香港中文大學
The Chinese University of Hong Kong
可持續校園 Sustainable Campus
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為迎接2012年實施四年制，大學陸續興建教研及學生活動中心。在應付未來所需之餘，校方更重視新建築與校園可持續發展的關係，從構思設計、與校園發展的配合，以至內部設施及施工，都嚴格遵守環保準則，確保每棟新樓成為綠色大樓。

樓宇設計配合現有環境

校園發展處高級建築師馬維剛先生說：「設計新樓宇時，首要考慮的是它必須配合所處地勢及周圍的自然環境。」以圖書館擴建項目為例，玻璃結構的建築物緊貼大學圖書館北側，其通透的外觀，既與現有圖書館渾然一體，又不會破壞或扭曲中大人珍視的林蔭大道中軸線。這個設計的另一優點是引入天然光線，節省能源，也讓學生溫習時看到外面的景致，緩解疲累。

虛線所示為玻璃結構的圖書館擴建部分
Simulation of the glass library extension with dotted outline

擴建圖書館固然是為了滿足大學師生的需要，但在設計上也顧及棲息於圖書館外牆的小白腰雨燕群落。大學早在2007年已委託本港鳥類專家詹肇泰博士進行生態評估，並制訂保育措施。是以，擴建部分的外牆會採用不反射玻璃，加上搪瓷線條，防止鳥類飛近。擴建地盤現已築起圍板，短期內會進行模擬測試，觀察雀鳥對這些玻璃物料的反應。

馬維剛先生
Mr. Michael W.K. Ma

從中央道所見的圖書館擴建部分，其右為田家炳樓
Simulation of library extension from Central Avenue with Tin Ka Ping Building on the right

位於方潤華堂旁的兩座綜合教學大樓（下圖）的設計是另一以環保為念的例子。馬先生表示，該幅用地本足以興建三棟大樓，為免造成擠逼感，大學將第三棟建於對面的露天停車場，並設計兩座大樓面向不同角度，避免造成屏風效應，亦增加樓宇之間的空間。

兩座綜合教學大學（左）及第三座教學大樓（右）透視圖
Perspective of Two Integrated Teaching Buildings (left) and the Third Integrated Building (right)

To accommodate the anticipated upsurge of students due to the reversion to a four-year undergraduate curriculum in 2012, new teaching, research and student amenity buildings are being constructed on campus. The University attaches great importance to the sustainable development of its campus, and takes great care to ensure that the designs of buildings, their compliance with campus development plans, the choice of internal facilities, and the construction all meet rigorous environmental standards.

Designs Complement Natural Environment

Mr. Michael W.K. Ma, senior architect at the Campus Development Office, says, 'Whenever we design a building, its complementarity with the terrain and surrounding environment is the first thing we consider.' Take the extension to the University Library as an example. The design consists of a glass structure annexed to the north side of the Library building. The glass-house design provides a fluid continuum to the existing library building without distorting or displacing the central axis of the University Mall which is much cherished by University members. The design will also maximize natural light in the rooms and reduce electricity use. By gazing through the glass, students can take a break after long hours of studying.

Though the new library extension is built for teachers and students, the design has factored in the needs of the house swifts which build their nests in the vicinity. The University commissioned Dr. Tsim Siu-tai, a local bird expert, to conduct a study on them in 2007. Dr. Tsim proposed a number of preservation measures, which will be adopted in the construction of the glass extension, such as the use of non-reflective glass with fritted strips as pattern on the surface to prevent birds from flying near. Hoardings have been erected at the extension site. A mock-up test on the reaction of birds to the glass will be held soon.

Situated next to Fong Yun Wah Hall, the Two Integrated Teaching Buildings (*left*) are another good example of the University's concern for campus sustainability. Mr. Ma reveals that initially three buildings had been planned for the site. However, to avoid over-crowding, the University decided to take one out by building it on the car park across the road. The two existing structures face different directions for increased space between buildings and to avoid a wall effect.

（接下頁 *To be continued*）

銀獎 Silver Award 2008 香港環保卓越計劃

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配合步行文化

校園發展計劃的重點之一是締建「樂步健行校園」，因此，籌劃新建築之時，必須考慮如何鼓勵安步當車，並增設便捷的步行路線。馬先生以兩座綜合教學大樓安裝了電動扶梯說明：「行人從大學站可經此到達文質堂，再經五旬節會樓低座的升降機到達保健路，沿路而上便是中央校園。如要再往新亞或聯合書院，則可分別搭乘蒙民偉樓或西部教學大樓的快速升降機。」

兩座綜合教學大樓的電動扶梯
Escalators at Two Integrated Teaching Buildings

隔熱外牆和靈活內部設計

校園發展處工程師李陞祥先生指出，屋宇署制定的樓宇外牆熱傳送守則只規管商業大廈，對大專院校並沒有規限。然而，大學為保樓宇切合綠色原則，自願遵守有關指引，甚或過之。如屋宇署指定大樓外牆總熱傳送值不得高於30瓦特/平方米，中大更把這上限降低，加強樓宇隔熱效力，減少空調的電力需求，亦即減少碳排放。樓宇的內部規劃也以靈活為前提，以便日後改動間隔時，減少拆牆、重新鋪設電線等浪費。

第三座教學大樓
The Third Integrated Building

李陞祥先生
Mr. Li Sing-cheung

節能和再生能源設施

李先生說：「樓宇內部的空調、抽風、照明和供水系統，無不採用節能設計，並輔以再生能源和循環再用的設施，務求達至最大的節能減排效果。這些例子比比皆是，如兩座綜合教學大樓廣場的電動扶梯配置了感應系統，無人使用時，以極慢速運行；用者走近即會自動回復常速。」

綠化設施也是少不了的。大家較為熟悉的，應是邵逸夫夫人樓的天台綠化園庭。未來除了繼續綠化天台外，校方亦會多引入垂直綠化。馬先生解釋：「聯合書院的湯若望宿舍牆身鋪滿了植物，就是天然垂直綠化的例子。較新穎的人工垂直綠化，是在外牆上另加支架栽種植物。我們已計劃在第三座教學大樓實驗性地採用。」

減少施工污染

李先生強調，大學會在施工期間監察地盤對環境的短期影響，如廢料和噪音等。此外，大學與工程承辦商簽定合約時，要求承辦商遵守各項安全、健康及環保的作業方式，並把建築廢料分類妥善處理及記錄。「西部教學大樓的地盤便曾獲由發展局舉辦的公德地盤嘉許計劃銀獎。」

A Pedestrian Friendly Campus

A key aim of the University's Campus Master Plan is to make the campus a convenient and enjoyable place for walking. Thus when designing new buildings, enhancing opportunities for walking and opening up new pedestrians routes are vital. Mr. Ma explains, 'Escalators will be installed in the Two Integrated Teaching Buildings. Pedestrians coming from the University Station can reach Wen Chih Tang and the Pentecostal Mission Hall Complex Low Block by means of these escalators. The last has a lift that takes them to Clinic Road, a short walk from central campus. From there, they can take the express lifts in the Mong Man Wai Building and the Teaching Complex at Western Campus respectively to New Asia College and United College.'

Thermal Insulation and Flexible Design

Mr. Li Sing-cheung, engineer at the Campus Development Office, points out that the University not only complies voluntarily with the 'Overall Thermal Transfer Value in Building Code' for commercial buildings issued by the government's Buildings Department, it sometimes goes even further. For instance, the thermal value of our buildings façades is lower than the Buildings Department's 30w/m^2. Having a higher resistance to heat, the electricity demand from air-conditioning and emission of greenhouse gases can be reduced. We also adopt design providing flexibility through architectural design and provision of building services elements that allows for change in the use of spaces and reduce abortive work on site.

Energy Efficiency and Renewable Energy

Mr. Li says, 'To maximize the effects of energy conservation and pollutant abatement, we adopt energy-efficient features in air-conditioning, exhaust, lighting and water supply systems. Renewable energy and recycling facilities are installed wherever possible. These features are prevalent all over the campus. For example, there are occupancy sensors in the escalators at the Two Integrated Teaching Buildings. When not in use, the escalators move extremely slowly.'

The University has also done much by way of greening. A well-known example is the rooftop of the Lady Shaw Building. In addition, it will continue to do more vertical greening. Mr. Ma explains, 'The walls of Adam Schall Residence shows natural vertical greening. An improved method of vertical greening is to fix a stand next to the walls for the climbers. This will be first applied to the Third Integrated Building, opposite to the Two Integrated Teaching Buildings.'

Reducing Construction Impact

Mr. Li stresses that the short-term environmental impact of construction works, such as the production of waste and noise, is being monitored regularly. The University also requests contractors to adopt site safety, health, environmental and waste management practices. 'The site of the Teaching Complex at Western Campus has been conferred the silver award of the Considerate Contractors Site Award Scheme organized by the Development Bureau in recognition of its efforts,' he says.

聖堂臨溪建　水質保無恙

Chapel Construction No Long-term Damage to Water Quality

崇基校友徑的小溪，周遭寧靜清幽，不但是校園著名景點之一，更是大學的環保功臣。源自九肚山及大埔山區的溪水集流至未圓湖內儲存，供灌溉校園花草、冷卻系統和沖廁之用。自從崇基學院神學院決定於神學樓旁的小溪段上興建聖堂後，大家一直十分關心工程對小溪水質和生態的影響。為此，大學早於動工前邀請專家評估，以策保育。

評估研究於今年三至六月間進行，以了解旱季和雨季的不同情況，範圍包括小溪上下游和聖堂地盤一帶。研究指出，小溪流量不大，水質亦不屬上佳，但適合一些水生動植物棲息。物業管理處處長譚必成先生解釋，「這是因為溪水自山上而下，沿途夾雜了不少污染物及淤泥。所以，我們在沿溪多處加了半人工的堤壩，緩減水流速度及流入未圓湖的沙泥。」

研究建議，要確保小溪水質不受影響，最重要的是避免受地盤污水污染，並定時監察。譚先生回應說：「大學已動工興建地盆污水收集井，收集和處理地盤污水，防止水質受污染。同時亦會開闢臨時引水道，把原來流經聖堂地盤的溪水引流至未圓湖，待竣工後才恢復原來的路徑。此外，大學安全及環境事務處亦會加強水質監察，抽取樣本化驗次數由每月一次增至每周一次。」

The Chung Chi Stream along Alumni Footpath is not only famous for its beauty; it is also ecologically friendly. Stream water is diverted to Lake *Ad Excellentiam* which supplies water for irrigation, cooling systems, and flushing. So it was only natural that when the Divinity School of Chung Chi College decided to build its new chapel on the stream next to the Theology Building, University members were very concerned what it would mean for the water quality and environment. To find out, the University commissioned an external consultant to assess the impact.

The study, which lasted from March to June 2009, covered both dry and wet seasons, upstream, downstream, and areas adjacent to the construction site. It revealed that the stream itself is a small water body, whose quality is suitable for certain aquatic animals and plants. Mr. Benny Tam, Director of Estates Management, explains, 'The running water brings along dirt and mud. In fact, we have to make semi-artificial bunds along the stream to slow down the current and reduce the quantities of mud and sand going into Lake *Ad Excellentiam*.'

The study suggested that preventative measures should be introduced to avoid contamination of the Chung Chi Stream by waste water from the construction site. There should also be routine water quality monitoring. In response to the suggestions, Mr. Tam says, 'The construction of a sewage trap for the site has begun for the purposes of collecting waste water. A temporary catchment channel is being built to divert the stream from the site to Lake *Ad Excellentiam* until works are completed. The University Safety and Environment Office will reinforce monitoring by increasing water quality inspections from a monthly to weekly basis.'

小溪的居民
Inhabitants of the Stream

這些在小溪發現的生物，大家可曾留意？

Some creatures commonly found in the Chung Chi Stream. Have you ever seen them?

照片提供：詹肇泰/啟源智匯有限公司
Photo by S.T. Tsim/FYBR H.K. Ltd.

鰓刺溪蟹
Common Freshwater Crab
(Cryptopotamon anacoluthon)

海南沼蝦
Hainan Swamp Shrimp
(Macrobrachium hainanense)

小棘蛙
Lesser Spiny Frog
(Paa exilispinose)

姍姍來遲小聖堂
A Chapel 40 Years Late

神學樓於1967年策建時，原設計是有一座小聖堂的，但因經費不足而擱置。當年神學生人數不多，故可使用容納四十人之崇基禮拜堂低層靜室舉行祈禱會和崇拜。其後，神學生人數不斷增加，雖已將神學樓四樓的閱讀室改裝成小聖堂，可是只能容納八十人，現時全日制和兼讀生近二百，座位不敷應用，而預計學生人數還會持續增長。設有近千座位的崇基禮拜堂雖也可供作崇拜，但面積又過大。再說，禮拜堂亦是崇基及大學的多元用途中心，使用率高。因此，實需興建一座新聖堂，專供神學院崇拜、教學和各種活動之用。

在籌劃時，崇基學院神學院特別要求建築師盡量避免破壞周遭環境。最後落實於小溪上興建聖堂，以減少對附近樹木的影響。由於神學樓現無升降機，故聖堂工程亦包括在神學樓旁加設升降機塔，連接聖堂，方便行動不便人士。

In 1967 when the Theology Building was designed, a chapel was part of the plan. However, due to financial constraints, its construction was suspended. At that time, the number of theology students was comparatively small. They used the Meditation Room which could accommodate around 40 for prayer meetings and weekly worship. As the number of students continued to grow, the reading room on the third floor was turned into a small chapel accommodating 80 students. Today, there are about 200 full-time and part-time students and the number keeps growing. The small chapel simply cannot cope with the demand. Though close to the Theology Building, the Chapel of Chung Chi College, a multi-purpose venue for College and University activities accommodating around 1,000, is too large for the exclusive use of theology students. Thus a chapel designated for the use of the Divinity School of Chung Chi College is very much in need.

The Divinity School of Chung Chi College has requested the architect to take the project's environmental impact very seriously. Building the chapel on the stream would reduce the impact on trees in the vicinity. A lift will be installed in the new chapel to enable easy access for the physically challenged.

測試太陽能街燈

物業管理處執行大學可持續發展策略，期望於兩年內把校園七成路燈改為使用太陽電能，充分使用零碳排放的可再生能源，以減少耗電量。由於現正測試不同款式的太陽能路燈，故晚上街道或會光線不一，惟祈見諒。

現時校園內的路燈均是低壓納燈（左），節能效果不錯，但不耐用，且色溫偏差，令環境蒙上偏橙色調。更由於生產商已經停產，大學唯有另覓合適的路燈。

去年初，校方先行於校園不同地點安裝約五十枝電磁無極管（中）路燈，今年中又裝設另一款發光二極管路燈（右），測試它們的效能。該兩款路燈均可直接使用太陽能發電板提供的低壓直流電。據現階段觀察所得，效能不俗，色溫近似白色，貼近自然環境，一般可節省高達五成的耗電量。此外，新路燈壽命長達五年以上，不但比兩年壽命的低壓納燈優勝，亦有助減少產生污染廢物。

若全面使用太陽能供電的室外路燈及園藝燈，可把校內再生能源使用率增至百分之四點五。

Testing of Solar Lamp

With the aims of reducing energy consumption and maximizing the use of zero-carbon renewable energy, the Estates Management Office plans to replace 70% of campus lamps with solar lamps in two years' time. The office has installed different types of solar lamps across campus for testing purposes, and urges University members to be understanding of the varied nocturnal luminosity.

Widely used on campus, low-voltage sodium lamps (*left*) are energy-saving, yet they have a short lifespan and the colour temperature produces an orange ambience. The manufacturer has stopped production of these lamps hence the University needs to look for replacements.

Fifty sets of Electrodless Induction Lamps (*middle*) and Light Emitting Diode (*right*), were installed at different locations from early 2008 to this year for testing. Both kinds can be lit by low-voltage DC power by means of photovoltaic panels. Observation in the past months has shown that performance was very good with colour temperature close to white, that is, natural light, and energy consumption reduced by up to 50%. In addition, the life span of the lamps will be increased to five years, longer than the two years of sodium lamps.

If solar energy is fully employed for all outdoor street lamps and landscaped lights on campus, it is anticipated the percentage of renewable energy usage will reach 4.5%.

減廢新思維

大學早於1999年開始推行減廢回收，紙張總回收量由十年前百多公噸增加至2005年的三百二十多公噸，其後自2006年起開始回落，物業管理處於2007年底以問卷調查方式徵集改善減廢方法建議，並釐定了下列方案：

廣泛宣傳——宣傳深入至各部門/單位，如在樓宇大堂註明回收箱位置，於每台打印機及影印機旁張貼減少打/影印和以雙面打/影印的提示。

推行創新減廢獎勵計劃——聘用同一承辦商安排清走廢物及回收有用物品，並定下每月的減廢標準，如承辦商能於達標後進一步減少送往堆填區的廢物量，可獲額外獎金。

增加回收項目——紙張、膠瓶、金屬品、碳粉盒、舊衣物、手袋、鞋、電池、石屎廢料及玻璃等，均屬回收之列。

提升回收品質及數量——現時回收數量只是粗略估計，不經審核。紙張儲藏於室外，也會受雨水損壞及污染。物業管理處將在2010年推行辦公室無廢紙計劃，用處理保密廢紙的厚膠袋封裝所有高質素的辦公室廢紙。該等專用膠袋可處理約二十公斤紙張，且附有電腦條碼記認。回收公司直接於辦公室收取保密袋，重量亦會用條碼個別記標。

上述多項措施自去年底陸續實施，已見成效，今年九月的廢物量減少四成半。如能持續減少廢物及增加回收，每年校內師生製造的廢物量可望減至低於每人四十五公斤，亦將成為2010年首項達成持續發展目標（較2005年減少兩成半）的減碳排放項目。

New Waste Reduction Initiatives

The University first introduced a waste reduction programme in 1999. Paper recycled increased from over 100 tonnes in 1999 to 320 in 2005. The volume started decreasing in 2006. In late 2007, the Estates Management Office collected ideas for improvement by means of a questionnaire, as a result of which, the following measures have been introduced:

Promotion—Among other things, the locations of recycling bins are posted in the lobbies of buildings, reminders for minimizing printing and photocopying, and using duplex mode are posted next to printers and photocopying machines.

Waste Reduction Award Programme—A contractor has been assigned the jobs of waste cleaning and recycling. A monthly waste reduction target is set. The contractor is rewarded for outperforming the said target.

More Recycling—Paper, plastic bottles, metals, print cartridges, used clothes, bags, shoes, batteries, cement waste and glass etc., are being collected for recycling.

Enhancing Quality and Quantity of Items for Recycling—At present, the volume of paper for recycling is but an estimation and the paper is sometimes damaged by rain while being stored outdoors. To do better, the Estates Management Office will launch a paperless office programme next year. High-quality waster paper from offices will be collected and sealed in special plastic bags. Each bag can hold 20 kg and will be attached with a barcode for scanning. Recycling contractors will collect the bags and mark their weights.

Following the implementation of some of the above measures since the end of last year, there has been a 45% decrease in waste collected. Given the success of waste reduction and recycling, it is anticipated that the average waste produced by staff and students per year will be reduced to 45 kg per person, which means that this will be the first item to reach the University's emissions reduction target for sustainable development.