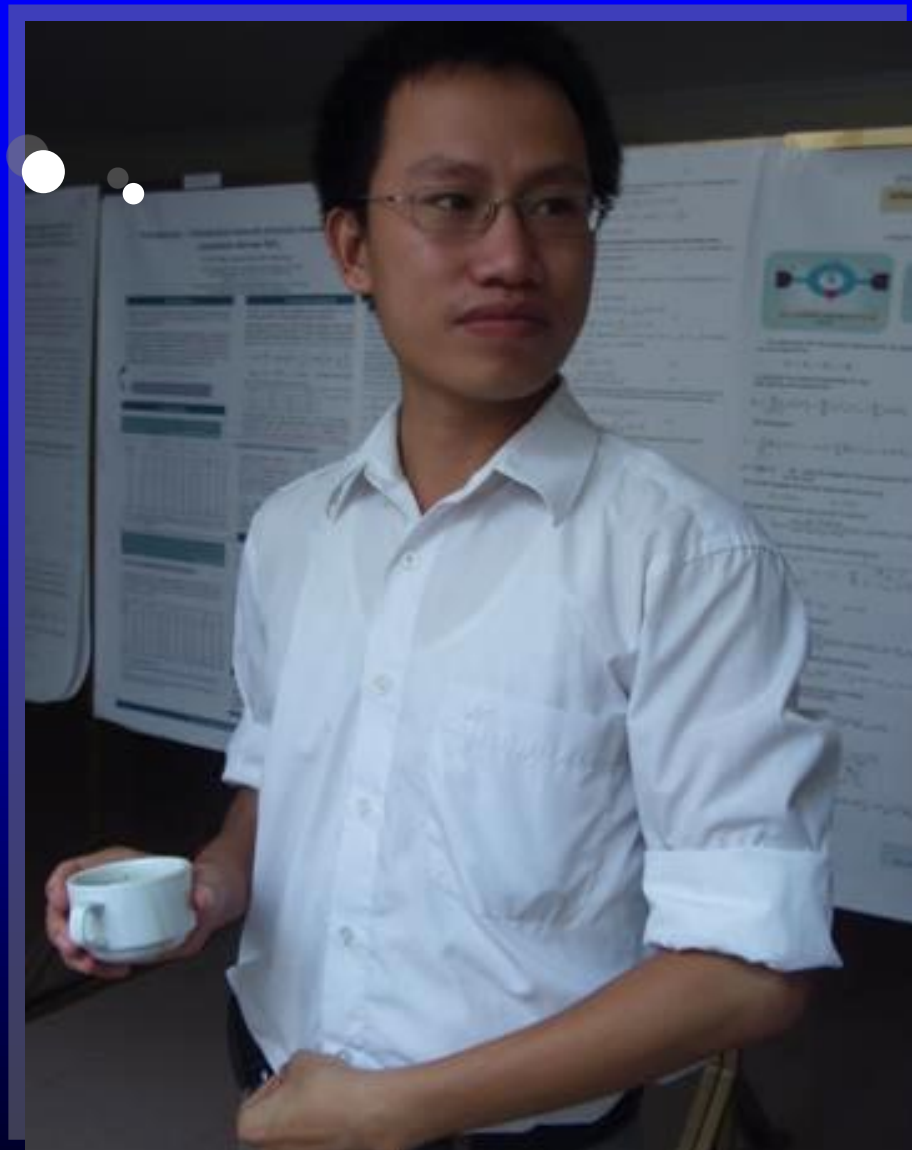
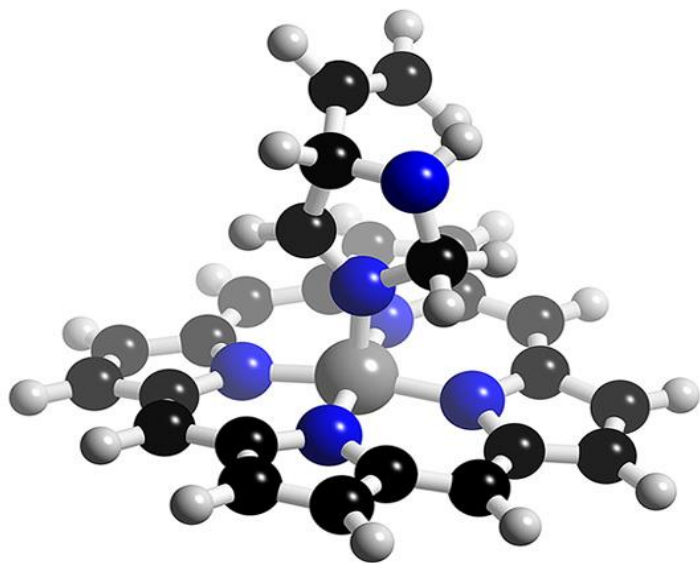
# Dr. Nguyen Tien Quang

(2013) Osaka University

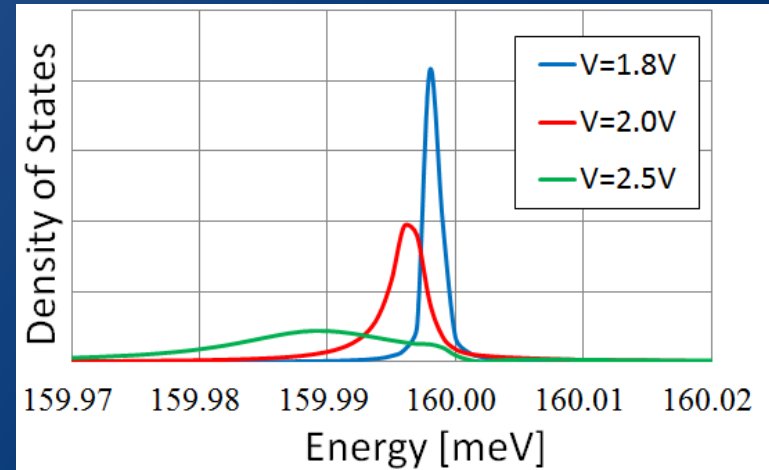
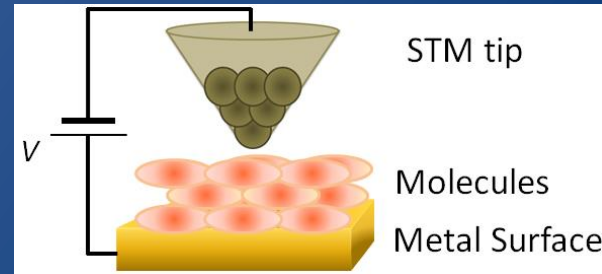
DFT method?  
Green's function  
method?... hmm?  
@\*#%&\$... ^\_^

- Nano-scale Structure and Properties

Fe porphyrin



Dr. Kuniyuki Miwa(2014)RIKEN *Molecular Vibrational Dynamics Induced by Surface Plasmons*



Vibrational DOS of ad molecules in the presence of surface plasmon excited by STM current



## **FERENSA OEMRY, PH.D.**

**Theoretical Study of Geometry, Size and Alloying Effects on the Reactivity of Small Pt Clusters**

**Application:** Diesel oxidation catalyst

**Graduated:** 2014

**Current:**

Faculty at the Indonesian Institute of Science (LIPI), Indonesia

**(part of his work is used by Isuzu)**





## **FEBDIAN RUSYDI, Ph.D.**

**Theoretical Study of Ligand and Solvent Effects on the Electronic Structure of Zinc Tetraphenylporphyrin**

**Applications:** Photodynamic therapy and dye-solar cell

**Graduated:** 2014

**Current:**

Specially-appointed Assistant Professor at Kasai Lab., Osaka University, Japan

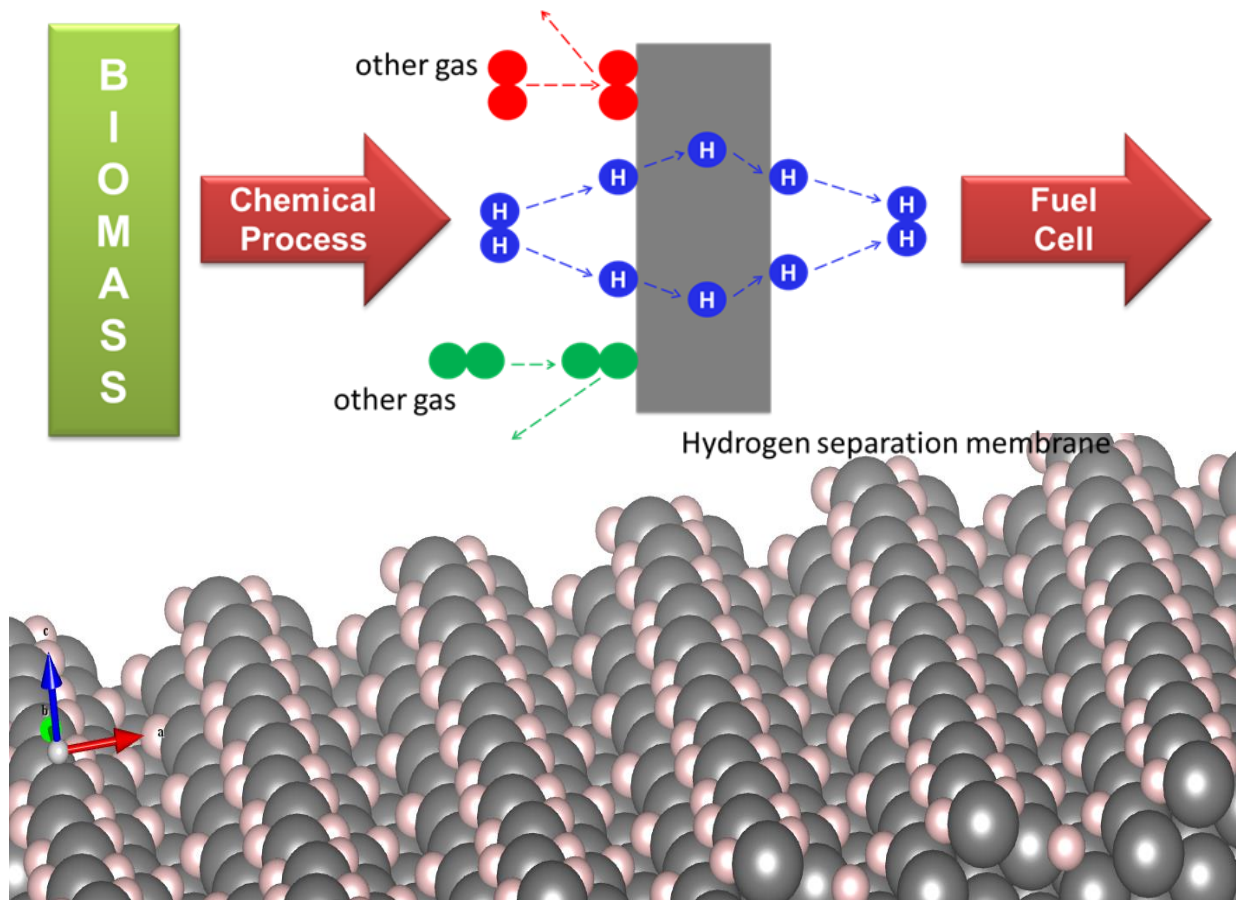
Faculty at Department of Physics Universitas Airlangga, Indonesia (Permanent)

**(part of his work is used by Panasonic)**



# Hydrogen Separation Membrane

Understanding H absorption on (1X2) missing row reconstructed Pd(110) surface



Dr. Allan Abraham Padama  
(2014) UP

A clear description on the behavior of H atoms on surfaces, especially its absorption process will be significant for various applications such as storage and hydrogenation or dehydrogenation of different molecules.



## **ADHITYA GANDARYUS SAPUTRO, PH.D.**

**Theoretical Study of Oxygen Reduction  
Reaction Mechanism on Transition-Metal-  
Nitrogen-Based (TM-N<sub>x</sub>-based) Active Sites**

**Application:** Direct Hydrogen Fuel Cells

**Graduated:** 2014

**Current:**

Specially-appointed Assistant Professor at  
Kasai Lab., Osaka University, Japan

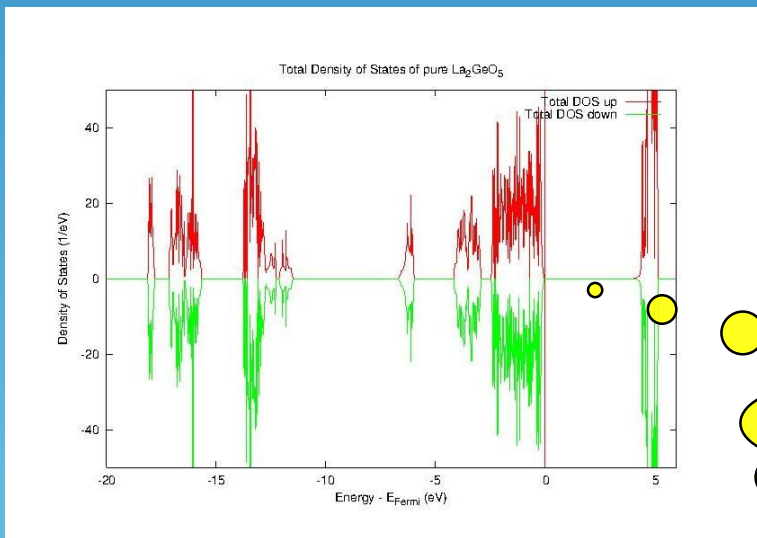
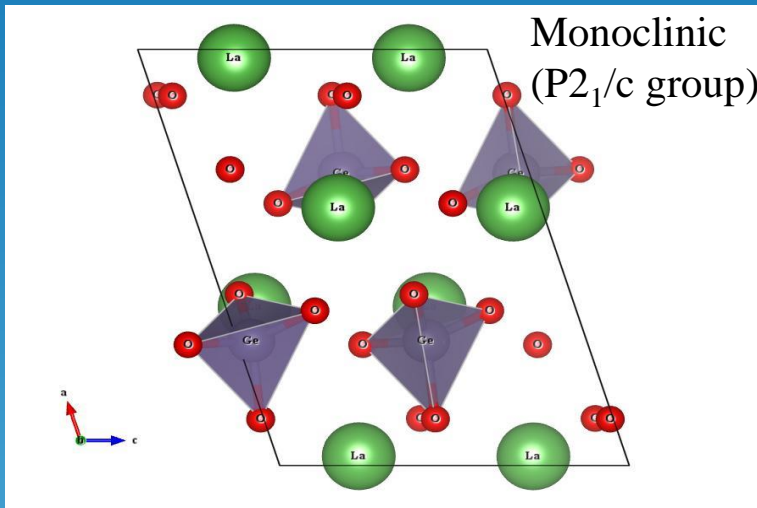
**(part of his work is used by Daihatsu)**





# Ph.D. Research Theme $\text{La}_2\text{GeO}_5$ – based Oxide Solid Electrolyte

Dr. TRAN Phan Thuy Linh  
Quantum Engineering Design Course  
(2014) Hue University



Pure  $\text{La}_2\text{GeO}_5$  is electrically insulating with band gap larger than 4 eV.

# Ph.D. Students who will graduate on March 25, 2015



**Ryan L. Arevalo**

Dissertation: Rational  
Catalyst Design Approach  
to Heterogeneous  
Catalysis: Oxidation of  
Borohydride and Nitric  
Oxide






















**Kohei Oka**

Dissertation: Profile of  
Segregation induced by  
Oxygen on  $\text{Cu}_3\text{Au}$  with  
Protective Layers

# Current Members of Kasai Laboratory

笠井 秀明 Hideaki Kasai   
 Wilson Agerico Tan Diño   
 中西 寛 Hiroshi Nakanishi   
 坂上 護 Mamoru Sakaue   
 山田 隆博 Takahiro Yamada   
 古山 恵子 Keiko Furuyama   
 野尻 郁子 Ikuko Nojiri   
 酒井 佐代子 Sayoko Sakai   
 伊藤 比鶴 Hizuru Ito   
 Aspera Susan Meñez   
 Febdian Rusydi   
 Saputro Adhitya Gandaryus   
 小島 一希 Kazuki Kojima   
 岡 耕平 Kohei Oka   
 Moreno Joaquin Lorenzo Valmoria   
 Ryan Lacdao Arevalo   
 Listra Yehezkiel Ginting   
 Paulus Himawan Lim   
 Alan Furkan 

Nguyen Hoang Linh   
 Fadjar Fathurrahman   
 清水 康司 Koji Shimizu   
 Musa Alaydrus   
 Chantaramolee Bhume   
 Ganes Shukri   
 Arguelles Elvis Flaviano   
 網野 修一 Shuichi Amino   
 戎 弘実 Hiromi Ebisu   
 岸田 良 Ryo Kishida   
 土谷 亮 Ryo Tuchitani   
 岩井 良真 Iwai Yoshimasa   
 村山 香 Kaori Murayama   
 黒川 乃一 Daiichi Kurokawa   
 川寄 航 Wataru Kawasaki   
 Robby Manrique Barlis   
 Vic Marie Camacho Inte   
 Ta Thi Thuy Huong   
 Leong Jun Xing   
 Wiriya Thamada   
 Pham Ba Duy   
 Tran Van Nam 

 Turkey
  Malaysia

 Japan
  Indonesia
  Philippines
  Vietnam
  Thailand

# Kasai Laboratory



# **CURRENT PH.D. AND MASTER STUDENTS FROM INDONESIA**





## FADJAR FATHURRAHMAN (PHD STUDENT D3)

“Theoretical study of  $N_2H_4$  decomposition reactions on transition metal surfaces”

**Applications:** Direct hydrazine fuel cell

(Part of his work is used by Daihatsu)





## MUSA ALAYDRUS (PHD STUDENT D2)

“Ionic transport in ceria based solid electrolytes”

**Applications:** Solid oxide fuel cell

(Part of his work is used by the Government under ALCA project)





## **GANES SHUKRI (PHD STUDENT D2)**

“Unsaturated-small hydrocarbon molecules interaction with anatase  $\text{TiO}_2$  surfaces”

and

“Degradation pathways of polymer backbone and TMA of functionalized Fluorinated Poly(arylene ether)”

**Application:** Direct hydrazine fuel cells

**(Part of his work is used by Daihatsu)**







## **LISTRA YEHEZKIEL GINTING (MASTER STUDENT M1)**

**“Photocatalytic Water-splitting Reaction for  
Hydrogen Production using GaN”**

**Applications:** photocatalyst for water splinting

**(Part of his work is used by Sumitomo electric)**





## **PAULUS HIMAWAN LIM (MASTER STUDENT M1)**

“Designing Pt-alloys as high performance electro catalysis in PEMFCs”

**Application:** Direct hydrogen fuel cells



# SCIENTIFIC WORKS IN NUMBER

(up to January 2015)

<http://dyn.ap.eng.osaka-u.ac.jp>

<b>450</b>	<b>Scientific publication</b> in various international journals
<b>36</b>	<b>Graduated Ph.D. students</b>
<b>30</b>	<b>Review articles</b> in various international journals
<b>21</b>	<b>Patents</b>
<b>11</b>	<b>Text books</b> in advanced physics



# SCIENTIFIC AWARDS

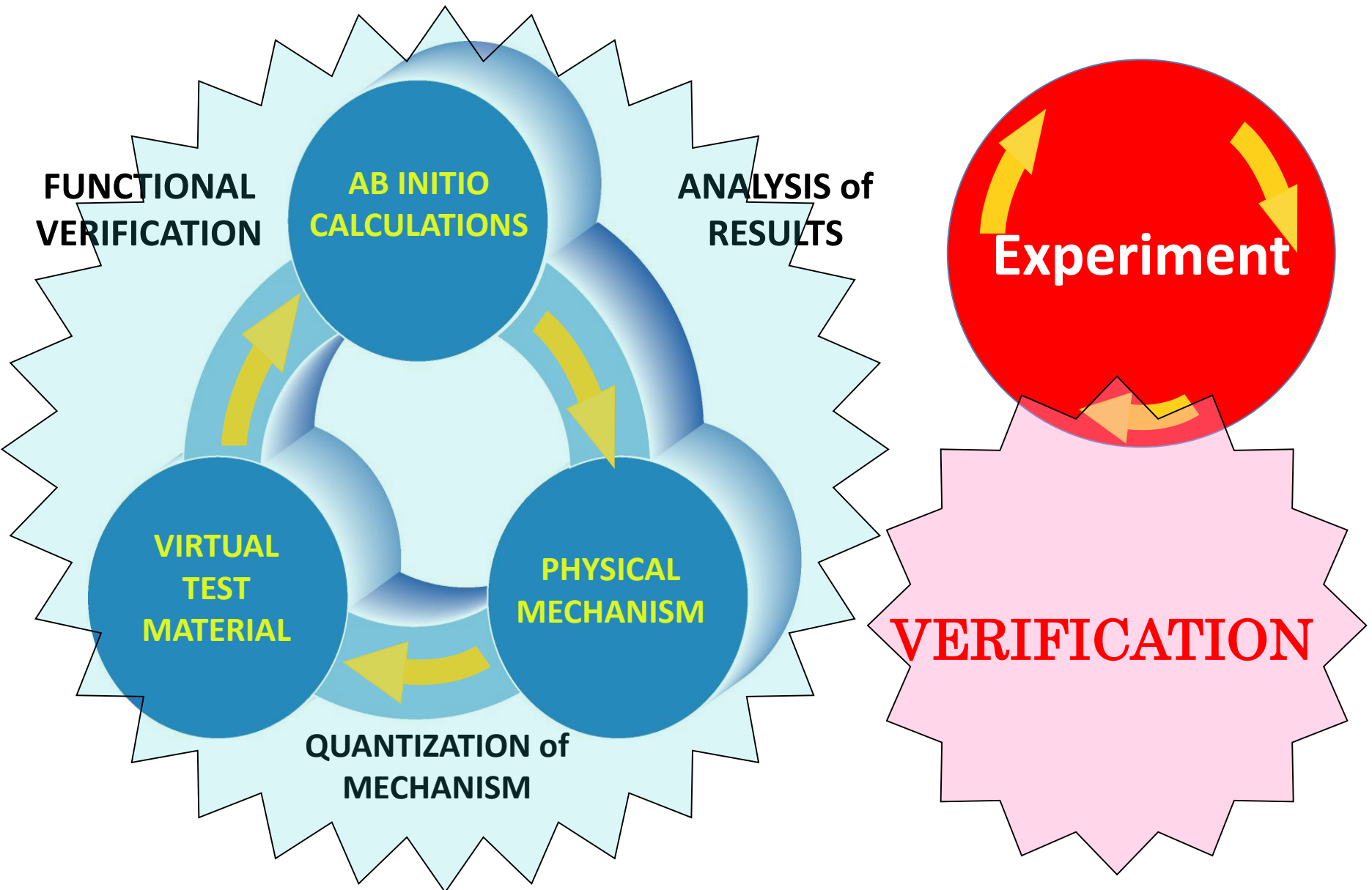
1. Ganesa Widya Jasa Adiutama from ITB Indonesia, 2014-July.
2. 総長顕彰 (Sōchō kenshō) award from Osaka University, Japan: This award is received who achieved outstanding performance in education, research or social and international contribution in order to further promote the development of Osaka University, 2014-August.
3. 文部科学大臣賞 (Monbukagaku daijin-shō) from Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan: Commendation prize for science and technology for his "Proposal of a Quantum Dynamics Theory and Pioneering Studies of Intelligent Materials Design Method", in 2012-April.
4. 5<sup>th</sup> Award for Academic Papers on Physics (日本物理学会第5回論文賞 (2000)), for "Rotational Alignment in the Associative Desorption Dynamics of Hydrogen Molecules from Metal Surfaces" from the Physical Society of Japan on September 24, 2000.
5. Other awards



**COMPUTATIONAL MATERIALS DESIGN (CMD<sup>®</sup>):**  
an Outstanding Example of  
University-Government-Industry Collaboration

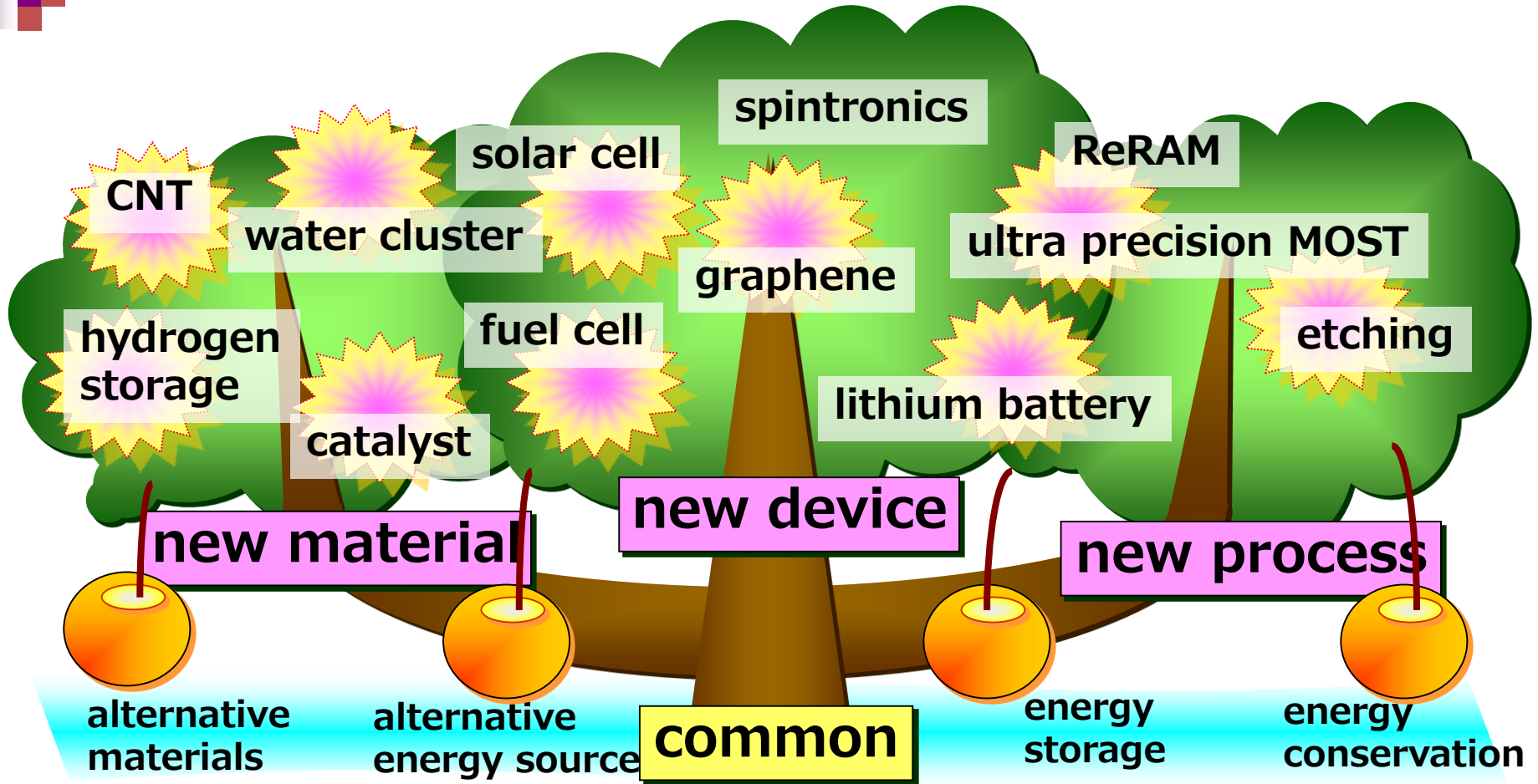


# Computational Materials Design<sup>®</sup> (CMD<sup>®</sup>)



# Through CMD<sup>®</sup>

-creation of new technique and technology in the 21<sup>st</sup> century



*Green Innovation*

**CMD: intelligent design and development**

# FIRST PATENT (2001):

## “METHOD OF PROMOTING HYDROGEN LIQUEFACTION”

- Inventors:  
Hideaki KASAI, Hiroshi NAKANISHI, Wilson Agerico DIÑO,  
Rifki MUHIDA
- Patent No.: Japan □ 2001 □ 274461
- Application: Liquid hydrogen storage  
Provides ortho-para conversion method for promoting and facilitating hydrogen liquefaction methods to high efficiency







Professor Hiroshi Nakanishi

# PROJECTS FROM THE GOVERNMENT AND INDUSTRIES

- After time goes, we got more patents and more publications.
- Our CMD® workshop (to be explained later) also became known to the public.
- CMD® has attracted the attention of the Industry and other Institutions.
- We got projects and grants from industries as well as from the Government.





**TOYOTA**



**DAIHATSU**



**ISUZU**

**Panasonic**

**SHARP**



**SUMITOMO  
ELECTRIC**

**TOSHIBA**

**KOBELCO**  
KOBELCO STEEL GROUP



**TANAKA KIKINZOKU KOGYO K.K.**



**MITSUBISHI  
ELECTRIC**



**MEXT**

MINISTRY OF EDUCATION,  
CULTURE, SPORTS,  
SCIENCE AND TECHNOLOGY-JAPAN



**日本学術振興会**

Japan Society for the Promotion of Science



技術開発機構



Advanced Low Carbon Technology  
Research and Development Program



## SOME NOTABLE CUSTOMERS

Long term projects:  
involving graduate students  
(master and doctoral) and  
visiting researchers.

Some of our alumni are  
taken directly by these  
companies to work.

They continue to use CMD®  
in their professional career.



**THE 10TH  
CMD® WORKSHOP  
KYOTO, 2007**



第10回コンピュータシヨナル・マテリアルズ・デザイン(CMD)ワークショップ 於 国際高等研究所 平成19年3月10日出



# CMD<sup>®</sup> WORKSHOP

- The workshop became famous, attended not only by academicians (students, researchers, teachers), but also by people from industry.
- Right now the 23<sup>rd</sup> CMD<sup>®</sup> workshop is taking place in Osaka, from Feb-23 to Feb-27.
- In average, CMD<sup>®</sup> workshop is conducted twice a year, the summer session and the winter session.
- Since 2008, CMD<sup>®</sup> workshop begun to take place outside Japan. The name is Asia CMD<sup>®</sup> workshop.



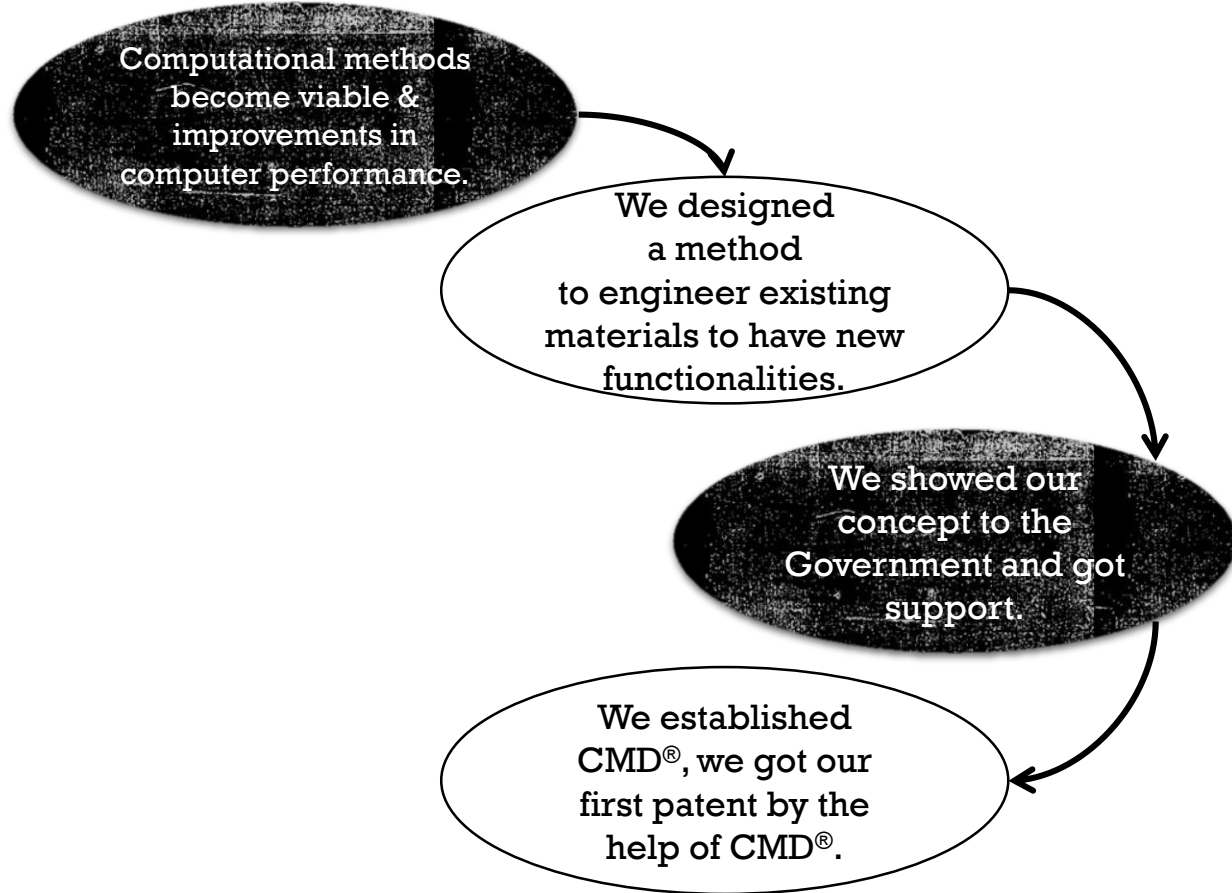
# ASIA CMD<sup>®</sup> WORKSHOPS HELD IN THE PAST YEARS

2008	ITB (Indonesia) [credit to Prof. Hermawan K. Dipojono] De La Salle Univ. (The Philippines)
2009	ITB (Indonesia) De La Salle Univ. (The Philippines) Hanoi University of Science (Vietnam)
2010	ITB (Indonesia) De La Salle Univ. (The Philippines) Hue University (Vietnam)
2011	Univ. Riau (Indonesia) De La Salle Univ. (The Philippines) Saigon University (Vietnam)

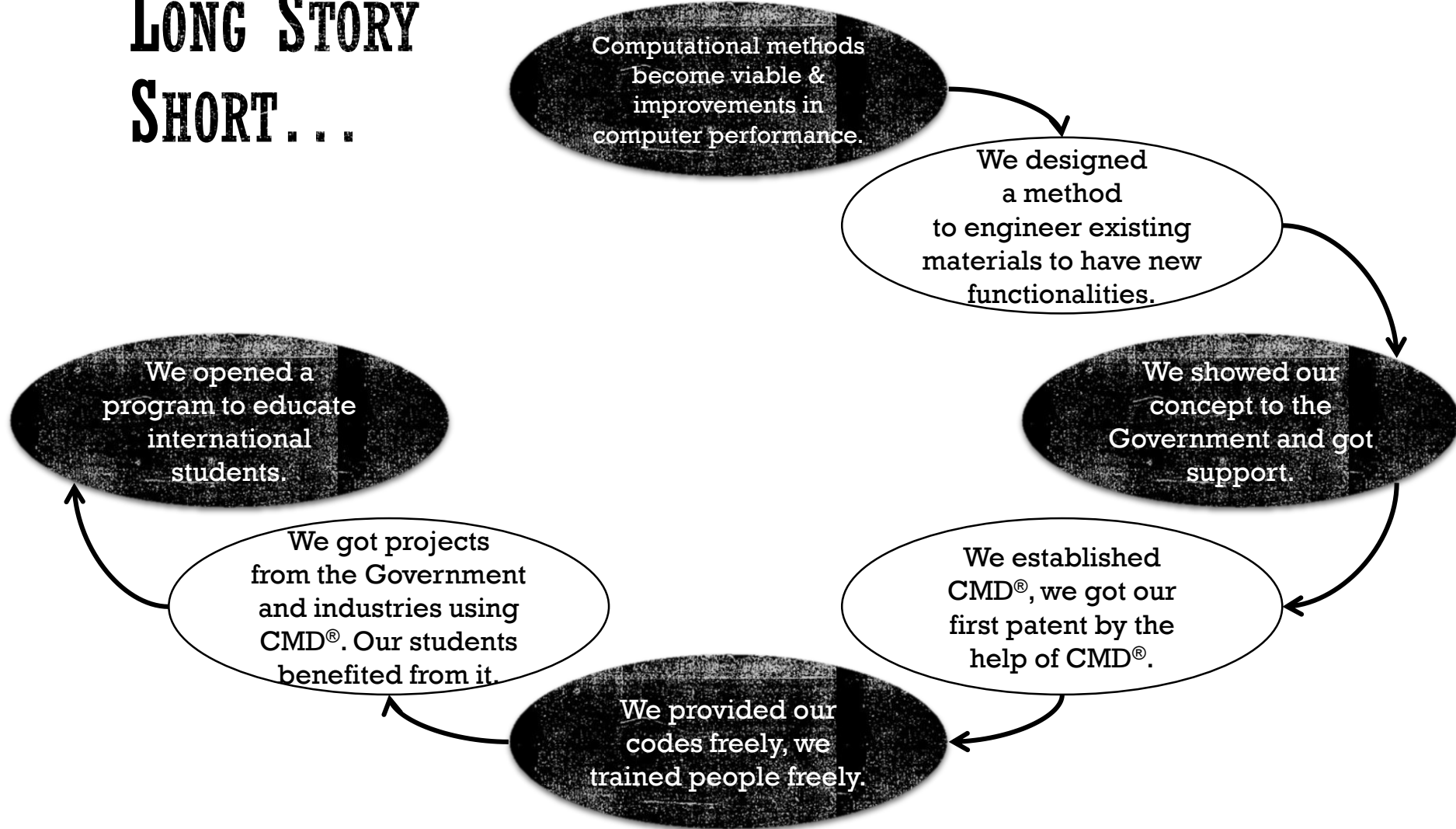
2012	Mahidol Univ. (Thailand) De La Salle Univ. (The Philippines) Hanoi University of Science (Vietnam)
2013	ITB (Indonesia) Mahidol Univ. (Thailand) De La Salle Univ. (The Philippines) Hanoi University of Science (Vietnam)
2014	ITB (Indonesia) De La Salle Univ. (The Philippines)



# LONG STORY SHORT...

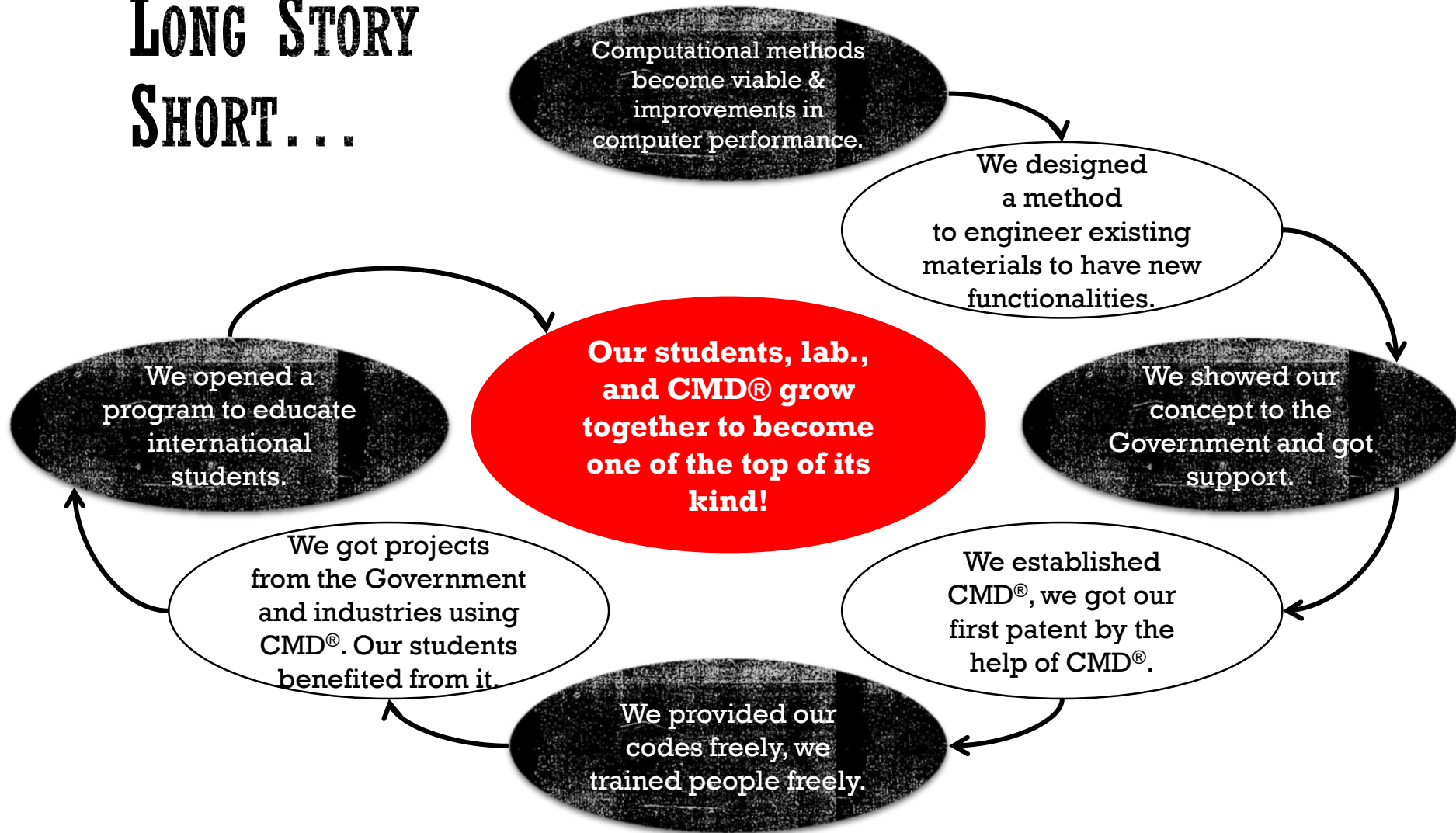


# LONG STORY SHORT...





# LONG STORY SHORT...



**SO, WHAT WE CAN LEARN FROM  
OUR EXPERIENCE WITH CMD®?**



# 1. IN DOING RESEARCH

“ Research is driven by the needs of our society and the academe.

- ✓ There should be a strong support from the Government
- ✓ The works of ***Social Sciences*** on the needs of society give insights for ***Natural Sciences*** to develop necessary technologies.



(c) kasai lab. 2015



## 2. IN DOING EDUCATION

“ Campus is 適塾 (teki-juku), *a place of learning*.

- ✓ Engage students in high-profile research.
- ✓ Diversity and mobility of students and academic staff is important.



# 3. IN DOING COLLABORATION

“ Live locally, grow globally.



(c) kasai lab. 2015



# Overview

- 1. Internationalization Efforts in Developing a Culture of Research in Osaka University**
- 2. Diversity and mobility of Students and Academic Staff in Kasai Laboratory**
- 3. Evidence of Research Outcomes**
- 4. CMD: An Illustrative Case of Developing Research Culture in the Academe**

# ACKNOWLEDGEMENTS

- Directorate General of Higher Education of Indonesia (DIKTI)
- Prof. Hermawan K. Dipojono of ITB
- Staff and students of Kasai-Laboratory



**TERIMA KASIH  
ATAS PERHATIAN ANDA**

