Citation for Prof Liu Tungsheng

Your Excellency,

Professor Liu Tungsheng, who graduated in Geology from the National South-West Associated Universities in Kunming in 1942 and who subsequently undertook further studies in Biology at the National Central University in Nanjing, which enabled him to extend his geological studies to the study of fossil plants and animals in the closely related discipline of paleontology, is a geologist and paleontologist of unusual distinction and world renown.

Between 1945 and 1953 he gained his practical experience, first as a junior geologist and paleontologist in the Geological Survey of China and then as a senior geologist in the Ministry of Geology and Mineral Resources.

In 1953 he was appointed as Associate Research Professor in the Quaternary Laboratory in the Institute of Geology of the Chinese Academy of Science as well as holding a concurrent appointment in the Academy's Institute of Vertebrate Paleontology and Paleoanthropology. Five years later, at the early age of 41, he was appointed as Research Professor to both Institutes. In 1968 he was appointed to a leadership position in the Guiyang Institute of Geochemistry.

In 1979, he resumed his appointments as Research Professor in the Academy's Centre for Quaternary Research in the Institute of Geology as well as in the Institute of Vertebrate Paleontology and Paleoanthropology. He has continued to hold both appointments to this day. But for some seven years from 1985 and 1992 his extensive experience and the leadership qualities he had developed in Guiyang made him the ideal person to serve as the founding Director of the Academy's Xian Laboratory of Loess and Quaternary Geology.

Your Excellency, the words *Loess* and *Quaternary* can serve as keys to Professor Liu's outstanding contribution to scientific research in our half of this century. As a Geologist and Paleontologist he is of course accustomed to place the results of his research into a time frame the range of which is nothing less than astonishing for the rest of us, if we are neither earth scientists nor astronomers. From the beginning of the Cambrian era, that time frame stretches over three eras, divided into eleven periods, which between them add up to no less than 570 million years - wuwanwan qiqianwan nian. If one were to include the Pre-Cambrian period and go back to the formation of the earth's crust, one would be looking at a span of 4,500 million years. In that time span Professor Liu's Quaternary period began a mere two and a half million years ago and takes us to the present day. That might be said to make him a veritable modernist among geologists.

When he began his pioneering work on *loess*, which was to take him all over China's Loess Plateau, the extensive work which had been done on loess deposits in Russia, Europe and America had suggested that the first loess deposits probably dated from the latter half of the late *Pleistocene* epoch. But Professor Liu began by concentrating his studies on the thick and widely distributed silty formation which lay underneath the late *Pleistocene loess*. Basing himself on paleontological evidence found within this layer, he reached the conclusion that it was actually an earlier wind-borne form of loess. That conclusion extended the age of loess to the very beginning of the Pleistocene period, 2.5 million years ago.

His studies of the so-called "red bands" which are "paleosoil horizons", occuring at intervals in the sequence of loess, suggested that they had been formed under the warm and humid conditions, which periodically interrupted the glacial conditions of the *Pleistocene* epoch. Whereas earlier studies of the European Alps and China had suggested that there had been no more than four cycles of glacial and interglacial conditions in the *Pleistocene* epoch, Liu Tungsheng's studies, the results of which he first presented in 1961, showed the existence of many more glacial-inter glacial cycles. The interglacial cycles were represented in the Chinese loess plateau by the so-called "red bands", which were the "paleosoil horizons". These findings of "multi-glaciation" were later confirmed and accepted by loess studies in other parts of the world.

In the course of examining the loess and palesoil segments in different part of China's Loess Plateau, Professor Liu discovered that the correlations between loess deposits over the entire Plateau were sufficiently strong to demonstrate that Chinese loess deposits can serve as a geological "archive", which allows us to reconstruct the oscillations of climatic conditions on the Loess Plateau over a period of some two and a half million years. The evidence he has unearthed points to no fewer than thirty-seven major climate cycles during this period.

Since the early 1980s Professor Liu has been able to show that there are significant correlations between the paleoclimatic record of Chinese loess and deep sea cores, at least over the last 1.5 million years of the *Pleistocene* epoch. These correlations are clearly of global significance. His more recent researches have led him to examine the influence of the uplift of the Tibetan Plateau at the beginning of the *Pleistocene* epoch on the pattern of paleo monsoons and the pattern of marine sedimentation as revealed by oxygen-isotope records of deep sea cores.

In his pursuit of China's climatic archives, which he sees as being set in the sands of both late and earlier *loess*, Professor Liu has always been aware of the need for co-operation from research centres in other countries and for an approach to scientific research, which is both inter-disciplinary and genuinely international. That in turn has seen him work hard as a leader and facilitator of interregional and international co-operative programmes and conferences and as a driving force in China to encourage the constant interchange of information both in his own and in other scientific disciplines. In recognition of his contribution in the field of Quaternary Geology, he was the first Chinese scholar to have been elected in 1991 as President of the International Union for Quaternary Research and has only just completed his four-year term.

Professor Liu also has strong academic links with Hong Kong. He played a major part in organizing three international conferences on the evolution of the East Asian Environment, held in Hong Kong since 1983. In recognition of his high standing, he has been an honorary member of the Geological Society of Hong Kong since 1984.

Your Excellency, I have much pleasure in presenting to you Professor Liu Tungsheng, not only as a scientist of unusual range, energy and perspicacity but as an indispensable and persuasive facilitator in the development of close relations between scientists in China and elsewhere, for the award of a Doctor of Laws, *honoris causa*.

劉東生教授贊辭

總督閣下:

劉東生教授是一位超卓不凡、舉世知名的地質學家及古生物學家。劉教授在昆明的西南聯大修讀地質學,一九四二年畢業,其後在南京國立中央大學進修生物學,從而將地質學的研究擴展至古生物學範疇中的動植物化石研究。

- 一九四五年至五三年期間,劉教授累積實際經驗,先是在中國 地質測勘所任初級地質學研究員及初級古生物學研究員,後出任地質 礦物局高級地質學研究員。
- 一九五三年,劉教授獲中國科學院地質研究所的第四紀研究室 聘用爲副研究教授,同時並任職科學院古脊椎動物與古人類研究所。 五年後,劉教授獲兩研究所聘任爲研究教授,時年四十一歲。一九六 八年,他在貴陽地球化學研究所負責領導有關的研究工作。
- 一九七九年,劉教授重返中國科學院,出任地質研究所第四紀研究中心及古脊椎動物與古人類研究所的研究教授。這職銜他一直擔任到現在。但一九八五年至大九九二年大約有七年時間,他負責創辦西安第四紀地質研究室,並擔當主任一職。他在貴陽時的廣泛工作經驗和領導才能,使他成爲擔任該職務的最佳人選。

總督閣下,「黃土」及「第四紀」兩個詞彙可用來闡明劉教授過去半世紀在科學研究的卓越貢獻。劉教授是地質學家,也是古生物學家,習慣將研究結果連繫在一時間框架內,對既非地球科學家亦非天文學家的我們來說,這時間框架的幅度著實令人驚愕不已。從寒武紀開始,這時間的框架跨越三個紀元,共十一期,合算起來是五億七千萬年。如果將前寒武包括在內,回到地殼形成時期,我們面對的時距將是四十五億年。在這漫長的時距中,劉教授的第四紀祗有二百五十萬年,將我們帶回現代。這大概可以說,在芸芸地質學中,他著實是一個現代主義者。

劉教授曾踏遍中國的黃土高原,從事有關黃土先河初創的研究工作。工作開展之初,他曾參考在俄國、歐洲及美洲有關黃土沉積的大量研究。研究結果顯示,第一層黃土沉積極可能追溯至晚更生世。劉教授開始有關研究時,專注於藏在晚更生世黃土下那深厚而廣佈四處的淤泥。根據該淤泥層內所發現的古生物遺跡,他得到的結論是:該淤泥層其實是較早期由風輸送形成的黃土。這結論將黃土形成的年期推向更生世的初期,即二百五十萬年前。

劉教授對所謂「紅帶」,即不時出現在黃土層列中的「古土壤層」的研究結果顯示,古土壤層是溫暖和潮濕狀況下的產物,而溫濕狀況周期性地出現在更生世的冰川氣候中。雖然早期在歐洲亞爾卑斯山脈及在亞洲進行的研究顯示,更生世中冰川狀況祗有四個周期,但劉教授在一九六一年所提出的研究結果顯示存有更多的冰川 - 間冰周期。中國黃土高原的「紅帶」,亦即「古土壤層」正好表明間冰周期的存在。這「多次冰蝕」的研究結果後未獲得世界其他地區黃土研究的証實和確認。

劉教授在研究中國黃土高原不同地帶的黃土及其中的古土壤時,發現整個黃土高原不同黃土沉積之間的相互關係足以表明中國的黃土沉積可用作地質學上的「檔案」,能讓我們重新整理黃土高原在大約兩百五十萬年期間的氣候變動狀況。他發掘的証據指出:在該時期內主要的氣候周期多達三十七個。

從八十年代初期開始,劉教授已証明:至少在更生的最後一百五十萬年中,中國黃土的古氣候紀錄和深海也核之間有重要的相互係。明顯地,這些相互關係有全球性的意義。他最新的研究是檢視更新世初期高峻的西藏高原對古代季風的模式及對深海地核中氧同位素紀錄所顯露海洋沉澱的模式的影響。

劉教授認爲中國的氣候檔案儲存在後期和較早期黃土的沙層中。在進行該項研究時,他常常意識到有需要與其他國家的研究中心合作,亦有需要採用跨學科及真正國際性的科學研究方法。這意識令他孜孜不倦,領導及推動籌辦地區和國際性合作計劃和研討會;也使他成爲中國一股主催力量,鼓勵在自己及其他科學範疇內作持久的訊息交換。爲表揚他在第四紀地質學範疇內所作的貢獻,他是第一位中國學者於一九九一年爲國獲推選爲國際第四紀研究協會會長,今年剛完成四年任期。

劉教授與香港亦有緊密的學術聯繫。一九八三年開始,他在籌辦三屆有關東亞環境改進的國際研討會上,均承擔重要任務。爲褒揚他崇高的地位,他自一九八四年開始獲選爲香港地質學會榮譽會員。

總督閣下,劉教授不單是博學廣聞,精力充沛及敏銳精明的科學家,同時在促進中國科學家與其他地區發展緊密聯繫方面一位令人信服,不可或缺的人物,現特恭請您頒予榮譽法學博士銜。