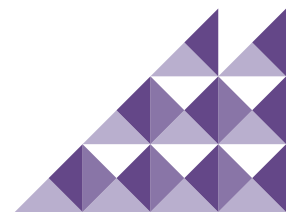


TRANSFORMING HIGHER EDUCATION FOR A SUSTAINABLE TOMORROW

2011 Delivering Excellence:
World's First Initiatives



2011



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delivering excellence / editors Dzulkifli Abdul Razak & Badaruddin Mohamed

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Vision, Mission, Values and Thrusts





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About

Delivering Excellence

Delivering Excellence is Phase 2 of the Higher Education Transformation Road under the Strategic Plan of the Ministry of Higher Education beginning from 2011. Phase 1 is about Laying the Foundation, 2009 to 2010.

The challenge is therefore to translate some of the work in the last two years into meaningful outcomes that will make a difference towards the APEX agenda under the vision: Transforming Higher Education for a Sustainable Tomorrow. In other words, Unversiti Sains Malaysia has to focus on the long-term prosperity of Key Intangible Performance (KIP) rather than simply the short-term gains based on annual performance indicators. Delivering Excellence therefore needs to be understood in these terms as part of the transformational effort of creating a sustainability-led university that cuts across ecological, social and economic sensitivities that is relevant to the current state of humanity globally.

This volume presents the pioneering nine initiatives structured as a platform to break away from the business-as-usual mindset to deliver excellence through knowledge discoveries. Each of the initiatives has been nurtured in the last two years using a variety of “business unusual” approaches, challenging the status quo to create the world’s first discoveries and/or innovations. Each is potentially an iconic Centre of Excellence (CoE) that has the advantage to autonomously blaze new trails in delivering excellence from an indigenous base with a global outreach directed more at the marginalised and underprivileged majority which in the university’s mission statement are contextualised as the bottom billion.

The Lead:

Delivering
Excellence





USM chancellor DYMM Tuanku Syed Sirajuddin Ibni Al- Marhum Tuanku Syed Putra Jamalullail launching a report entitled *Transforming Higher Education For A Sustainable Tomorrow: 2010 Laying The Foundation* at Universiti Sains Malaysia on 18 March 2011. It documents the university's efforts in development under the APEX initiative for 2010.



Source
New Straits Times
4 September 2008

In the two previous “report cards”^[1] on USM’s APEX journey (2009-2013), we reported and documented numerous activities, efforts, attempts and barriers in the first two years of “laying the foundation” to transform the university within the APEX framework agreed to by the Ministry of Higher Education (MoHE). There were multi-level and multi-tasking efforts undertaken in various aspects, namely, nurturing and learning, research and innovation, students as well as alumni management and development, community engagement and industrial linkages, human governance, talent management, infrastructure and physical enhancement, and international and global agenda. These were undertaken with total and holistic commitment and dedication by the whole USM community in tandem with the university’s new vision and mission as a sustainability-led university.

Since the pronouncement of the designation of the APEX status to USM in September 2008, we have now arrived at the mid-point of the journey. The euphoria of being nominated as the first and sole APEX university for Malaysia on 3 September 2008 soon turned into “hard and heart” work in constructing the road ahead while “challenging the status quo”^[2]. Needless to say, it was the teamwork effort built on brute

determination of “failure is not an option” that has kept us going^[3]. Often a 24-hour day work was simply insufficient to accommodate the mountainous work that needed to be done, and hence Saturdays and Sundays as well as public holidays became “normal” working days. The initial preparatory months to thinking strategically based on the Scenario Plans^[4] conceived some three years before appeared to be useful as we put together the APEX programme in earnest by early 2009. The goal was to “turn around” the university, and two years later, our efforts began to bloom.

This publication is a record and documentation of what we have conceptualised since 2008 and up to June 2011 as an agenda to “Delivering Excellence”. This is the second phase following the first, namely, “Laying the Foundation.” Still, the window is for the period between January and June to redefine some of the strategic deliverables for excellence for the next half of the APEX journey.

More specifically, we want to report on the first nine (9) “deliverables for excellence” under the category of “world’s firsts” (in contrast to “world-class”) as a platform to further enhance and accelerate the accomplishment of the APEX mission, which is, “USM is a pioneering, transdisciplinary research intensive university that empowers future talent and enables the *bottom billion* to transform their socio-economic well-being.”

In this way we believe USM’s articulation as a sustainability-led university, and hence its image and stature as an alternative metaphor of a university of tomorrow, can be realised through the APEX programme. These “deliverables” are therefore not mere “products” in the conventional

sense. This will be made clear in the listings chosen for this volume, with many more in the pipeline. They are: (i) the Bukit Bunuh archaeological discovery, (ii) the Sungai Batu Archaeological Complex project, (iii) the natural rubber genome discovery, (iv) the jute agrogenome project, (v) the halal collagen project (vi) the halal meningococcal tetravalent vaccine project, (vii) an android-based ENDEAVOR-Mobile innovation, (viii) the Malay eKodBraille innovation and (ix) the human genome project. Each of them is expected to (i) enhance the preeminence of the university at the global and international level, (ii) address the issue of sustainability from the various aspects, especially based on the “sejahtera” concept^[5], and (iii) serve the interest of the *bottom billion* (the 60 per cent of the world’s population who are placed at the bottom of the social pyramid).



Stone core with meteorite surface marks

- In the field of archaeological research, for example, the USM research team has discovered two major sites which could result in the rewriting of the global history of human civilisation. In Bukit Bunuh in Lenggong Perak, our researchers have discovered a site which will significantly contribute towards our understanding of the prehistoric environment and the culture of early humans. The work began with the discovery

of the oldest hand axes in the world embedded in suevite boulders formed from a meteorite impact. Dating by the fission-track method (Japan D0806004, 2008) carried out by the Japan Geochronology Laboratory on a sample of the encrusting suevite gave a date of 1.83 million years ago. This suggests that humans had lived in and made tools in Bukit Bunuh earlier than 1.83 million years ago.

Therefore, in 2009, as part of laying the foundation, the Centre for Global Archaeological Research (CGAR) introduced “The Out-of-Malaysia: putting Malaysia on the Map of Human Development” theory, which questioned the Out-of-Africa and Movius Line theories^[6]. Dating activities conducted to fulfil the impact journal criteria have all authenticated this finding. They were done over the last three years, between 2009 and 2011, by (1) the Hiruzen Institute for Geology and Chronology, Okayama, Japan, (2) the Oregon State University Geochronology Laboratory, USA, (3) ACTLAB Canada, and (4) the Japan Geochronology Laboratory, Tokyo, Japan. They aimed to confirm the first dating results, 1.83 Ma. This discovery by CGAR makes the archaeological heritage of the Lenggong Valley a unique cultural landscape of outstanding universal value for the study and understanding of world prehistory.



- Another significant archaeological finding recorded by USM was in the Sungai Batu Archaeological Complex in Merbok, Kedah. The discovery of this complex enables us to change the mainstream theory about the development of the ancient entrepot of old Kedah as well as unearthed other existing findings in the coastal areas of Southeast Asia. Evacuation this year (2011) has resulted in the unearthing of five more new mounds and planning is underway to excavate a sunken ship and burial site. This research has resulted in some significant impact in terms of the scientific knowledge, economic contribution and also awareness in society. In terms of scientific knowledge, this research has deployed various scientific methods to date or identify the artifacts discovered.



- Through the research activities of the Centre for Chemical Biology (CCB@USM), breakthroughs were made in the genomic research for two major Asian crops – rubber and jute. In the case of the rubber genome, for the first time ever in 2009^[7], CCB@USM has decoded the draft of about two-billion base genome of the rubber tree *Hevea brasiliensis* using its seamless genome-based discovery platform, the world’s first research centre to decode the first-ever draft of the rubber tree genome.

In a relatively short period since its establishment in 2009, CCB@USM has developed a unique seamless genome-based discovery platform that can address a genome project from the isolation of high quality genomic DNA to the generation of raw sequencing data with assembly and annotation. As part of the platform, three next generation sequencing (NGS) techniques were used to generate over 80 billion bases of raw data. To validate the assembly and annotation, decoded genes were then used to map out the rubber biosynthetic pathways whose end-products are used worldwide to support a multi-billion dollar global industry. The project is expected to produce new knowledge and contribute to social welfare and foster economic development via technology transfer. In order to protect the intellectual property rights on rubber, CCB@USM has already applied for several national and international patents on the discovery.

- Using the rubber genome platform, and in collaboration with researchers from Dhaka University, Bangladesh Jute Research Institute (BJRI) and Software Company DataSoft Systems Bangladesh Ltd. and the University of Hawaii, CCB@USM has decoded the jute draft genome; again, this is the first time it has been done in the world.
- For the human genome project, CCB@USM is attempting to locate the specific genomic factors that cause Achondroplasia, or dwarfism in humans.
- In the effort to contribute to the establishment of the Malaysian halal hub, USM has also made major breakthroughs in the production of halal collagen with sheepskin and halal vaccine. The researchers at the Centre for Advanced and Analytical Toxicological Services (CAATS)



based at the USM Doping Control Centre (DCC) have successfully produced food-grade halal collagen from ovine skin. The product could be considered as the world's first food grade halal collagen from sheepskin. A further aspect of this work will provide not only collagen for food, but nutraceutical and pharmaceutical applications of this value-add products are being explored. The framework for collaboration has resulted in the establishment of the necessary platform technologies to make Malaysia an emerging player in the world halal collagen market. The halal collagen project has recently been given a vote of confidence by Frost and Sullivan in its latest report dated 27 May 2011.



- With regard to the halal vaccine project, while vaccines for the meningococcal disease have been available for more than 30 years, halal vaccine is wanting. Haji pilgrims and umrah visitors, in particular, are in a dilemma as it is mandatory to get a meningococcal vaccination before entering Saudi Arabia. In February 2010, USM signed an agreement with Finlay Institute in Cuba to co-develop, produce and market the combined halal tetravalent meningococcal meningitis vaccine. This is the first academic collaboration of its kind to produce a halal vaccine, namely the development of the polysaccharides serogroups A, C, Y and W135 from *Neisseria meningitidis* (Men ACYW) under halal conditions.



- The final two projects reported in this volume are the Malay eKodbraille and Extensible Medical Image Analysis and Visualisation Platform (ENDEAVOR). Currently, formal Braille learning is only available at educational institutions training pre-service special educators. The numbers trained are limited by the availability of expensive brailers. There are also no Braille courses available for parents or other interested individuals. Schools face a dire situation in which special educators teaching children who are blind are not trained in Braille.

Thus, eKodBraille, an online multimedia tutorial system to teach Malay Braille to sighted individuals on the internet, has been developed to solve the above problems. With eKodBraille, an unlimited number of people can be trained anytime, anywhere, without the need for the use of expensive brailers. Restrictions in terms of course availability, geographical locations and time or work constraints can be solved with the use of this online tutorial system.

The ENDEAVOR-Mobile is the world's first fully android-based mobile teleradiology collaboration platform. This product enables doctors to immediately crowd source expert opinions on critical medical cases from their colleagues, regardless of time and location. It deploys advanced medical imaging technologies. ENDEAVOR-Mobile not only implements live image case discussion by highlighting areas of interest in medical images but also utilises phone-based voice calls for effective live collaborative diagnoses. With a few taps of the finger, ENDEAVOR-Mobile brings industry standard teleradiology services into a wide range of Android-based smart phones and tablet devices. Medical images from different modalities (CT, PET, MRI, X-rays, etc.) can be downloaded and viewed clearly on various handheld devices. This



can help to channel medical services more effectively and potentially save lives by enabling mobile users to access medical images rapidly while they are on the move.

The above initial nine “deliverables” which we are convinced will live up to the category of the “world’s firsts” are among the major discoveries and breakthroughs which we have produced/discovered/innovated since USM was appointed as Malaysia’s first and only APEX status university. Each is poised to develop its own niche that will in turn project the APEX agenda shown in the figure below:

The journey to deliver excellence:
a conceptual overview



We look forward to report their progress as well as many more of such endeavours in the forthcoming publications especially in the second half of 2011, between July and December. This includes among others 14 projects which are “handpicked” from the various submissions by various schools and research centres in USM. Like those in this publication, we will capture the benefits and contributions of each of

them in delivering excellence in the next volume. Some updates from previous findings and others of promising discoveries/inventions will also be documented. On the same basis, these discoveries/inventions go beyond mere technical and scientific hallmarks and include the socio-cultural dimensions as well.

In this regard, the recent International Conference on Decolonising Our Universities, 27-29 June 2011, has given added impetus to totally transform Malaysia higher education for the 21st century and beyond^[8]. In the final analysis, the seeds which we sowed in September 2008 are now beginning to bear fruits. Overall, the results have been of significance^[9,10]. Indeed, apart from producing tangible outcomes, the “harvests” from some research and work are in the pipeline and should be ready for the “market” in the near future.



As seen in this publication, they promise to be a good harvest from The University in a Garden^[11] – the metaphor of a sustainability-led university of the future.

Finally I would like to acknowledge the passion and dedication of the entire teamwork and everyone involved in ensuring the delivery of our ideals towards our journey to achieve excellence and the APEX status. In particular, I would like to say special thanks to Professor Ramli Mohamed for his untiring leadership and assistance in all the APEX documentations and publications since its inception in 2008.

I hope you will continue to partake in this journey and enjoy it as much as it has enriched our lives over the years.

“Ensuring a sustainable tomorrow”



Dzulrifli Abdul Razak, Prof. Tan Sri Dato'

Vice Chancellor

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27 July 2011

- [1] Universiti Sains Malaysia (2011). Transforming higher education for a sustainable tomorrow, 2010 laying the foundation. Penang: USM, and Universiti Sains Malaysia (2010). Transforming higher education for a sustainable tomorrow, 2009 laying the foundation. Penang: Penerbit USM.
- [2] A statement made by the Ketua Setiausaha Negara, Y.B. Tan Sri Sidek Hassan, at the meeting of the Malaysian Statutory Bodies, USM, 24 Jan 2009
- [3] For a comprehensive understanding of USM's APEX framework, objectives and journey submitted for its nomination, see Universiti Sains Malaysia (2008). Transforming higher education for a sustainable tomorrow. Penang: Penerbit USM
- [4] See Universiti Sains Malaysia (2007). Constructing future higher education scenarios: insights from Universiti Sains Malaysia. Penang: Penerbit USM.
- [5] Sejahtera is a concept used widely in USM to express our hope to instill five underlying values amongst our students and staff:
 - To create a mindset for every individual to voluntarily take responsibility for the well being of the campus
 - To promote the idea of teamwork across discipline and knowledge-based for a sustainable development of the campus
 - To create spaces, both physical and social, for everyone to provide data-driven solutions to further enhance the well being of the campus
 - To enrich the conducive learning environment by engaging talents and resources within the campus in advancing the campus well being
 - To document all the work and suggestions as well as recommendations for implementation before forwarding it to the university
- [6] Universiti Sains Malaysia (2011). Transforming higher education for a sustainable tomorrow, 2010 laying the foundation. Penang: USM, and Universiti Sains Malaysia (2010). Transforming higher education for a sustainable tomorrow, 2009 laying the foundation. Penang: Penerbit USM.
- [7] Scientific American. Malaysia innovation: A vision for 2020. Page M7.
- [8] C. Alveres and S. Faruqui (2011). Decolonising our universities. Penang: Penerbit USM.
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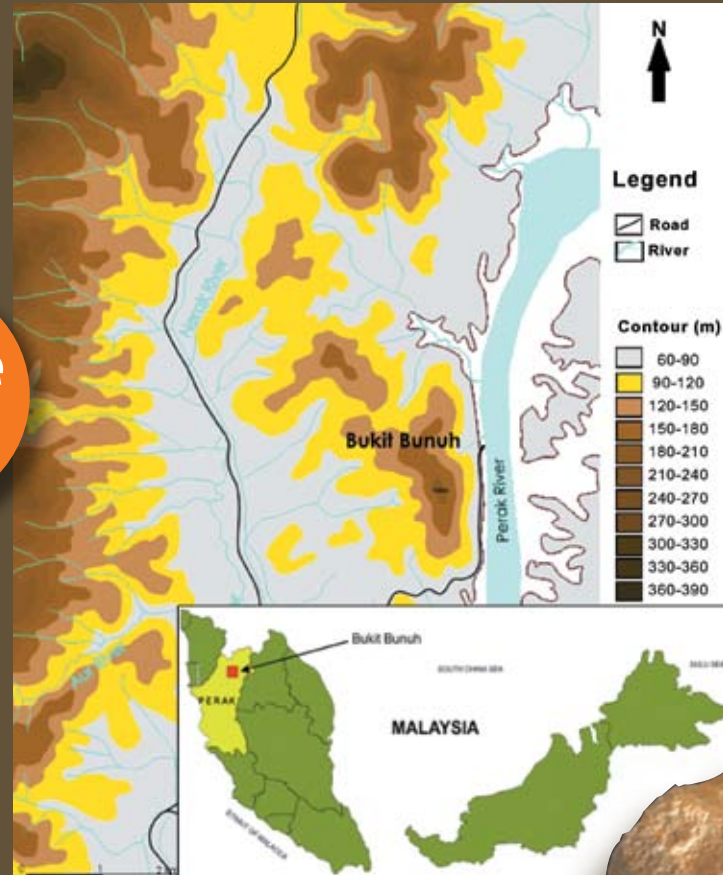


The open-air site of **Bukit Bunuh** has recorded the earliest **hominid presence** thus far known outside of **Africa**

Out-of-Malaysia: an emerging view of early human migration

Mokhtar Saidin, Jaffrey Abdullah, Mohd Nawawi
Mohd Nordin & Rosli Saad

Figure 1.1



The open-air site of Bukit Bunuh (Figure 1.1) has recorded the earliest hominid presence thus far known outside of Africa. The site is located at the longitude of 100° 58.5' East and latitude 5° 4.5' North – with the highest point being over 180 metres above sea level. Extensive studies on Bukit Bunuh have thus far significantly contributed towards our understanding of the prehistoric environment and culture of early humans beginning with the discovery of the oldest hand axes in the world embedded in suevite boulders formed from a meteorite impact. While waiting for the dating results confirming the 1.83 Megaannum (Ma) artefacts, Universiti Sains Malaysia's Centre for Global Archaeological Research (CGAR) has for the past two years focused its research on:

1 The survey and mapping of any possible human remains while undertaking the conservation and preservation of the site

2 Submitting a dossier of nomination on the contributions of Bukit Bunuh as a World Archaeological Heritage Site in the Lenggong Valley

3 Completing the meteorite impact evidence reports



Source The Sun 14 February 2011

Source The Star 14 February 2011

Source Kosmo! 14 February 2011

Used-ware on the flake tools from Bukit Bunuh



ROAMING THE EARTH

more than
1.83
MILLION YEARS AGO




The site was initially discovered during a mapping exercise of the area in the year 2000.

In 2001, the first excavation exercise was carried out in the southern part of Bukit Bunuh revealing an *in situ* stone tool-making workshop dating back to some 40,000 years ago. It was amidst a vast quantity of suevite boulders found scattered around the area which dated back to 1.83 million years ago, evidence based on optically stimulate luminescence (OSL) technology and fission-tracking methods respectively. The findings of suevite boulders are important as they indicate that the area had been struck by a meteorite during that time, but more importantly, the boulders are the first of its kind to be discovered in East Asia providing the only evidence of a dated meteorite impact in the region.

A greater significance of Bukit Bunuh emerged in 2007. A hand axe embedded in a suevite boulder was discovered among the surface artefacts. Dating by the fission-track method (Japan D0806004) carried out by the Japan Geochronology Laboratory on a sample of the encrusting suevite gave a date of 1.83 million years ago. This suggests that humans had lived in and made tools in the Bukit Bunuh

earlier than 1.83 million years ago. Therefore, in 2009, as a part of laying the foundation, CGAR introduced "The Out-of-Malaysia: putting Malaysia on the Map of Human Development" theory, which questioned the Out-of-Africa and Movius Line theories. To further verify these findings, more dating samples were sent to (1) the Hiruzen Institute for Geology and Chronology, Okayama, Japan, (2) the Oregon State University Geochronology Laboratory, USA, (3) ACTLAB, Canada and (4) the Japan Geochronology Laboratory, Tokyo, Japan.

One of the ultimate goals in the Bukit Bunuh project for 2011 is the discovery of a human part, such as a tooth, which can support the finding of the hand axe and can be used to establish the generic identity of the hominids at Bukit Bunuh. Although the chances of finding human remains in the meteorite impact areas are very minimal, CGAR has nevertheless already found some indicators to the major discoveries. Detailed scientific studies and mapping on each of the suevite blocks are being conducted from time to time this year to retrieve the evidence.



The archaeological heritage of the Lenggong Valley, which comprises both open-air and cave sites provide a series of chronologically-ordered and spatially-associated culture sequences from the Palaeolithic through the Neolithic to the Metal periods. The sites have been chronometrically dated from 1.83 million to 1,000 years ago. Thus, the Lenggong Valley is one of the longest archaeological culture sequences found in a single locality in the world. Given its importance and significance in terms of world human history, the archaeological heritage of the Lenggong Valley has therefore been chosen for nomination on the World Heritage List. CGAR was given the responsibility to lead the writing of the dossier by the Department of National Heritage (DNH), which was sent to UNESCO, Paris, at the end of January 2011.

The main justification of this dossier is the evidence of the extraordinary survival of early Palaeolithic humans at Bukit Bunuh in the wake of a meteorite strike 1.83 million years ago. Many Palaeolithic stone tools were found to be preserved in the melted suevite boulders formed by the meteorite impact. This is indirect evidence of hominid presence in the Lenggong Valley

more than 1.83 million years ago. This makes the archaeological heritage of the Lenggong Valley a unique cultural landscape of outstanding universal value for the study and understanding of world prehistory.

As of July 2010, the earth impact database kept by the Planetary and Space Science Centre (PASSC) at the University of New Brunswick in Canada contains 896 confirmed meteorite sites from around the world (Figure 1.2 & 1.3). However, there is no record of confirmed impacts from Malaysia although about 15 such Malaysian sites have been potential candidates as deduced from satellite and radar images, aerial photographs, geological and topographical maps, field work and laboratory studies. This is largely due to the absence of detailed studies to meet the chief criteria for an impact structure formed by the hypervelocity impact of a meteorite or comet which are required for enlistment in the PASSC catalogue. To date, CGAR, with some collaboration from other institutions, has actively researched the area to prove the occurrence of meteorite impact in Bukit Bunuh around 1.83 million years ago.



Making its way into the early **Quaternary Period**

In the year 2011, a detailed geological mapping exercise was performed in the area involving the mapping of impact craters and impact rock lithology. The study successfully mapped the area and classified the different types of impact rocks covering an area of about 4km² in Bukit Bunuh. The evidence gathered includes impact breccias, suevite, impact melts, impact granite, impact quartz, impact metasediment and other impactites. Further analysis of the rocks reveals their characteristics (based on the observation of the thin-section samples and photomicrographs) which provide physical evidence of the meteorite impact at Bukit Bunuh. From the geological perspective, the discovery of this site is of paramount importance considering the site is the first to be discovered in Asia and provides the only evidence of a dated meteorite impact in the region.



Figure 1.2 also shows that only 3% of the confirmed meteorite sites revealed the presence of suevite and Bukit Bunuh is the only one from Asia. Where the Quaternary Period is concerned, Bukit Bunuh is the only site with the dating of early Quaternary in the world. Therefore, the findings at Bukit Bunuh have contributed towards the fundamental knowledge on early Quaternary meteorite impact evidence in the world.

CGAR recognises the importance of Bukit Bunuh, both archaeologically and geographically. To secure the importance of the site, Bukit Bunuh was suggested to be a new geological unit in Malaysia that is the Quaternary Stratigraphic Unit of the country. To achieve this goal, a four-day meeting attended by a committee of eminent geology experts from Universiti Sains Malaysia, Universiti Kebangsaan Malaysia, Universiti Malaya and the Minerals and

Geoscience Department of Malaysia (JMG) was held to discuss the proposal. Based on data and evidence collected at the site and affirmation by the committee during the meeting in Ipoh, the Bukit Bunuh Complex was finally declared as the Quaternary Stratigraphic Unit in Malaysia on 13 May 2011.

The CGAR has collaborated with many agencies and departments, providing valuable information for its researchers. Such agencies included the Division of Earth and Environmental Sciences of the Korea Basic Science Institute, which provided the OSL dating of archaeological samples. The Activation Laboratories LTD, Ontario, Canada undertook the petrography study while the Hiruzen Institute for Geology and Chronology, Okayama, Japan assisted with thin section separation (matrix), low potassium option and K-Ar dating. The School of Physics at USM likewise assisted with geophysical data.



An Outstanding Archaeological showcase

Bukit Bunuh is an open-air site that has provided enormous significant archaeological and geological data that have contributed directly to our understanding of the palaeo-environment and early human cognitive behaviour and culture. The presence of hand axes, along with other recent discoveries in Southeast Asia contradicts the Movius Line theory which suggests that hand axe making technology only existed west of India. Indeed, Bukit Bunuh is unique among archaeological sites in Southeast Asia, having evidence of human inhabitation from the Lower to Upper Palaeolithic periods. The new minerals found inside the suevite boulders have aroused the attention of geologists from around the world.

Considering the archaeological and geological potential importance of Bukit Bunuh, it is of paramount importance that the site is protected and preserved for further study by both archaeologists and geologists as a whole. Bukit Bunuh has certainly far more secrets to reveal.

The verification of Bukit Bunuh as a world-class heritage site will be undertaken by a UNESCO committee which is expected to visit the site in Lenggong Valley in July 2011 for nomination on the World Heritage List and the result will be announced within the same month. The main aim of this nomination is to protect and preserve the archaeological heritage of the Lenggong Valley for humanity and posterity.

Site : Wanapitei
Region : North America
Dating (Ma) : 37.2 ± 1.2

Site : Manicouagan
Region : Canada
Dating (Ma) : 214 ± 1

Site : Säcksjärvi
Region : Europe
Dating (Ma) : 514 ± 12

Site : Paasselkä
Region : Europe
Dating (Ma) : $< \sim 1900$

Site : Lappajärvi
Region : Europe
Dating (Ma) : 73.3 ± 5.3

Site : Suvasvesi S
Region : Europe
Dating (Ma) : ?

Site : Gardnos
Region : Europe
Dating (Ma) : ~ 546

Site : Logoisk
Region : Europe
Dating (Ma) : 30 ± 1

Site : Lockne
Region : Europe
Dating (Ma) : 455

Site : Mien
Region : Europe
Dating (Ma) : 121.0 ± 2.3

Site : Dellen
Region : Europe
Dating (Ma) : 89.0 ± 2.7

Site : Steinheim
Region : Europe
Dating (Ma) : 15 ± 1

Site : Ries
Region : Europe
Dating (Ma) : 14.34 ± 0.08

Site : Jänisjärvi
Region : Europe
Dating (Ma) : 682 ± 4

Site : Puchezh-Katunki
Region : Europe
Dating (Ma) : 167 ± 3

Site : Kara
Region : Europe
Dating (Ma) : 70.3 ± 2.2

Site : Popigai
Region : Europe
Dating (Ma) : 35.7 ± 0.2

Site : Ilyinets
Region : Europe
Dating (Ma) : 445 ± 10

Site : Ullapool
Region : Europe
Dating (Ma) : ?

Site : Rochechouart
Region : Europe
Dating (Ma) : 214 ± 8

Site : Azuara
Region : Europe
Dating (Ma) : 32.0 ± 7.0

Site : Bosumtwi
Region : Africa
Dating (Ma) : 1.07

Site : Rio Cuarto
Region : South America
Dating (Ma) : < 0.1

Site : Kalkkop
Region : Africa
Dating (Ma) : 0.250 ± 0.050

Figure 1.2 Meteorite Impact Sites: 27 out of 896 sites with suevit evidence

Source: PASSC & CGAR

Malaysia
Site : Bukit Bunuh
Region : Asia
Dating (Ma) : 1.83

Australia
Site : Henbury
Region : Australia
Dating (Ma) : 0.0042 ± 0.0019

Figure 1.3

Meteorite Impact during Quaternary Period

Source: PASSC & CGAR

1. Sikhote Alin, Rusia
2. Wabar, Saudi Arabia
3. Sobolev, Rusia
4. Haviland, USA (T)
5. Kaaliyarv, Estonia
6. Campo del Cielo, Argentina
7. Henbury, Australia
8. Macha, Rusia
9. Ilumesta, Estonia
10. Tenoumer, Mauritania
11. Barringer, USA
12. Odessa, USA
13. Lonar, India
14. Rio Cuarto, Argentina
15. Morasko, Poland
16. Amguid, Algeria
17. Tswaing, South Africa
18. Dalgara, South Africa
19. Wolfe Creek, Australia
20. Boxhole, Australia
21. Zhamanshin, Kazakhstan
22. Veevers, Australia
23. Monturaqui, Chile
24. Bosumtwi, Ghana
25. New Quebec, Canada
26. Kalkkop, South Africa
27. Karikioselka, Finland
28. Aouelloul, Mauritania
29. Telemzane, Algeria
30. Bukit Bunuh, Malaysia





DECLARATION

THE BUKIT BUNUH COMPLEX
AS A NEW QUATERNARY STRATIGRAPHIC UNIT IN MALAYSIA

BASED ON
DATA AND EVIDENCE COLLECTED AT THE SITE
AND AFFIRMATION BY
A COMMITTEE OF EMINENT GEOLOGY EXPERTS MEETING
ON 23-26 APRIL, 2011 AT THE SYUEN HOTEL, IPOH, PERAK

BY

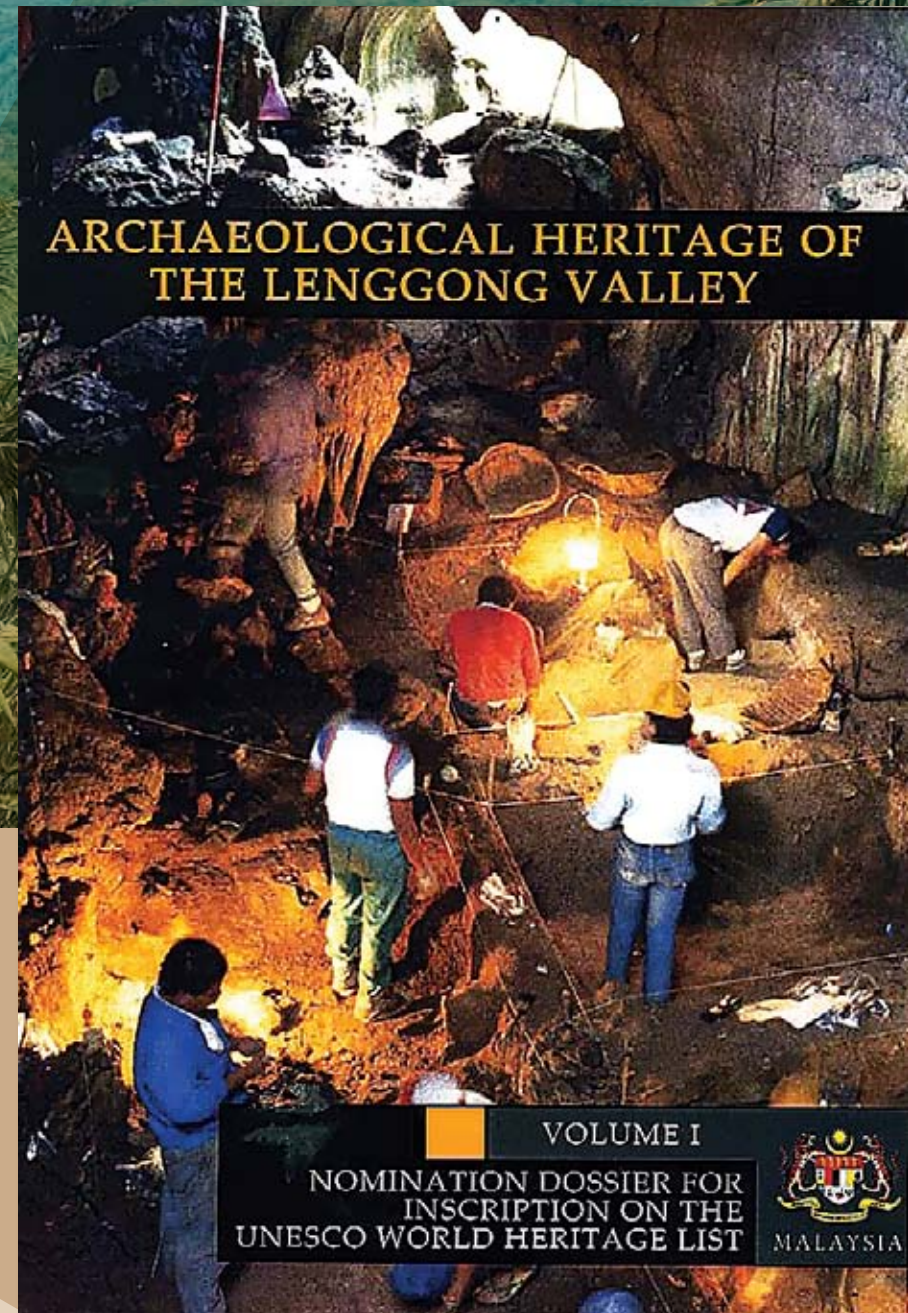
DATO' HANIYUS ABDUL RAZAK
DIRECTOR
MINERALS AND GEOSCIENCE DIVISION
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT MALAYSIA

ON
13 MAY 2011
(9 JAMADILAKHIR 1432)

WITNESSED BY

PROFESSOR TAN SRI DATO' DZULKIFLI ABDUL RAZAK
VICE-CHANCELLOR
UNIVERSITI SAINS MALAYSIA

The Bukit Bunuh site officially declared as a Quaternary Stratigraphic Unit



The Dossier that was sent to UNESCO in January 2011



The discovery of the **Sungai Batu Archaeological Complex** is by far the most important and significant in this region to the extent that it may dwarf other existing findings in the **coastal areas of Southeast Asia**

Deciphering ancient architecture: rewriting Southeast Asian history

Mokhtar Saidin, Stephen Chia, Jaffrey Abdullah, Hamid Mohd Isa, Mohd Nawawi Mohd Nordin, Ruslan Rainis & Sam Teng Wah



The Sungai Batu Archaeological Complex

is located at the banks of Sungai Batu, one of the confluences of the Merbok-Muda riverine network. The Sungai Batu site is one of the most important archaeological findings in the Bujang Valley insofar as these findings are able to change the mainstream theory about the development of the ancient entrepôt of old Kedah. The archaeological complex, consisting of 97 earth mounds, potentially contains ancient ruins, of which 22 mounds have been excavated. Current studies undertaken by Universiti Sains

Malaysia (USM) unveiled the function of the excavated mounds as possible jetties, ritualistic monuments as well as iron smelting sites. Such discoveries have been virtually unknown in research done by previous scholars prior to the year 2009. The discovery of the Sungai Batu Archaeological Complex is by far the most important and significant in this region to the extent that it may dwarf other existing findings in the coastal areas of Southeast Asia. Excavation efforts this year alone have resulted in the discovery of five more new mounds and planning is underway to unearth a sunken ship and burial site in the near future.



Preparing the way for USM's discoveries

The Sungai Batu site was first discovered by Dr. Susan Jane Allen during her geo-archaeological survey in the early 1980s for her doctoral dissertation. She noticed the existence of three mounds labelled as site numbers 71, 72 and 73. During her survey, she discovered some remains of *in situ* bricks, laterite, shale and also fragments of iron oxide. The surroundings of the site consisted of a swamp dominated by mangrove and *nipah* plants.

In 2007, an archaeological group via the collaboration between the Centre for Global Archaeological Research (CGAR), then known

as the Centre for Malaysian Archaeological Research (CMAR) along with the Malaysian Department of National Heritage (DNH) carried out a remapping project that covered the Merbok-Muda riverine network. The extensive survey had led to the unexpected discovery of a vast number of important archaeological sites consisting of low earth mounds. After going through careful planning, excavation works commenced on the two mounds – named SB1A and SB2A – beginning 1 February 2009 by a postgraduate and a graduate student respectively. From 2009 until December 2010, the number of mounds excavated increased

from two to 17 sites due to the necessity to get a clearer view concerning the function of those sites. All of the aforementioned sites were excavated by USM graduate and postgraduate students with the exception of site SB1J, which was unearthed by DNH researchers.

The research during the first half of the year 2011 has yielded the discovery of five new sites, namely SB2F, SB2G, SB1N, SB1P and SB1Q (Figure 2.1). Three sites have been successfully excavated with the remaining two still in progress. Most sites were generally built from baked bricks although their true functions have yet to be ascertained.

The artefacts discovered along with those sites include tiles, earthenware and beads. Excitingly, site SB2G was revealed to be an iron smelting site with the discovery of a large quantity of iron slag and tuyeres (pipes used to blow air into furnaces). All those sites are being studied by registered graduate and potential graduate students. Besides the five sites excavated in 2011, existing excavation sites in the previous year are still being meticulously studied and so far continue to yield new discoveries.

Bringing back the past in a fast-paced world

This research has resulted in some significant impact in terms of the scientific knowledge, economic contribution and also awareness in society. In terms of scientific knowledge, this research has deployed various scientific methods to date or identify the artefacts discovered. For instance, the dating method deployed included carbon dating, thermo-luminescence as well as Optical Stimulated Luminescence (OSL). With regards to artefact identification, methods used for elemental analysis included X-ray diffraction and atomic spectroscopy to detect the existence of trace elements, hence the provenance of the findings. The discovery of various brick structures and iron smelting sites catalysed more research in the fields of metallurgy and materials engineering. In addition, archaeological research within the vast area of Sungai Batu Archaeological Complex has also boosted studies in heritage conservation.



The research has also contributed to the community surrounding the archaeological complex. Economically, the research project provided job opportunities as much of the excavation workforce comprise local villagers. This project has also educated the local community on the importance of national heritage preservation; as such awareness is crucial for the archaeological site's sustainability. Furthermore, following the development of such a large archaeological complex, the expansion of the archaeo-tourism industry within the vicinity will be encouraged, which may further contribute to the socio-economic development there.

Discovering the oldest civilisation in the region

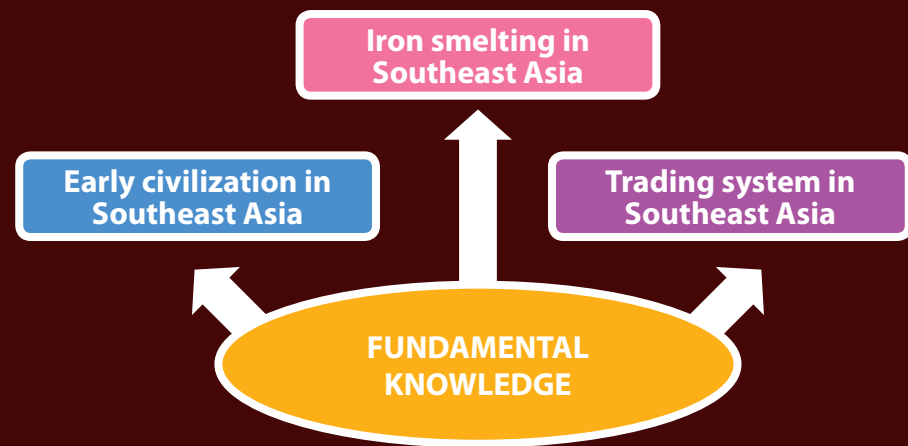
Based on the research potential of the area, first excavation was undertaken on 1 February 2009, focusing on two areas of Sungai Batu namely SB1A and SB2A, which were previously marked by Allen. By the end of 2010, 17 sites had been excavated exposing artefacts and structures. All these sites have contributed significantly to the

national and regional archaeology, by claiming the fact that:

- The Sungai Batu Archaeological Complex is thus far **the oldest civilisation complex** in Southeast Asia, which predates Angkor Wat (circa 800 AD) in Cambodia and Borobudur (circa 900 AD) in Indonesia;
- It was formed as an **economic-based civilisation**, established upon the findings of an industrial-scale iron smelting site (Plate 1), which is the first of its kind ever discovered in Malaysia. This is further corroborated by the discovery of jetty-like structures (Plate 2) which could signify trade and commerce. On the contrary, most of the proto-historical sites found in Southeast Asia are religion-based;
- The structure of SB1A (Plate 3) is **the oldest monument in Southeast Asia**, based on precise chronological dating techniques; and
- The Sungai Batu Archaeological Complex is the only site in Southeast Asia where **continuous evidence of beliefs** could be observed, from pre-religion (animism) and Hindu-Buddha periods up to the Islamic era.



Furthermore, this research has contributed significantly to the establishment of fundamental archaeological knowledge, via the construction of theories and hypotheses based on systematic research demonstrated in the diagram below:



Building Networks

This research project had also involved collaboration with other organisations. They include:

- The School of Physics (Universiti Sains Malaysia)
- The Department of Mineral and Geosciences (Ministry of Science and Technology)
- Pusat Penelitian Arkeologi Nasional Indonesia
- The Beta Analytic Laboratory, USA
- The Korea Basic Science Laboratory, Korea
- The Hiruzen Geochronology Laboratory, Japan
- The University of Washington Chronology Laboratory, USA

The next move

The discoveries within the Sungai Batu Archaeological Complex hold some of the world's most precious archaeological treasures. With that in mind, it is USM's prerogative to ensure that these treasures are meticulously preserved and continuously studied in a careful and diligent manner.

Towards that end, CGAR plans to develop this archaeological complex as one of the world's most important centre for archaeo-tourism. The complex will also house an archaeological gallery showcasing the artefacts discovered in Sungai Batu along with other excavation sites within the Bujang Valley.

In terms of skills training, the CGAR aims to train more technical staff specialising in mapping, excavation methods, conservation methods and reconstruction methods, as well as to prepare more academic staff specialising in maritime archaeology, metallurgy, palynology, epigraphy-palaeography, archaeo-history and architecture. Such specialists are necessary to accommodate future large-scale projects, including excavation work on a probable shipwreck structure known to exist in one of Sungai Batu's sites as evident from resistivity analysis. Other future projects will also include studies on probable habitation sites within the Sungai Batu vicinity.

**Figure
2.1**

Excavated sites in the
**Sungai Batu
Archaeological
Complex**





CCB@USM

has decoded the first-ever draft of the approximately **two-billion base genome** of the rubber tree *Hevea brasiliensis* using its seamless genome-based discovery platform. CCB@USM is the **World's first research centre** to decode the first-ever draft of the rubber tree genome

3

The Rubber Genome Project: decoding a billion dollar global industry

Jennifer Ann Saito, Nazalan Najimudin & Maqsudul Alam

Rubber is a raw material used in a wide variety of areas, from medicine to transportation and defence



Natural rubber is an essential resource for modern human society, much like fuel and iron. People can do without starch-based plastics or microbial polymers but cannot be deprived of natural rubber. Where Malaysia is concerned, it is a very important cash crop, second only to oil palm. Rubber is a raw material used in a wide variety of areas, from medicine to transportation and defence. The annual natural rubber production is approximately one million tonnes, making Malaysia the world's fourth biggest producer, after Indonesia, Thailand and India. The natural rubber industry is projected to contribute an estimated RM52 billion for Malaysia's gross national income (GNI) by 2020 from a GNI of RM18 billion recorded in 2009. There are currently 442,872 rubber smallholders in a total area of 1,009,330 hectares of plantations (RISDA Annual Report, 2009) with smallholders contributing about 94% of the production.

Rubber cannot be replaced by synthetic materials in many applications. The rubber demand will strongly increase (probably twofold) in the near future and as soon as within the next decade, resulting in uncertainty in the long term security of rubber supply.



The natural rubber industry is projected to contribute an estimated RM52 billion for Malaysia's gross national income (GNI) by 2020 from a GNI of RM18 billion recorded in 2009

Rubber genomics: moving ten steps ahead of competitors

The total genetic content of an organism is called a genome. It contains all the information that governs the living processes of a living thing. It is akin to the genetic software of the organism and it is encoded in a very long chemical chain known as DNA.

In order to maintain superior technical expertise on rubber, it is necessary to have genomic data; this is an essential element in the discovery of novel scientific knowledge. It is also equally important to protect the intellectual property rights of rubber genomics. Due to its importance, the Centre for Chemical Biology at Universiti Sains Malaysia (CCB@USM) has decoded the first-ever draft of the approximately two-billion base genome of the rubber tree *Hevea*

brasiliensis using its seamless genome-based discovery platform. CCB@USM is the world's first research centre to decode the first-ever draft of the rubber tree genome.

CCB@USM has developed a unique seamless genome-based discovery platform that can address a genome project from the isolation of high quality genomic DNA to the generation of raw sequencing data with assembly and annotation. As part of the platform, three next generation sequencing (NGS) techniques were used to generate over 80 billion bases of raw data. To validate the assembly and annotation, decoded genes were then used to map out the rubber biosynthetic pathways whose end-products are used worldwide to support a multi-billion dollar global industry. This genome project is the successful and significant result of the international collaboration led by CCB@USM.

The following major scientific advancements were made by CCB@USM:

- CCB@USM has completed the identification and validation of genes and encoded proteins for the production of rubber from sucrose in *Hevea brasiliensis*, including rubber polymerase.

- Besides rubber biosynthesis, CCB@USM has fully reconstructed 155 pathways while 161 pathways miss one enzyme.

- CCB@USM has completed the identification of all genes and their encoded proteins related to Hevea lignin. The applied implementation of this invention is related to the production of plant biomass with expected lignin content.

- CCB@USM has completed the identification, structural and functional annotation of disease resistance genes.

Recently, the national Performance Management & Delivery Unit (PEMANDU) R&D programme on *Hevea brasiliensis*, via its "Rubber Functional Genomics Programme" ensures that the country's rubber industry remains stable and competitive as a robust sustainable economic platform.



This PEMANDU initiative will transform Malaysia into a global centre of excellence for natural rubber. Time and speed are critical; the post-genome phase needs rapid progress for the global rubber industry, where Malaysia can and should take a leadership role. The benefits derived from the project, amongst others, are the production and communication of new knowledge, contribution to social welfare and fostering of economic development via technology transfer.

New knowledge accrued from data mined from the genomic database will give Malaysian researchers an advantage to move rubber biotechnology into strategic directions. The Malaysian rubber genome sequencing project will allow us to discover key information from the rubber genome and protect it against possible exploitation and other claims. The dual objective of delivering both the scientific data and the trained manpower in genomics and bioinformatics to carry the project to the next stage will drive the economic potentials as revealed by the genomics programme.

Besides rubber biosynthesis,
CCB@USM has fully
reconstructed **155 pathways**
while **161 pathways**
miss one enzyme



As it is necessary to protect the intellectual property rights on rubber, CCB@USM has already applied for several national and international patents on the discovery, uniqueness and practical implications of the rubber genome.

CCB@USM is in extensive discussion with industry and research institutes and has already signed a Memorandum of Understanding with a Malaysian biotechnology company to explore the possibilities of functional rubber genomics.

The Hevea rubber tree is the only plant species being cultivated for the commercial production of rubber in the world. It is therefore important to study the regulation and expression of the genes involved in natural rubber biosynthesis. To meet the ever-increasing rubber demand, it is necessary to increase the latex production substantially by genetic manipulation.

In summary, CCB@USM plans to obtain improved populations for the mapping of the economically important characteristics of the rubber tree, to develop new varieties of natural rubber for Malaysian-manufactured gloves, tyres, timber products and medical applications, as well as to develop human capital in research and development, small and large industries and intellectual properties.

The key to **Success**
for this project was the
tripartite combination
of **industry, academia**
and **government**
research
organisations



Bangladesh's Jute Genome Project: facilitating world's first breakthrough collaboratively

Haseena Khan, Mahboob Zaman,
Mohamed Kamaluddin & Maqsudul Alam

A global partner and resource platform in agrogenomes



Jute, the “Golden Fibre of Bangladesh” is the second most important fibre crop after cotton, providing natural, renewable and an environment-friendly and green biodegradable ligno-cellulose fibre used in making burlap, sacks, mats, ropes, paper and carpet backing. The leaves are used as vegetables and in herbal medicine, as they

are rich in vitamins, carotinoids, calcium, and potassium. Bangladesh, India, and China account for 90% of the world’s supply of jute.

In 2010, a consortium of researchers from Dhaka University, the Bangladesh Jute Research Institute (BJRI) and software company DataSoft Systems Bangladesh Ltd., in collaboration

with the Universiti Sains Malaysia’s Centre for Chemical Biology (ccb@usm) and the University of Hawaii, USA successfully decoded the jute draft genome – the first time it had been done in the world.

For Bangladeshis, jute is not just a plant that produces fibre, but rather a national icon linked to the adage “Sonar Bangla” (Golden Bangla). Jute is also linked to the quest for economic emancipation where in mythical golden Bengal, around which much of the national lore is constructed, undulating rice fields together with a field of fibre, both golden in colour are seen stretching beyond the horizon. In today’s world, the jute industry is where Bangladesh can become a global leader by investing very

little (Golden Fibreby, Prof. Abed Chaudhury, The Daily Star, 2008-03-23). A combination of the knowledge of the jute genomic sequences together with mutational analyses will pave a way towards this development. Such a modern research platform will also be highly sought after by other jute-producing nations such as India.

In December 2009, the Bangladesh Minister of Agriculture took the initiative to fund the Jute Genome Sequencing Project. A multi-institutional partnership was formed, with Dhaka University as the research partner, DataSoft Systems Bangladesh Ltd. as the IT support provider and BJRI as the jute field scientist partner along with other international collaborators.



CCB@USM, known for its unique seamless genome-based discovery platform, was selected as an international counterpart and assigned to generate raw sequencing data and formulate the project outcome data. In July 2010, the Prime Minister of Bangladesh, the Honourable Sheikh Hasina announced in the national parliament the completion of the jute draft genome for the first time in the world.

Advanced genomic technology

Genomic DNA (gDNA) from Tossa Jute *Corchorus olitorius* O-4 was used for high-throughput Next Generation Sequencing (NGS) platforms including 454 GS FLX, Illumina/Solexa and SOLiD. More than a 50X coverage (over 100 billion of A, C, G and Ts) of the jute genome sequencing data was used for assembly. The jute genome team used several open and commercial genome assembly and annotation pipelines. To validate the draft genome, it also carried out transcriptome analysis. For data analysis, different computational resources

were utilised, from a high performance cluster server to Dell servers and Silicon Graphics SGI Altix-350 and 450.

As a result of the jute genome sequencing projects, researchers now have the opportunity to make changes in genes in such a way that plants come out with many or all desirable characteristics. Currently, cultivated jute varieties produce fibre having high lignin content, making it difficult for use in textile industries. After decoding the jute genome, the functional genomics team at BJRI has targeted the development of cold and salt tolerant jute varieties. This will enable farmers to grow this cash crop in huge coastal areas of the country

the whole year round. Knowing the genome will allow Bangladesh to explore this property and use jute in treating diseases.

Revitalising the jute industry

The jute plant specialists from BJRI took heavy wet-laboratory training, passed critical bio-informatic benchmarks and are ready to continue the functional genomics phase of the project "genome to seed". The rapid economic growth of China and India has increased the demand for materials needed for packaging, paper and construction. Cultivation and processing of jute provides employment for over 12 million people in Bangladesh and India in agriculture and allied industries for processing and marketing of jute products.



Jute could be a major cash crop or an alternate fibre and energy crop in both tropical and subtropical climatic regions.

The key to success for this project was the tripartite combination of industry, academia and government research organisations. The successful collaboration opened up the possibility of future ventures for scientific endeavours in Bangladesh. Graduates from Dhaka University provided the biology aspects of the project; DataSoft coordinated the computational infrastructure with the close collaboration of CCB@USM as well as provided the bio-informatics IT support. BJRI, with its jute research

The discovery of **novel scientific knowledge** from this research is **significant**

infrastructure, took the lead for technology transfer from genome knowledge to improve the jute plant. The deployment of this unique model has opened up great prospects in Bangladesh, paving the way for future scientific research in the country.

The discovery of novel scientific knowledge from this research is significant. In order to protect the intellectual property (IP) rights of the jute genome discovery, BJRI has applied for an international patent on the genome, both for the discovery and its uniqueness.

The jute genome project has created a new platform for genomics and bioinformatics research in Bangladesh. It has created a new paradigm, a knowledge-based economy of local academic, private and government partnership with global collaboration. A local talent-

based global life and agro-science based IT infrastructure is rapidly progressing. In summary, the jute genome project is a great boost to the national branding of Bangladesh.

Also, the discovery has created a suite of genomic resources that are essential for speeding up the jute improvement programme to incorporate agronomic traits such as insect and disease resistance, drought and cold tolerance, fibre quality and photoperiod insensitivity. This bold initiative by the Bangladesh government is a positive move in the right direction to rejuvenate the multi-million dollar jute industry.





5

CAATS has successfully
produced food-grade
halal collagen
from **ovine skin**

Halal collagen:
widening access
to the world

Aishah Abd Latif & Gan Chee Yuen



The production of food-grade collagen from sheepskin using halal techniques was the result of a contract research service provided to Holista Colltech Pty. Ltd. This research engagement has created partnerships with the private sector to ensure continuity in focus-directed research employing the expertise and sophisticated technology found at the Centre for Advanced Analytical Toxicology Services (CAATS), based at Universiti Sains Malaysia's Doping Control Centre (DCC).

Currently, CAATS has successfully produced food-grade halal collagen from ovine skin. Ovine skin is considered as a bulk waste in Australia and would historically need to be buried or

discharged in a manner that would not cause environmental or biological hazards.

Instead, in a partnership arrangement between USM and Holista CollTech, the skin was successfully hydrolysed into 3-10 kDa collagen using blends of plant and microbial enzymes. The product could be considered as the world's first food grade halal collagen from sheepskin. The framework for collaboration has resulted in the establishment of the necessary platform technologies to make Malaysia an emerging player in the world halal collagen market. These activities include all the provisional research and consultancy services as well as knowledge transfer in various stages of the production.



Turning waste to gold

Ovine skin and other such collagen-rich tissues are considered as a bulk waste in Australia and would have to be buried or disposed as waste. As an alternative, Holista CollTech imports this waste material to Malaysia and utilises the skin as the source of collagen. This practice is viewed as a more sustainable approach in turning waste into wealth as well as protecting the environment.

The cost of waste treatment could also be eliminated and additionally provide income to the sheep farmers. The product could be considered as the world's first food-grade halal collagen from sheep. This will make Holista CollTech's ovine collagen more relevant to the growing global Islamic population that is increasingly looking for halal certified products.

Commercial production methods for collagen involve the extraction of collagen from sources such as cows (bovine) and pigs (porcine), which is an issue of concern among followers of a number of religions worldwide. Furthermore, the enzyme (i.e. pepsin) used in the extraction process is mostly of porcine origin. However, the process that was developed for collagen production in this project has enabled Holista CollTech to utilise local plant enzymes.



Preparation of sheepskin for digestion with plant-based enzymes

Developing a faster process to produce an important food component

The project has successfully turned waste (sheepskin) and other unutilised parts of the sheep including the ears, trachea and skull into a high value product in the form of food-grade collagen. The process is unique in the following ways:

-
- It does not use the traditional method of using pepsin, the origin of which is usually porcine
 - The production of the collagen uses economically viable enzymes produced locally from plants
 - The hydrolysis process steps has been decreased from seven days to only three hours, making production more economical and efficient by greatly reducing the consumption of energy and labour

Impacting the country and the world

The research project has broadened the perimeters of scientific knowledge as well as provided an economic impetus for various industries. The research has led to the discovery of a new hydrolysis process to produce predominantly 3 kDa collagen, which has a molecular weight distribution that can be easily consumed and absorbed by the body. The process is

considered innovative with the use of local materials that can produce the desired halal products in a most timely manner. Intellectual property (IP) for this process has been filed by both USM and Holista CollTech.

In terms of income generation, the global food-grade collagen market is currently estimated at RM1.6 billion annually, with each kilogramme of collagen selling for RM130-150. The first phase of this research has culminated in the setting-up of a pilot plant producing collagen in Damansara, Kuala

Lumpur which has the capacity to produce 5-10kg daily. Holista CollTech has also offered stock options of the company to USM and the agreement for this offering is now being prepared by both parties.

encouraging sign as this development with sheepskin would attract even more foreign farming industries into this technology development.

The result of the project is a product called Ovinex sheepskin collagen; a halal food-grade collagen will eventually be accessible to the global population with religious dietary restrictions, mainly the Muslims, Buddhists and Hindus. Closer to home, the construction of the production facility for Ovinex, located at Techpark@Enstek will bring new manufacturing expertise to the country in addition to creating jobs and technology development in the region. The expertise in both the research and the manufacturing phase of this project can make a significant contribution to the human resource development as the researchers' team moves into other areas of product development. In addition, scientists have gained extensive enormous experience in developing processes that can be used in large-scale productions.

In addition, the efforts of both Holista CollTech and USM have not gone unnoticed as their research endeavours have gained international recognition via a technical report released recently by market analysis experts Frost & Sullivan dated 27 May 2011.

The result of the project is a product called **Ovinex** sheepskin collagen

It is anticipated that the second phase of research into the fatty fraction by-product of the digestion process is a potential resource for more value-added products, making an overall positive contribution towards the returns on the investment of the collagen-producing process. As a result of the technology developed, local sheep and goat farming industries have shown interest in this research area. This is an





Building successful networks

The success of providing a research solution to the private sector in a timely manner has resulted in several additional potential projects from not only Holista CollTech but also other companies with manufacturing facilities requiring services and research that are important for new product developments. Also, parallel research activities are being conducted in the Akron General Medical Centre in Ohio through collaboration with Holista CollTech.

Holista-USM hasilkan kolagen halal kambing biri-biri

Oleh SHAWKATH AZDE
shawkath.azde@kosmo.com.my

KUALA LUMPUR - Kolagen di pasaran sebegini ini diperolehi daripada dua sumber utama iaitu lembu dan babi yang menimbulkan banyak permasalahan di kalangan pengguna beragama Islam, Hindu dan juga Buddha.

Kolagen digunakan bukan sahaja untuk tujuan kosmetik tetapi digunakan secara meluas dalam bidang perubatan khususnya untuk merawat luka selepas pembedahan.

Kini kebimbangan tersebut dapat ditansi melalui penemuan satu sumber baru kolagen yang dihasilkan daripada sumber

kambing biri-biri yang mana ia lebih bersifat neutral.

Penghasilan kolagen tersebut telah berjaya diralisasikan oleh Holista CollTech Limited (Malaysia) (Holista Malaysia) dan Universiti Sains Malaysia (USM) dalam membekalkan kolagen yang berstatus halal.

Ketua Pegawai Eksekutif Holista Malaysia, Datuk Dr. Rajon Marickavasagar berkata, setelah berjaya menghasilkan kolagen berasaskan sumber kambing biri-biri itu satu lagi perjanjian telah ditandatangani bersama USM yang bertujuan untuk menjalankan kajian untuk mengetahui bagaimana enzim tumbuh-tumbuhan mampu mengurai kolagen tersebut untuk me-

modahkan sistem penghadaman manusia.

"Ia juga mengatasi usaha mengekstrak lemak lebihan dan serat daripada kulit kambing biri-biri bagi menghasilkan makanan ayam dengan status halal," katanya dalam kenyataan pada majlis perasmian DiMalaysia 2010 di sini kelmarin.

Turut diadakan pada majlis perasmian yang telah disempurnakan oleh Timbalan Perdana Menteri, Tan Sri Muhyiddin Yassin itu ialah pertukaran dokumen perjanjian antara Holista Malaysia dengan USM.

USM telah diwakili oleh Naib Canselornya, Prof. Tan Sri Dzulkifli Abdul Razak.



RAJEN (kiri) bertukar dokumen perjanjian dengan Dzulkifli sambil diperhatikan oleh Muhyiddin (dua dari kiri) di Kuala Lumpur kelmarin.



Carrying on the good work

A further aspect of the R&D in this research will explore collagen utilisation for food, nutraceutical and pharmaceutical applications. Medical applications for collagen have an even higher market value and this aspect will be explored simultaneously. Following the process of collagen digestion, the fatty by-product (waste) will be analysed for potential compounds of nutraceutical value like vitamin D and fatty acids. The research will include development of a process by which these compounds can be isolated on a commercial scale. In addition, plans are in the pipeline to build a large-scale (five tonnes a day) collagen production later this year.

Source

Kosmo!

9 November 2010



Halal Meningococcal Vaccine: providing affordable health protection

**USM will be setting up
the nation's first
cGMP, bio safety
level 3 (BSL-3)
pilot plant
designed to carry out
Men ACYW
production**

Norazmi Mohd Nor, Sidney Yee, Lim Li Sze, Tang Hui Ying, Amin Malik
Shah Abdul Majid, Mohamad Hekarl Uzir, Chee Jiun Yee, Azman
Tambi Chik, Izhar Hifnei Ismail & Rizal Alwani Mohamed Nordin

Meningitis, which causes inflammation of the protective membranes surrounding the brain and spinal cord, is a potentially life-threatening disease that occurs in children and adults. The disease is usually caused by viruses and bacteria, one of which is the bacterium, *Neisseria meningitides* (*N. meningitides*).

N. meningitides, which causes meningococcal meningitis, is easily contracted in crowded areas. It is commonly transmitted through body fluids such as saliva and other respiratory excrements from coughing or sneezing. If left untreated, the disease may cause deafness, epilepsy, cognitive dysfunction and even death in severe cases.

While vaccines for the meningococcal disease have been available for more than 30 years, halal vaccines have been left wanting. Haj pilgrims and Umrah visitors, in particular, are in a dilemma as it is mandatory to get a meningococcal vaccination before entering Saudi Arabia.

Developing smart inter-varsity partnerships

Recognising the predicament faced by Muslims around the world, Universiti Sains Malaysia has been focusing ongoing efforts to build a solid platform for a halal hub. In February 2010, it signed an agreement with Vacunas Finlay (VF) of Cuba to co-develop, produce and market the combined halal tetravalent meningococcal meningitis vaccine. This is the first academic collaboration of its kind to produce a halal vaccine – namely the development of the polysaccharides serogroups A, C, Y and W₁₃₅ from *Neisseria meningitidis* (Men ACYW) under halal conditions.

USM has long-standing research collaboration with VF dating back to 2003. Both parties appreciate each other's strength and a level of trust and rapport has been forged to ensure that the project will be successful.

USM will be responsible for the performance of clinical trials and product registration as well as for facilitating the halal accreditation of the vaccine. It will also facilitate the marketing of

the vaccine to selected countries in the region. In return, VF will develop the vaccine right up to the pre-clinical testing stage and will transfer the technology to USM. This collaboration is anticipated to be completed in three years and will form the basis for future co-development and commercialisation of pipeline vaccines and pharmaceuticals from both institutions.

USM has also been given the rights to produce and market the halal vaccine, initially in four countries with significant Muslim populations, that is, Malaysia, Indonesia, Singapore and Brunei, with possible expansion into other countries later. The clinical trials, product development and manufacturing, halal certification, product registration and marketing will be managed by Sanggar SAINS, a wholly-owned subsidiary of USM, together with its industry partners.

Translating newly-found **fundamental knowledge** into **tangible solutions**

Vaksin halal meningokokus

Sanggar Sains, anak syarikat sepenuhnya milik Universiti Sains Malaysia (USM), berperanan mengkomersialkan vaksin halal penyakit meningokokus menerusi perjanjian di antara USM dan Institut Finlay dari Cuba.

UNIVERSITI Sains Malaysia (USM) melalui jaringan strategiknya dengan Institut Finlay dari Cuba mencipta sejarah dalam bidang pengajian tinggi apabila kedua-dua pihak mencapai persetujuan untuk membangunkan vaksin halal pertama bagi penyakit meningokokus yang dikenali sebagai *Neisseria meningitidis* (ACWYS) tersebut.

Perkara itu dipatikan menerusi majlis memorandum memorandum perjanjian oleh kedua-dua pihak di Kedutaan Besar Malaysia di Havana, Cuba pada satu majlis yang turut dihoskan oleh Ketua Penasihat Sains/Ilmiah, Majlis Negara Republik Cuba, Dr. Fidel Castro Diaz-Balart dan Duta Besar Malaysia ke Republik Cuba, Yon Yoke Heng.

Perjanjian tersebut ditandatangani oleh Nady Casado USM, Prof. Tan Sri Daud Khalid Abdul Razak dan Presiden Institut Finlay, Francisco Dominguez Alvarez.

Melalui perjanjian tersebut, Sanggar Sains, anak syarikat sepenuhnya milik USM, akan berperanan dalam mengkomersialkan vaksin tersebut.

Kerjasama sebagaimana itu merupakan detik paling bersejarah buat kedua-dua pihak khususnya dalam menyelesaikan masalah kesihatan ekoran penularan penyakit meningokokus yang banyak melanda rakyat di negara-negara membangun dan mundur.

Disulit dalam satu kenyataan berikutan kerjasama di antara USM dengan Institut Finlay berikutan sejak



OSZULKIFLI ABDUL RAZAK (lima dari kanan) dan Francisco Dominguez Alvarez (enam dari kanan) pada majlis memorandum perjanjian untuk membangunkan vaksin halal penyakit meningokokus di Kedutaan Besar Malaysia di Havana baru-baru ini.

lepas tahun lalu dan sepanjang berkolaborasi, kedua-dua pihak telah membangunkan pelbagai jenis penyelidikan, antaranya berkenaan penyakit tuberkulosis.

Katanya, penyelidikan tuberkulosis

melibatkan cabang penyelidikan lain syafa menjadi satu lagi inisiatif kita dalam membangunkan nasib golongan *bottom billion*, sekali gus meletakkan nama Malaysia sebagai antara pengeluar vaksin halal terkemuka di pentas global," katanya.

Sementara itu, Francisco Dominguez pula berkata, kerjasama yang sekian lama terjalin itu akan sentiasa ditransformasikan dan kedua-dua pihak akan meneroka peluang-peluang penyelidikan baru demi manfaat masyarakat di negara-negara membangun dan mundur.

"Visi dan matlamat di antara USM dengan Institut Finlay tidak jauh berbeza iaitu untuk mencari penyelesaian efektif dan boleh diakses penduduk negara-negara miskin yang amat memerlukan bantuan dan sokongan," jelas beliau.

Tambah beliau, selain mencari penyelesaian, kerjasama itu juga dapat mengkomersialkan keupayaan teknologi dan tarikan Islam sebagai dengan penghasilan yang dicipta oleh barat.

Penyakit meningokokus adalah penyakit jangkitan bakteria serius yang ditubuhkan oleh sejenis bakteria dikenali sebagai *Neisseria meningitidis*.

Ini menjadi penyumbang utama kepada jangkitan bakteria meningitis kepada kanak-kanak di seluruh dunia yang berumur dalam lingkungan dua tahun hingga 10 tahun yang jika tidak menerima kaedah rawatan sepenuhnya boleh membawa kepada maut.

yang terdahulu telah memberi pelbagai manfaat khususnya dari aspek pertukaran kepakaran, staf dan para pelajar di antara USM dan institusi pengajian tinggi Cuba itu.

"Perkembangan baru ini yang



This collaborative project involves the development and preparation of the capsular polysaccharides from serogroups A, C, Y, W135 by VF using animal-free components and processes in the entire workflow, i.e., from strains and culture media selections, elaboration of the master and working seeds, development of fermentation processes and for API purification and vaccine manufacturing. Parallel to vaccine formulation and freeze drying procedures, all relevant analytical procedures will be established to evaluate and release the intermediate and final products based on the Guidelines and Technical Reports for meningococcal vaccine production as required down by the World Health Organization (WHO). This know-how and technology will be transferred to USM via training and technology transfer programmes.

USM will be setting up the nation's first cGMP, bio safety level 3 (BSL-3) pilot plant designed to carry out Men ACYW production. It is believed that this facility will be the first bacterial fermentation facility in the country. The facility, which consists of a fermentation suite, downstream processing suites, a lyophilisation unit as well as an aseptic "fill and finish" unit, can potentially be used for future contract research/ services as well as serve as a training platform for transferring new knowledge and skills in vaccine production to other scientists.

USM will endeavour to ensure that the cost of the halal Men ACYW will be significantly lower than the current vaccines. This cost factor is important, not only for the benefit of Muslims going for Haj and Umrah but also for others, particularly those located in the so-called "meningitis belt" where some of the world's poor and neglected – otherwise known as the *bottom billion* – live.

Source
Kosmo!
26 February 2010

Future plans

USM is in the process of obtaining halal certification for Men ACYW following two presentations that were forwarded to the Department of Islamic Development Malaysia (JAKIM). IN addition, the university is now working towards compiling the information on raw materials utilised in the production of Men ACYW for JAKIM's reference. This process will pave the way for the halal certification of vaccines as well as other pharmaceuticals and biological products, which will give Malaysia a competitive edge in this industry.

USM is in the final stages of choosing the best well-suited clinical research organisation (CRO) for conducting clinical trials on Men ACYW. It is also in the process of selecting the best well-suited CROs for the construction and design of the cGMP, BSL-3 pilot plant for producing Men ACYW. The pilot plant will be located at sains@usm which is the university's hub for integrating research and business development. By establishing a successful pilot plant, USM/ Malaysia will be recognised worldwide in vaccine research and development (R&D) and manufacturing within less than five years.

Meanwhile, the university is in the midst of preparing three of its scientists to undergo a one-month technology transfer training programme at VF beginning 1 September 2011. Discussions are also underway with potential third parties to carry out the "fill and finish" of the API from VF to prepare the clinical trial batches.



On 8 November 2010, a group of JWC-USM members made a five-day trip to VF to participate in the "First Joint Working Committee Meeting for the Collaboration Agreement for the Certification of Halal ACW^{135Y} and Its Joint Production". At the meeting, updates were given by both parties followed by a discussion on the production process flow of the meningococcal vaccine and agreement regarding the timelines for halal certification, clinical trials and technology transfer programmes. The JWC-USM members also visited the meningococcal vaccine production plant of VF.

This project is a model for the establishment of a bacterial vaccine manufacturing capability for USM and Malaysia to ensure a sustainable development of Malaysia's vaccine industry

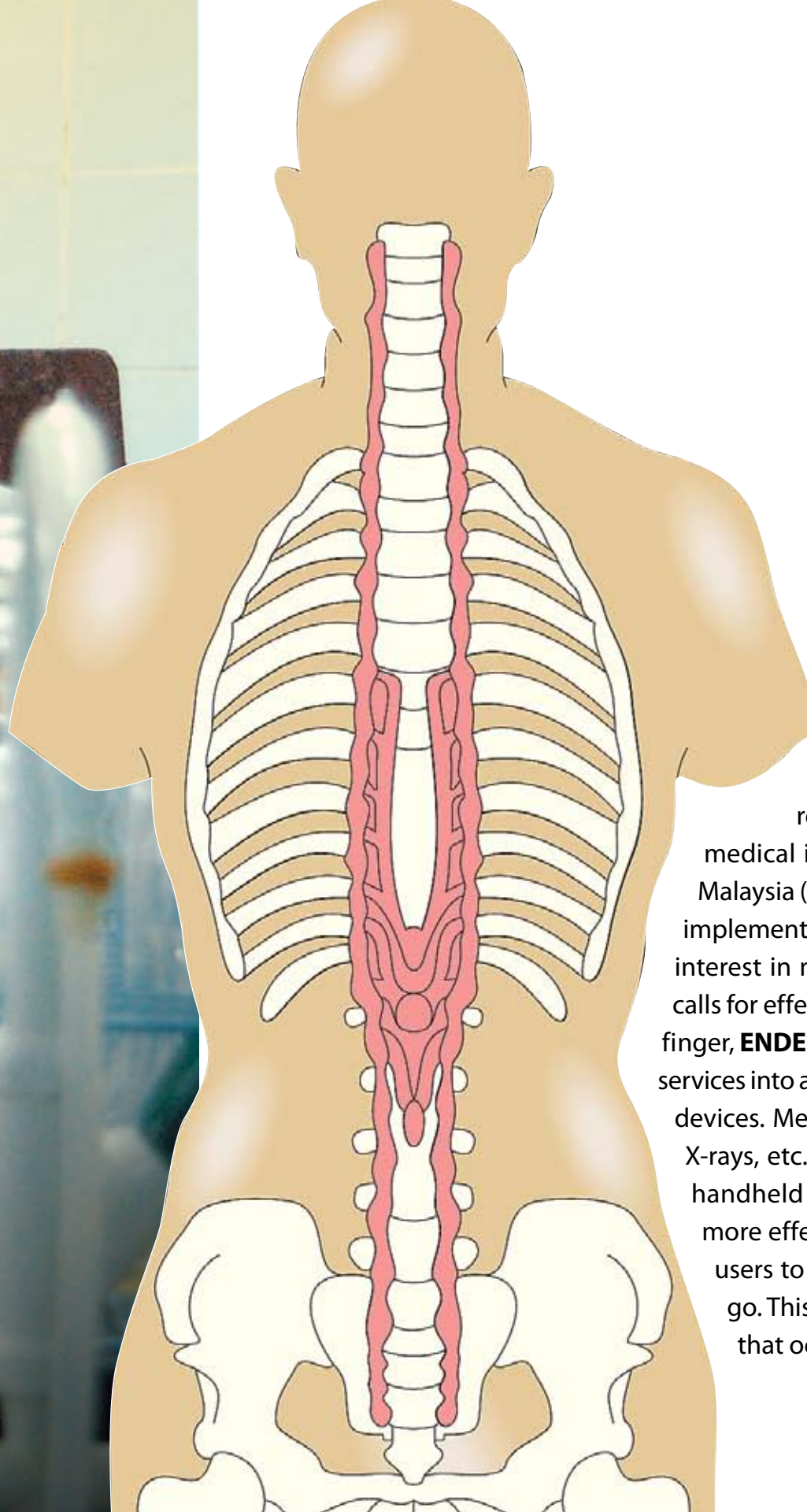
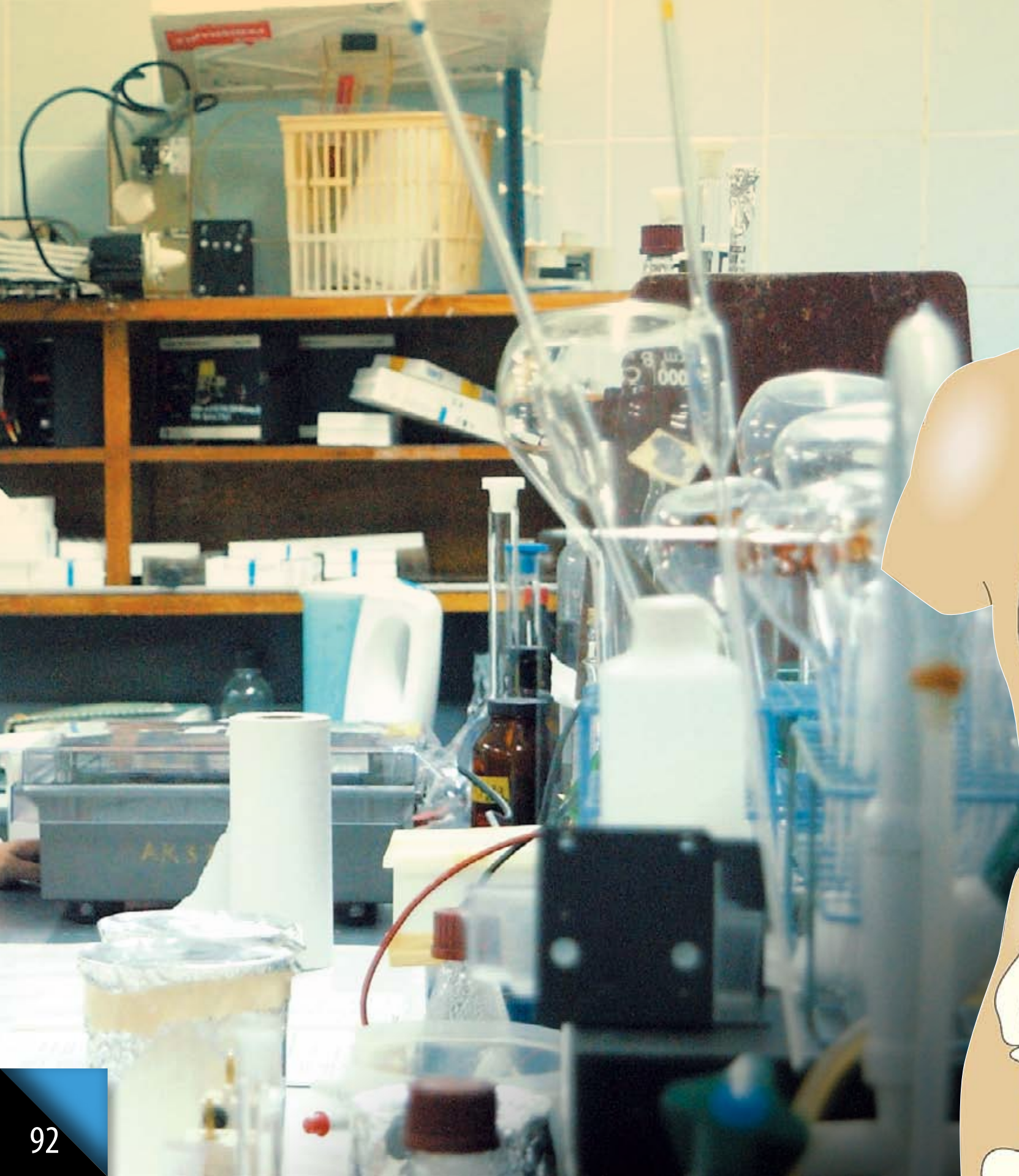
Many more pipeline vaccines and pharmaceuticals may adapt this model to produce affordable drugs and biological products, particularly for developing nations. USM is seeking opportunities for smart partnerships with manufacturer(s) for other pipeline products.



ENDEAVOR-Mobile
enables doctors to immediately
crowd source
expert opinions
on **critical medical cases**
from their **colleagues,**
regardless of time
and **location**

**Mobile
teleradiology:**
establishing
high-tech medical
solutions in
low-tech
environments

Mandava Rajeswari, Muhammad Fermi Pasha
& Saravanesh Supramaniam



The Mobile Extensible Medical Image Analysis and Visualisation Platform (ENDEAVOR-Mobile)

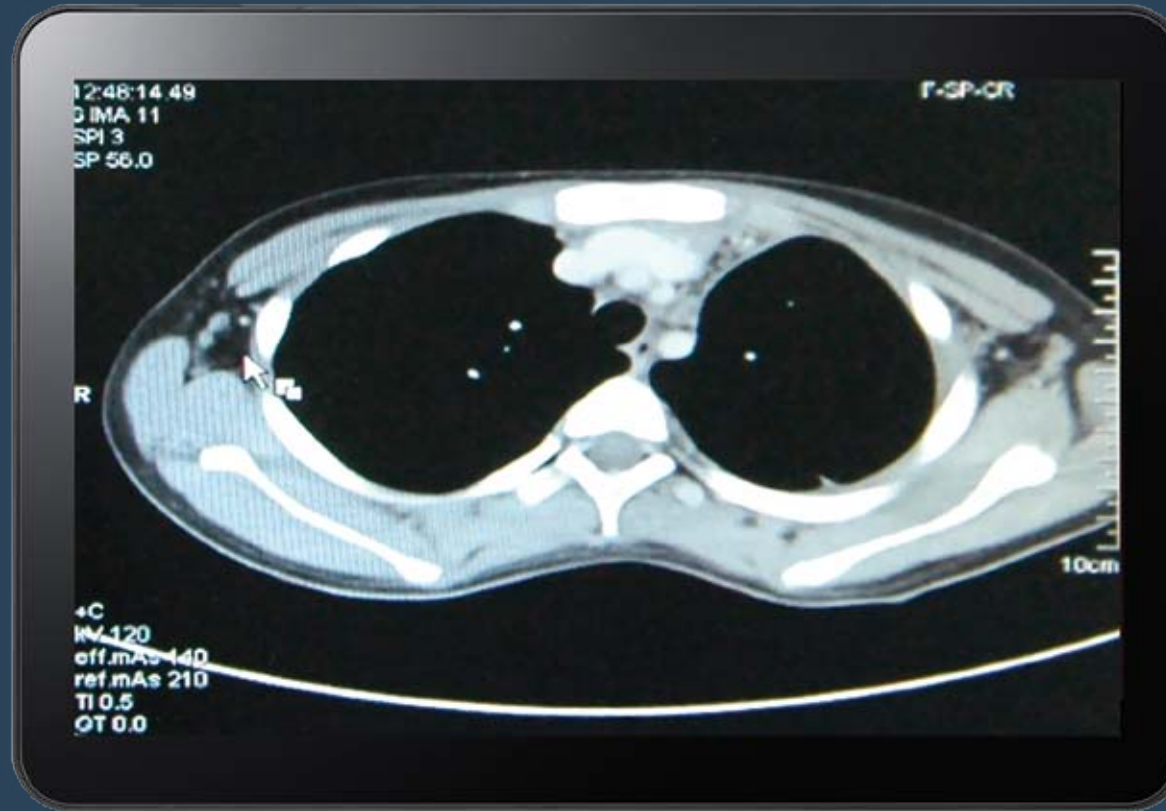
is the world's first fully Android-based mobile teleradiology collaboration platform

ENDEAVOR-Mobile enables doctors to immediately crowd source expert opinions on critical medical cases from their colleagues, regardless of time and location. It deploys advanced medical imaging technologies developed in Universiti Sains Malaysia (USM) over several years. **ENDEAVOR-Mobile** not only implements live image case discussion by highlighting areas of interest in medical images, but also utilises phone-based voice calls for effective live collaborative diagnoses. With a few taps of a finger, **ENDEAVOR-Mobile** brings industry standard teleradiology services into a wide range of Android-based smartphones and tablet devices. Medical images from different modalities (CT, PET, MRI, X-rays, etc.) can be downloaded and viewed clearly on various handheld devices. This can help to channel medical services more effectively and potentially save lives by enabling mobile users to access medical images rapidly while they are on the go. This would be particularly useful in medical emergencies that occur in the most rural parts of Malaysia and the world.

Complex problems solved by state-of-the-art solutions

Converting research on medical image analysis into commercially viable solutions is a challenging task which requires expertise not only in the fields of medical and computer science, but also extensive research and software development skills. Due to its complexity, much of this research output remains at the algorithmic level or at most, as simple laboratory prototypes.

The above scenario motivated a team of USM researchers from the School of Computer Sciences to design their own software platform that could rapidly convert such research output into commercially attractive applications. Thus began their sustained intensive effort over the past three years (2008 – 2010) to develop their



own medical image analysis and visualisation platform, which was named ENDEAVOR. With pervasive computing getting more and more popular, these researchers launched a new project towards the end of 2010 to research and develop a mobile version of ENDEAVOR. With new funding from the APEX Delivering Excellence grant secured early in 2011, the researchers were able to accelerate the project and they eventually launched ENDEAVOR-Mobile in late April.

Currently, medical images from various imaging machines (i.e., CT, MRI, and X-ray) are usually obtained and stored within medical image servers called PACS servers. Doctors

wishing to access these images for diagnostics and treatment purposes can only use workstations fixed in static locations to obtain this information. This restricts their mobility which is vital in emergency situations. **ENDEAVOR-Mobile** potentially solves this problem by allowing these doctors to access medical images at any time via their mobile devices. In fact, it goes a step further by enabling these doctors from

different locations to conduct real-time case discussions armed only with their personal computers, smartphones or personal data assistants (PDAs).

This is the first Android-based mobile teleradiology collaboration platform achieved both locally and abroad. The researchers have deployed state-of-the-art mobile Java technology on advanced Android OS to research and develop an advanced and robust **ENDEAVOR-Mobile** enabling communication and interactions with their desktop-based ENDEAVOR platform. While other mobile software in the market is limited to iOS-based devices like the iPads, this achievement is truly

multi-platform (it enables sessions between Android smartphones, tablets, Windows, Mac and Linux personal computers). In addition, data transfer between devices is minimal in contrast with other technologies which deploy screen sharing methods that require high bandwidths.

ENDEAVOR-Mobile brings the power of pervasive computing and cloud computing to improve healthcare services. Innovations in medical image analysis research via pervasive computing technology have resulted in these researchers being some of the few pioneers who have brought mobile teleradiology solutions, in addition to being the first in collaborative teleradiology into Android OS worldwide. **ENDEAVOR-Mobile** also takes advantage of the cloud computing technology to efficiently retrieve medical images remotely and allows medical professionals to collaborate and made collective diagnoses from anywhere without borders.

In line with the new k-economy concept which relies on the utilisation of state-of-the-art technology, this software will help to reduce the costs of providing medical healthcare by helping our medical experts to reach out to a broader swathe of the community via mobile technology.

Reaching out to the people



Malaysia suffers from a lack of medical doctors, a situation which is currently being addressed. As of 2009, the ratio of doctors to patients has stood at 1:940, above the recommended ratio of the 1:600 standard set by the World Health Organization (WHO). Until the WHO target

is achieved, this innovative application will enable the nation's limited number of medical experts to reach out to large numbers of patients regardless of location.

Experts will no longer need to physically travel to the farthest reaches of the country but can instead communicate via mobile technology. This will result in significant cost savings (transportation, lodging, allowances). Most importantly, it will lead to the democratisation of healthcare delivery to various parts of the country. There are also plans to commercialise this application and thus generate income, by partnering with both local and international resellers.

ENDEAVOR-Mobile will empower medical professionals to provide better medical services to the people at large by synergistically combining their expertise and accessing medical information regardless of geographical limitations. Some of the scenarios where **ENDEAVOR-Mobile** may be of use include the following:

- A real life emergency where critical medical procedures need to be carried out but where medical experts are not physically present in the vicinity. **ENDEAVOR-Mobile** may help to connect these professionals and obtain their expert opinion in real time.

- A scenario where a doctor in a remote part of Sarawak may require a teleradiology collaboration session with specialists in Kuala Lumpur and fellow surgeons on holiday in Penang. **ENDEAVOR-Mobile** may assist in connecting these parties together regardless of time and location.

- Where medical doctors conducting their rounds in large hospitals are constantly on the move. **ENDEAVOR-Mobile** will provide them with instant access to the latest scans of patients at any time. Doctors will no longer be burdened with bulky X-rays as their mobile devices can be synchronised to a hospital's medical image storage servers.



ENDEAVOR-Mobile has been successfully prototyped and tested as a proof of concept with numerous medical images from both the Advanced Medical and Dental Institute (located in Bertam) and Hospital Universiti Sains Malaysia (located in USM's Health Campus) as well as tested to work in remote areas with basic mobile data communication support. In addition, the project has also recently received a number of enquiries from both national and overseas companies/organisations. The project is also a recipient of the Delivering Excellence APEX 2011 grant.

Talks are currently being held with local Telco providers on the possibility of fully utilising the mobile capabilities of **ENDEAVOR-Mobile** and the country's cellular networks. As previously mentioned, various companies/organisations have also expressed interest in collaborating with the researchers in developing new solutions, systems integration partnerships or acting as resellers to promote the products.

Future efforts

Several new features are in the pipeline for the enhancement of the application. The first is bringing full 3D medical image visualisation capabilities on to mobile devices. Next is enabling access to an individual patient's electronic medical record (EMR) on mobile devices for doctors going on rounds via link ups with existing HIS (Hospital Information Systems) and the RIS (the Radiology Information System).

Furthermore, several hospitals under the USM APEX community outreach programme have been earmarked to conduct pilot tests for the entire ENDEAVOR suite of products (including **ENDEAVOR-Mobile**). There are plans to commercialise the suite of ENDEAVOR products and provide consultancy services to medical establishments, both locally and abroad.





eKodBraille is
the first and only **online
multimedia tutorial
system** with an embedded
Braille simulator to **teach
Malay Braille to
sighted individuals
via the Internet**

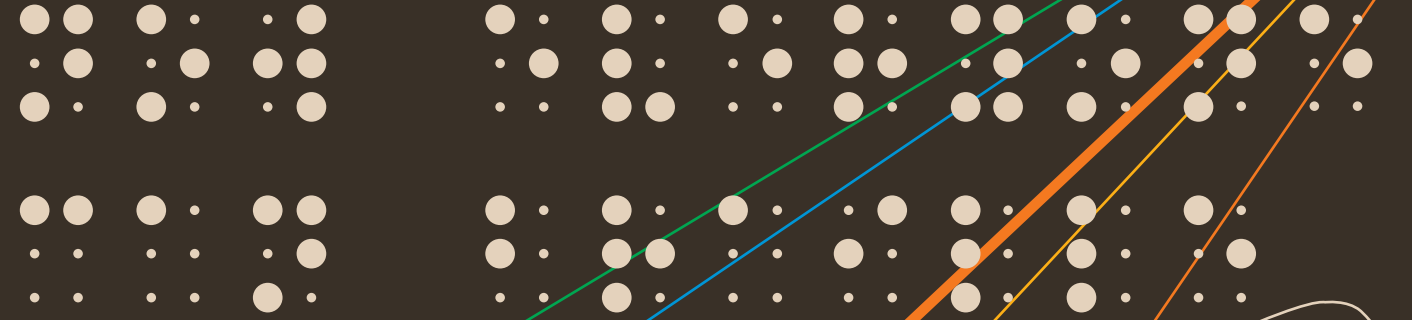
8

**Malay Braille
for the sighted:
facilitating Braille
education**

Lee Lay Wah & Abdul Rashid Mohamed

"There is a wonder in reading Braille
that the sighted will never know:
to touch the words and
have them touch you back"

(Jim Fiebig)



* Now everyone
can braille!



eKodBraille^{BM}

eKodBraille is therefore not simply a website but a **comprehensive and complete self-paced, self-accessed tutorial system** which also can **monitor individual progress**

eKodBraille is the first and only online multimedia tutorial system with an embedded Braille simulator to teach Malay Braille to sighted individuals via the Internet. Sponsored by Universiti Sains Malaysia's (USM) Research University Grant amounting to RM100,000, the eKodBraille

project is headed by Assoc Prof Lee Lay Wah, assisted by co-researcher Prof Abdul Rashid Mohamed. This open-access online tutorial system is a Social Responsibility (SR) project of USM and is available at <http://ekodbraille.ses.usm.my>



USM chancellor DYMM Tuanku Syed Sirajuddin Ibni Al-Marhum Tuanku Syed Putra Jamalullail along with Vice Chancellor Prof Tan Sri Dato' Dzulkifli Abdul Razak signing a Memorandum of Understanding with the St Nicholas Home



Untuk membraille **Titik 6**, tekan kekunci



Rakan Braille



the eKodBraille system

an online multimedia tutorial system to teach Malay Braille

Braille is the primary alternative written communication system for people who are blind. However, in recent years, there has been a dramatic decrease in Braille learning due to reliance on technology such as voice recognition software. Research has shown that technology as a substitute for Braille has left people who

are blind illiterate. In contrast, other studies have shown that blind people who know Braille are more likely to be more successful, earning advanced degrees, finding better jobs and are able to live independently. It is therefore important that the Braille system is being taught to children who are blind.

Teachers are not interested in learning Braille because Braille is not an easy subject to learn or teach. Its content is dry, memory-dependent and has to be learnt in a highly structured manner, with repeated practices. When adults supporting children with visual impairment – such as parents, special educators and Non-Governmental Organisations (NGO) staff – do not know or have not fully mastered Braille, this will inevitably affect education, literacy and communication skills between the blind and the sighted.

Currently, formal Braille learning is only available at educational institutions, which train pre-service special educators. However, it is limited by the availability of expensive brailers (Braille typewriters). Furthermore, there are also no courses available for parents or other interested individuals to learn Braille. Schools face a dire situation where special educators assigned to teaching sight impaired children are not fluent in Braille.



Thus, the **eKodBraille** system, an online multimedia tutorial system to teach Malay Braille to sighted individuals on the Internet has been developed to solve the above problems.

The system is developed based on five theories of instruction, namely Mastery Learning, Direct Instruction, Multimedia Learning, Motivational Design and Cognitive Learning Strategies. Based on the above theoretical constructs, an interactive, individualised learning environment has been created with features such as animated demonstrations, Braille simulators and games, guided assessments, virtual tutors and pop-

up pages to support learning. The lessons are modelled, followed by guided instruction as well as independent or unsupervised practice and summative assessments.

In addition, the system features a comprehensive support service such as an individualised learning tracking system and a learning management database designed to monitor user progress. User profiles, such as learning times, test scores and learning rates are also recorded. Furthermore, an internal mail system, eKodMail, provides email support for learners.

eKodBraille offers five mastery levels:

1
basic Braille

2
Braille contractions

3
Braille signs

4
basic mathematical signs

5
Braille texts



Source
Berita Harian
4 March 2011



With a simple infrastructure, eKodBraille allows an unlimited number of people to learn about Braille anytime and anywhere, without the need for the use of expensive brailers

As the learning of Braille codes is progressive, progress to the advanced levels is dependent on the mastery of prior levels. This system also awards online certificates of completion for each level of mastery.

eKodBraille is therefore not simply a website but a comprehensive and complete self-paced, self-accessed tutorial system which also can monitor individual progress.

The main impact of this project is the promotion and improvement of Braille literacy in Malaysia. Since its launch on 18 March 2011, hundreds of users have registered to learn using the system. To date, 11 users have fully completed all five levels of this course. The shortest learning rate recorded so far is two

weeks achieved by a special education teacher who is currently teaching students who are blind in a secondary school. Comments from users show that it is possible to learn Braille online independently without much assistance because of the systematic and highly-structured curriculum of **eKodBraille**. The **eKodBraille** system has made Braille learning easier and more interesting.

With simple infrastructure, **eKodBraille** allows an unlimited number of people to learn about Braille anytime and anywhere, without the need for the use of expensive brailers. Restrictions in terms of course availability, geographical locations and time or work constraints can be solved with the use of this online tutorial system.



Gaining recognition in the community

eKodBraille was awarded a silver medal at the Malaysian Technology Exposition 2011 held at KLCC in February 2011, which received a lot of attention from the media and the public. In addition, on 16 May 2011 **eKodBraille** was awarded the prestigious Knowledge Transfer Grant (Community) by the Malaysian Ministry of Higher Education.

A Memorandum of Understanding has been signed with two NGOs serving people who are blind in Penang and nationwide. They are the St. Nicholas Home and the National Council for the Blind Malaysia. Both are also the community partners for the Knowledge Transfer Grant.

The researchers are continuing to expand the collaboration with NGOs serving people who are blind to promote this system among parents, families and special education teachers. It is hoped that this system will be useful not only for parents and special education teachers, but also for pre-service special educators at all higher learning institutions and training institutes. With the tagline of Now Everyone Can Braille!, it is envisaged that this system will be the a cost-effective solution in the teaching and learning of Braille. Plans are also in the pipeline to expand the system to teach English Braille.



9

The majority of **achondroplasia** cases are **sporadic** and result from alterations in **gene sequences** in affected individuals

The human genome achondroplasia project: quest for new markers

Lee Ling Sze, Chris Detter & Maqsudul Alam

Diana Nyad

(a former world record holding American swimmer):

“I am willing to put myself through anything; temporary pain or discomfort means nothing to me as long as I can see the experience will take me to a new level. I am interested in the unknown, and the only path to the unknown is through breaking barriers, an often painful process.”

Achondroplasia is the most common cause of short-limbed dwarfism in humans, affecting 250,000 individuals worldwide. This genetic disorder results in various social and medical complications. The majority of achondroplasia cases are sporadic and result from alterations in gene sequences in affected individuals. This autosomal-dominant disorder is caused by single nucleotide mutations in the gene encoding the type 3 receptor for fibroblast growth factor (*fgfr3*) located in Chromosome 4. This project was performed with an achondroplasia volunteer of Asian origin, one of CCB@USM's own graduate students, in close collaboration with the United States Joint Genome Institute (JGI) - Los

Alamos National Laboratory. Chromosome 4 was separated from the rest of the 22 chromosomes, sequenced and assembled. From the analysis, none of the classical diagnostic mutations of achondroplasia and hypochondroplasia was identified. It indicates that the classical achondroplasia indicator gene, *fgfr3*, may not be the only indicator in this particular case. To search for other potential markers, the whole human genome sequencing project was launched by high-throughput sequencing of individually sorted chromosomes. More information will be available publicly by end of September, 2011.



(Courtesy <http://www.moondragon.org/obgyn/pregnancy/achondroplasia.html>)



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