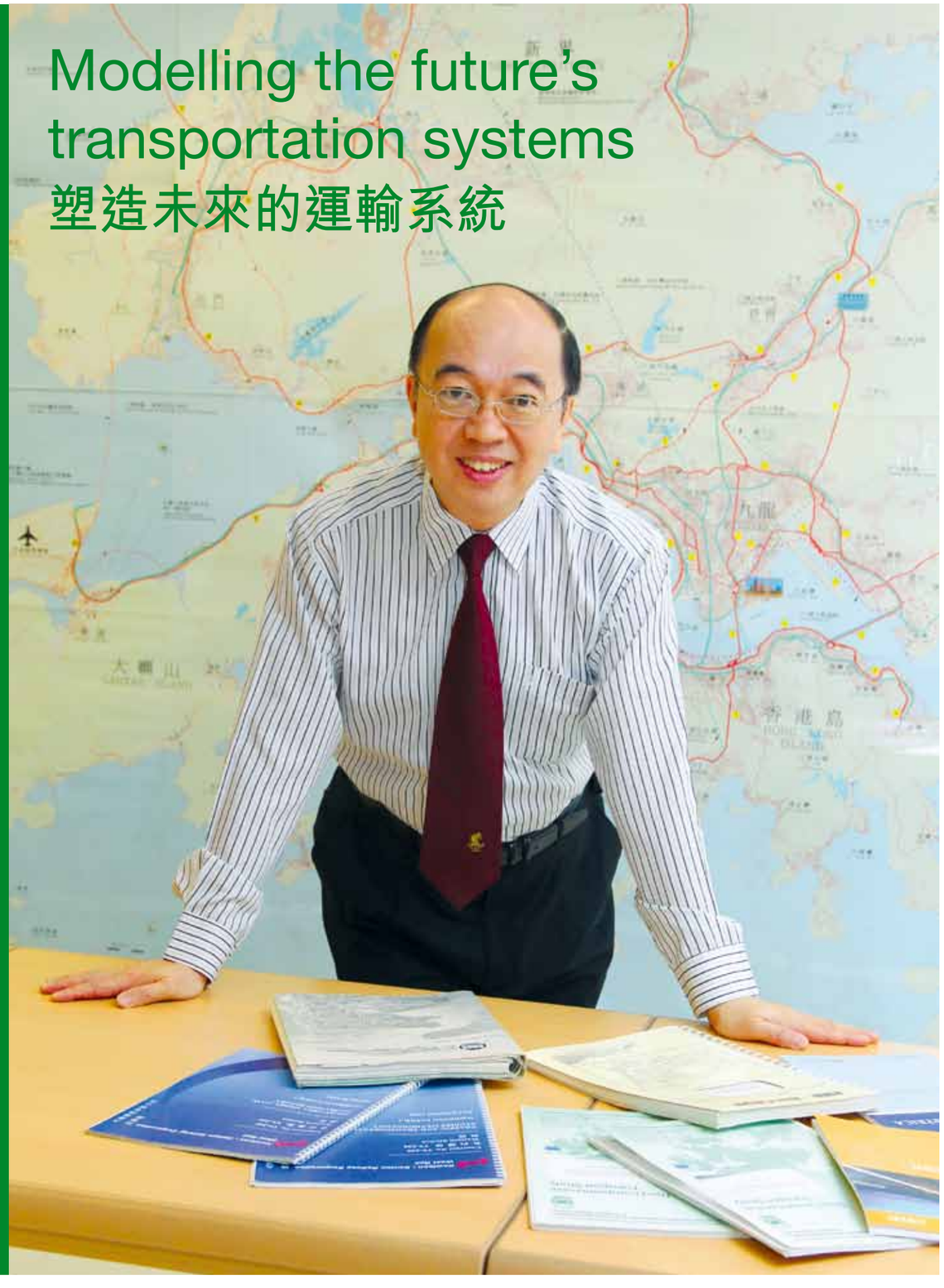
Modelling the future's transportation systems
塑造未來的運輸系統



Although he studies traffic flow patterns in rapidly developing cities, Ir Prof. William Lam took the road less travelled when choosing his discipline. Rather than focusing on structural engineering during his graduate studies in civil engineering, he found himself "more interested in human behaviour, particularly how it affects transportation systems". Now Chair Professor and Associate Head of the Department of Civil and Structural Engineering, Prof. Lam is a pioneer in transportation system modelling which he describes as "a relatively new discipline".

A fascination that began when he interviewed passengers at a bus stop in the middle of a Canadian winter as a Master's student has led Prof. Lam ever deeper into travel behaviour and how it changes over time under different weather conditions. Recently, as one of a group of five collaborators from Hong Kong and the Chinese mainland, he received the 2011 National Natural Science Award (Second Class) for significant contributions to the numerical study of how human behaviour influences the spatial-temporal features of urban traffic-flow distribution.

When asked how receiving the highly prestigious award would change things for him, Prof. Lam responded that it would "provide me with more opportunities to collaborate with scholars in the mainland". This is a crucial element of his engineering outlook, as he is constantly searching for ways to exchange knowledge and hone his professional understanding of how transportation systems should be designed. He currently holds the Changjiang Chair Professorship at Beijing Jiaotong University and is often invited to give guest lectures and seminars on his current research work at other mainland universities.

That work is particularly intense in Hong Kong, where Prof. Lam has received 12 Earmarked Research Grants since 1998. He says he has achieved that remarkable feat by treating every proposal as though it were a paper to be submitted to a leading international journal. But he is also quick to note that the proposal is only the beginning – the research and its outcomes are what matter most.

One outcome that has been particularly important is the result of Prof. Lam's work on traffic speed and journey time estimation. Having received funding from PolyU for a niche area project in early 2000, he and his team devised a transport information system for estimating traffic speeds and travel times. Although it covered only a small part of Hong Kong at first, with the collaboration of Autotoll Limited, the scope expanded and the team completed several related projects for the Transport Department. 2008 saw the launch of a 'speed map' on the Transport Department's website, which was further updated in 2010.

The system allows the general public to "track the real-time traffic conditions on the major roads" through interactive maps of Hong Kong's major districts. Users can find out which routes are congested and what the travel speeds currently are, with updates every two minutes. Given the system's usefulness in a city that offers very few alternative routes, it fittingly received an award for the Best Public Service Application (Small Scale Project) at the 2008 Hong Kong

A scholar's focus on human behaviour related to urban traffic flow-distribution attracts National Natural Science Award.

人類行為對城市交通流影響的研究為學者贏得國家自然科學獎。

Under the supervision of Prof. Lam (right), Lu Hua won the Chartered Institution of Highways and Transportation (Hong Kong Branch) Student Paper Award 2011.
在林教授（右）的指導下，陸化奪得英國特許公路及運輸學會（香港分會）二零一一年學生論文獎。

ICT Awards. The system has since been extended to provide travel times on various gantry signs for drivers wanting alternative tunnel routes beneath Victoria Harbour. Under this “Journey Time Indication System”, drivers on Hong Kong island can now see real-time traffic information while travelling on the major roads along the harbour, which is particularly useful when there have been traffic incidents or temporary road closures.

One of Prof. Lam’s current projects is devoted to extending this system to Beijing or other cities in Asia, such as Bangkok, so it can be used to predict travel times and traffic accidents. That has meant adapting it to new traffic conditions, with Prof. Lam offering Beijing’s profusion of motorcycles as a key difference on the roads of the capital as compared to Hong Kong.

For a scholar who has already achieved so much both locally and in the mainland, Prof. Lam is never satisfied with the state of knowledge in the present. Indeed, forecasting travel demand in a system is always focused on the future. To understand how a transportation system might accommodate a certain level of future demand, “we have to understand how people change their travel behaviour over time”, he said. That involves dealing with various uncertainties, and only then can “a robust transportation system for our next generation” be achieved.

Prof. Lam’s concern for the next generation is also evident in his teaching, which covers transport planning and highway engineering. “We have to educate our students to learn independently”, he commented, “because nowadays knowledge is forming very fast.” Students should not only know how to run computer models in sophisticated software, but also know the theories behind these models so they can detect when the output is incorrect.

His students have certainly responded to the challenge, with some taking out best paper and project awards in recent years. As part of a new breed of transportation engineers, they are emerging into a profession that Prof. Lam suggests will be playing a much more active role in planning not only locally, but also in the broader Pearl River Delta and throughout Asia. It is, after all, a more fundamental element of the human behaviour for a sustainable transportation system that Prof. Lam has long studied to collaborate with neighbours rather than to compete.

林興強教授、工程師雖然一直致力研究發展迅速的城市之交通流量，但在揀選自己的專業路向時，他卻選擇了一條比較少人走的路。他發現自己對人類行為很感興趣，尤其是它如何影響運輸系統，所以他毅然在攻讀土木工程深造課程期間放棄主修結構工程。林教授是土木及結構工程學系講座教授兼副系主任，他是交通運輸系統建模的先驅，並形容這是一個相對較新興的範疇。

林教授對這範疇的興趣始於他在加拿大攻讀碩士課程的時候，當時正值冬天，有一次他在巴士站訪問乘客，這次經驗令他對研究交通活動行為及它如何隨時間及天氣而轉變產生濃厚的興趣。最近，林教授與四位來自香港和中國內地的學者，獲得二零一一年度國家自然科學獎（二等獎），表揚他們在研究人類行為如何影響城市交通流時空分佈規律與數值計算方面的重大貢獻。

林教授形容這崇高的榮譽會為他帶來更多與內地學者合作的機會，這是他在工程界別發展的重要方向，因為他一直亦致力尋求交流學術及善用專業知識，以提升運輸系統設計的方案。他現任北京交通大學長江講座教授，並經常應邀到其他內地大學作客座演講，講解他目前的研究工作。

林教授在香港的研究工作非常活躍。自一九九八年起，他共十二次成功獲取研究用途補助金。他直言認真撰寫每一份建議書，就看作是向國際權威學術期刊提交論文一樣，因而取得如此理想的成績。但他亦理解，提交建議書只是一個開始，研究本身及其成果才是最重要的。

其中，林教授在車輛行車速度及預計行車所需時間的研究有著重要成果。二零零零年初，林教授獲得理大支援一項發展專長領域計劃，他與團隊設計了一個交通訊息系統，用以預計行車速度及所需時間。雖然該系統最初只覆蓋香港的一小部份，及後團隊跟快易通有限公司合作，擴大系統的覆蓋範圍，並協助運輸署完成幾個相關項目。 二零零八年，團隊更助運輸署在網頁上推出「行車速度圖」，並在二零一零年再次更新有關資料。

該系統讓廣大市民利用香港主要地區的互動地圖，瞭解主要道路上的實時交通情況。系統每兩分鐘更新資料，讓使用者獲悉那些道路交通擠塞，以及當時的行車速度。對那些小有分流路線的城市來說，這系統尤其有幫助，它因而奪得二零零八年香港資訊及通訊科技獎的最佳公共服務應用（小型項目）獎。該系統亦擴展到在架空道路標誌上顯示實時行車時間，為過海司機提供分流隧道路線。在該「行車時間顯示系統」下，香港司機現在可以在沿海港主要道路上行駛時，獲得實時交通訊息。這系統在有突發交通事故或臨時封路的情況下尤其有幫助。

林教授的另一個進行中的項目，就是將上述系統應用到北京或其他亞洲城市，例如曼谷，作為預測行車所需時間及交通意外之用。林教授指出，由於北京的道路上有摩托車行駛，有別於香港的道路狀況，因此該系統需加以調整，以適用於新的交通情況。

雖然林教授是位在中港兩地都卓有成就的學者，但是他從來不滿足於現有的知識。事實上，預測交通系統的需求，著眼點始終是未來。他解釋說：「如果要理解運輸系統如何容納某種程度的未來需求，我們必先瞭解人們的交通活動行為怎樣隨時間而改變。」這涉及到處理各種不確定的因素，只有這樣才可為我們的下一代實現一個健全的交通運輸系統。

林教授對下一代的關注也體現於教學之中，包括他所教授的交通規劃和公路工程範疇。他表示：「我們要培養學生自主學習，因為現今知識的形成過程實在很迅速。」學生不但要知道如何利用複雜的軟件操作計算機模型，而且也要瞭解這些模型背後的理論，遇上輸出的結果是錯誤的，也能及時發現。

林教授的學生亦積極面對挑戰，他們當中有在近年獲得最佳論文及項目獎項的學生。林教授稱，作為新一代的運輸工程師，他們將會在本地，以至在珠三角地區及亞洲規劃中扮演更活躍的角色。畢竟，林教授長期以來研究在可持續運輸系統中人類行為的基本要素，是要與鄰近地區合作而非競爭。

Journey time indicators on gantry signs
架空道路標誌上顯示行車時間

Real-time Traffic Information System
實時交通資料系統