一轉念 知天才能順天

A Flip in Thoughts: Know about Nature and Conform to It

金恆鑣　談環境倫理

Professor Heng-biao King on Environmental Ethics

2005年卡崔娜颶風一夕重創美國，造成爵士之都紐奧良棄城，即便是世上富強之首迄今仍尚未全面復原；2009莫拉克颱風帶來驚人的雨量，把台灣一年的雨，在三天之內下完，災後重建之路仍長期漫漫考驗台灣。

面對自然的巨大力量，沒有強國。

人們在倉惶收拾殘局的同時，不得不正視逼在眼前的共業：

全球氣候變遷脫序，「天災」成為常態，如何重新看待人與自然的關係？如何與大自然共處？

如何順天？

天之道，人知道嗎？

「地球是活的。」

金恆鑣教授一語直入核心。地球上所有生命的發生與多樣性的存在、演化，和這股自然的擾動力量是分不開的，除非它和月球一樣，成為死星球。

就在這股不斷運行的演化過程，生命也從中衍生出適應的生存與繁衍機制，此時這些自然的力量往往是重生的力道大過破壞的力量。以颱風為例，從許多人的觀點是災難一場；就其他生物整體生態角度看，未必是壞事。

In 2005, Hurricane Katrina devastated the Gulf Coast overnight, forcing the New Orleanians to be evacuated from the Jazz City, and the U.S hasn't fully recovered from the devastation yet. In 2009, Typhoon Morakot brought Taiwan heavy rainfall equivalent to the island's annual precipitation within three days. The long road to reconstruction poses a daunting challenge to Taiwan.

When facing the enormous force of Nature, no countries can be called "great power."

As people scurried to clear up the mess, they had to take the common karma seriously: global warming is getting out of hand and natural disasters have become the norm. How should we redefine the human-Nature relationship, and how do we coexist peacefully with Mother Nature?

How do we bow to Mother Nature?

Do Humans Know the Way of Nature?

"The Earth is alive," Professor King got right to the point. The generation of all life forms and the existence and evolution of such diversity are inseparable with the Nature's force –unless the Earth becomes a dead planet just like the moon.

During this ever-evolving process, life learns to adapt and multiply and Nature shows greater power in regeneration than in destruction. Take typhoons for instance. They are considered disasters by many people, but this may not be the case from an ecological perspective."

採訪撰文 Interview & Text / 江明真 Mingzhen Jiang　翻譯 Translator / 黃詠蘭 Teresa Huang

地球是活的。氣流形成、海洋流動、颱風、颶風、海嘯等等，都是自然的擾動力。/ Leonid Nyshko 攝
The earth is alive. The formation of air current, the flow of the oceans, the typhoons, hurricanes, tsunamis, tornados, earthquakes and floods are all natural occurrences. / by Leonid Nyshko

人們應重視環境倫理，合理取用大自然賦予的資源，才能做到永續 / 史帝文攝
People should attach greater importance to environmental ethics and reasonably use the resources provided by Nature so as to live a sustainable life. / by Stephane

金教授以長期森林生態觀察說明，每一次的颱風過境，豪雨強風會大量吹落樹葉與吹倒樹木，這些殘枝敗葉正好給了腐食性的動植物、土壤微生物營養大補帖，颱風季對他們而言是美味加料的豐收派對好時光，而在大量分解有機物作用下，也促進森林的營養循環速率，讓森林更茂密，也維持生物多樣性。長期來看，颱風造就了重生。

颱風是如此，地震、土石流等等台灣慣見的「天災」亦然，生養期間的無數物種生命也在一再重演的自然擾動中練就一身長期適應能力，成就台灣特有的生態體系。人呢？

花時間，向大自然學習

「人要順天，怎麼順?! 怎麼知道你有順天？自然一個動作下來，搞不好人還會錯意呢！」

長期參與「國際長期生態研究網指導委員會」，積極推動台灣長期生態研究的金教授一再重申：以跨世代、大空間的大思維，思考「我們」的生態環

King cited the example of ecological observations on forests and said that after each typhoon, the torrential rain and the gale knock down great amount of leaves and trees, which happen to offer scavengers and soil microbes plenty of nutrients. To them, typhoon seasons are time for harvests. Moreover, after large numbers of organisms are decomposed, the speed of the nutrient cycle is enhanced, leading to denser forests and richer biodiversity. In the long run, therefore, typhoons result in regeneration over and over again.

The same holds true for earthquakes, mudslides and other "natural disasters" common in Taiwan. Many species also learn to adapt themselves to the repeated natural disturbance, thus forming an ecosystem specific to Taiwan. But what about humans?

Take Time to Learn from Mother Nature

"How do humans conform to Nature's way? And how do you know if you do it right? Perhaps humans would misunderstand the message sent by Mother Nature."

King, who has long been on the Committee of the International Long-Term Ecological Research (ILTER) and an ardent promoter of long-term ecological research in Taiwan, reiterated that people

境。這裡的「我們」不只是人類，亦是所有生命物種。

氾濫為什麼氾濫？對野生動物的影響如何？野生動物對人的未來又如何？如何適切的因應？沒有一個長期動態的科學資料作為了解自然現象的基礎，所有的防洪計畫、重建補助都可能是表面的應付遮掩，短時間雖然可以挨過去，長期看又是重蹈覆轍的世代災難開始。

持之以恆，是向大自然學習的關鍵心態。

這項學習的大工程，必須有賴一群人、一流知識、藉由尖端科技，作長期觀察與紀錄、資料分析與交流、結果比較與做模式，將資料變成知識，成為執行決策的科學依據。

金教授舉福山植物園的長期生態觀察計畫為例，頻繁的颱風擾動年年造成大量落葉，但也形成次年春季的大量新葉長出，觀察小組從1994年的六次颱風過境福山的闊葉林，以當年的吹落枝葉量為起點，每隔兩週記錄一次，年年的葉量變化迄今，結果顯示，即便颱風年年報到造成落葉，每一年的數量仍呈穩定的成長數，年年遞補回來一點，「到第十一年，整體數量回到原來規模，達成平衡」而期間原本棲息的獼猴，亦因葉量的增減暫離遷移，來來去去，最後回返原棲地。當然研究落枝葉只是颱風對森林作用的項目之一，其他的影響項目非常多。

should rethink the idea of "we" in a broader sense to incorporate not just humans but all species of life.

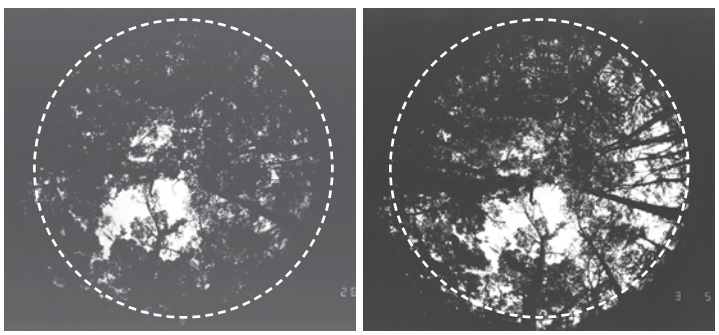
Why do floods occur and what impact do they have on wild animals? How do wild animals influence the future of mankind? How do we cope with the changing Nature? Without a long-term dynamic scientific data as the basis to understand natural phenomena, all the flood prevention projects and reconstruction subsidies would fail to address the root cause of the problems, but allow disasters to repeat one after another.

Staying persistent is the crucial mindset in learning from Nature.

Such a huge learning task requires a group of knowledgeable people that employ advanced technology to conduct long-term observation, recording, data analysis, exchanges and comparisons to transform data into knowledge as the scientific basis for the execution of decisions.

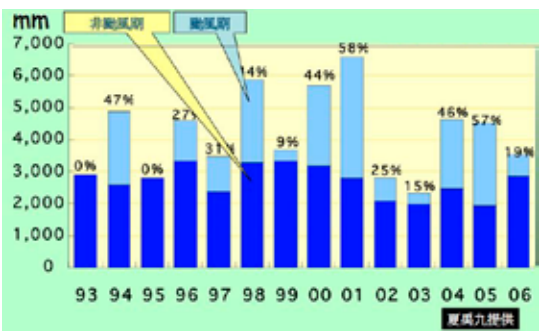
Another example concerns the long-term ecological observation program of Fu-Shan Botanical Garden, where frequent typhoons cause many fallen leaves every year but new leaves to sprout in the following year. In 1994, the observation team started to record the amount of twigs and leaves blown off by the 6 typhoons that struck Taiwan that year. The recording, which has been done every two weeks and still ongoing as of today, shows that in spite of the leaves blown off by typhoons each year, there is still a steady annual growth in the number of leaves, "with the total number back to its original scale after 11 years." And the macaques, which migrate according to the variation in the number of leaves, eventually returned to their habitat. Fallen twigs and leaves are just, among many others, one effect that typhoon poses to the forests.

1994年的六次颱風吹過福山森林
（樹冠層的改變）

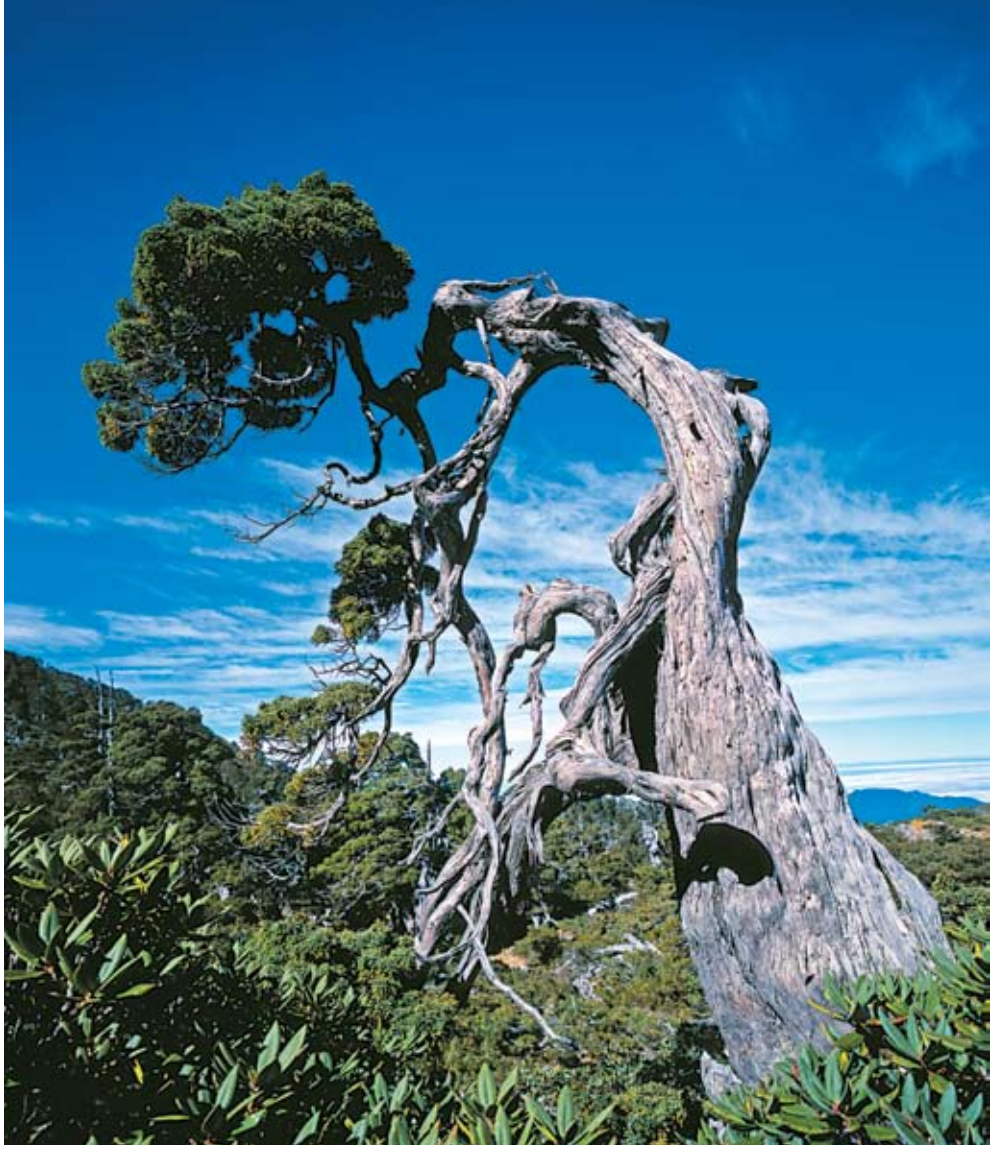


風災前　　風災後

福山長期生態研究站之年降雨量



台灣一百年歷經350次颱風，如何持續累積每次的學習經驗，是「知天」的基礎。
圖為福山生態觀察小組自1994年迄今，持續觀測颱風擾動的葉量變化紀錄 / 金恆鑣提供
Taiwan has experienced 350 typhoons over the past century. Learning from each typhoon is the basis to better understand Nature. The photo shows the record of leaves blown off by typhoons since 1994/ Image provided by. Heng-biao King



自然萬物面對氣候嚴峻考驗時，生生不息的堅韌才是人們師法的典範 / 余榮欽攝
We should respect the perseverance demonstrated by all the living beings when face the challenges posed by severe weather patterns. / by Rong-chin Yu

因著這十五年來的長期觀察紀錄，我們才有一條可供森林生態系經營規劃的參考曲線出現。

生態學研究　跨界跨國界

有鑑於長期生態學研究的重要性及資訊分享的精神，自2004年金教授成立以林朝欽博士領軍的「生態資訊研究團隊」，開發我國的「生態資訊管理系統」。目前，台灣生態資訊管理系統的技術已居於亞太地區的主導地位，並成功協助亞太地區共計10國建置長期生態資訊系統。

「生態學研究，特別是長期生態學研究是全面的、綜合性的，而且是無國界的。」台灣生態資訊管理系統為這樣的前景，在科學領域立下一良好利基。可是研發畢竟是過程，應用才是目的，如何更上一層樓應用生態學研究的知識，將生態資料成為世代的襲產，為政策研擬的科學資訊，開發分享，讓這些龐大的研究資料發展出更多細部研究，發揮最大意義與效力？人力素質與財力資源是背後基本條件。

政府的支持、支援，是後續的主力。

The 15-year-long observation has provided a curve for reference in the management and planning of forests.

Cross-disciplinary and Borderless Ecological Research

In view of the significance of long-term ecological research and information sharing, King established the "Ecological Information Research Team," which is headed by Dr. Chau-chin Lin, and has developed Taiwan's "ecological information management system." Currently Taiwan is playing a leadership role across Asia in this technology, and has successfully helped the establishment of long-term ecological information system in 10 countries.

"Ecological research, particularly the long-term one, is multifaceted, comprehensive and borderless." Taiwan's ecological information management system has laid a solid foundation for such prospect. Nonetheless, R&D is just a process, while application is the ultimate goal. So the problem goes down to the transformation of the knowledge derived from the ecological research into ecological data that can be passed on to generations and serve as the scientific reference for policy-making, so as to maximize the use of such valuable data. All this requires high-quality human resource and funding, complemented by support from the government.

人，無法置外於生態體系

談到環境倫理的推動，以台灣目前的永續觀念，仍多以取得自然資源的永續經營為導向，「人」 擺在「天」前面，是環境權的擁有者與操控者，而非視衆生命皆有其生存權。在此既定觀念下，要探談環境倫理似乎太遙遠太不切實際？

對此，金恆鑣教授不從價值對錯單面取向，而提出更寬廣的觀察見解「要知道，這是自然科學與人文社會科學各自發展，越行越遠所造成的」。

生態學者「不食人間煙火」埋頭專研氣象、物種、地景變化……林林種種不一而足，就是未將「人」這個大參數：人的本性行為、人的思維、甚至制度、法律等等所造成的結果放進研究看整個生態問題；而熟知人類的社會科學研究者，亦不遑多讓，對另一端的生態學從未探頭涉足。

人的每一項行為所產生的結果，都會對環境造成不同程度且極為複雜的影響，受到改變的環境又會回過頭來影響人類，這是很淺顯的道理，卻是很複雜的關係。

相對於自然律的進行監測了解，人的作為所引導的結果亦須作成長期科學資料，兩相對應，提出解釋，颱風一來才有足夠的參考依據，順應天意，而非只是一再重複反射式的控制、圍堵，花千億治水計畫築水壩圍洪道。人要長治久安，必須有長期投入了解的意願與行為。

台灣不乏人力、財力，如何透過一個有願景、無私的領導者，發揮統合能力，持續做台灣長期生態研究的動力來源，累積知識，讓國人因「知」天而「順」天，而懂得如何讓每回的颱風過境災情逐次降低；更進一步，利用颱風成為協助台灣永續發展的力量，為下一世代提供更好的環境。

人，仍是啓動點。

Humans Cannot Sit Out of This Ecosystem

Speaking of environmental ethics, Taiwan focuses on the sustainable management in acquiring natural resources. This has put Nature after humans, who then become the owner and manipulator of environmental rights, rather than respecting all species' rights to live. Within this context, it may appear unrealistic to talk about environmental ethics.

Instead of laterally criticizing on the aforementioned values, King offered a broader thinking: “This is because the gap between natural science and social science has widened apart after their separate developments.”

Ecologists seclude themselves from the crowd to conduct research on meteorology, species, and changes in landscape and so on. They've, however, failed to factor in the parameter of “humans” -- human nature, human thinking, and even the consequences caused by the political and legal systems. Social scientists are no better, as they never want to tap into the other end of ecological studies.

The consequences of human behaviors will bring varying and complex impact on the environment, and the impacted environment will in turn exert its influence on humans. As simple as this idea may be, it has complex implications.

In addition to observing and understanding the law of Nature, it is also necessary to monitor over an extended period of time the consequences brought about by human behaviors. The juxtaposition and explanation thereafter constitute important reference materials to shed light on the importance of “conforming to Nature,” and leaves repetitive flood controls, containment and costly flood prevention projects obsolete. Lasting stability requires long-term dedication to the understanding of Nature.

Taiwan has abundant human and financial resources, but it needs a selfless leader with great vision to integrate everything and provide a consistent driving force for the long-term ecological research in Taiwan. This will allow the public to know about Nature, conform to it and know how to lessen the damage after each typhoon, or even better, to use typhoon to aid Taiwan's sustainable development, and offer a better environment for future generations.

Let humans be the trigger for change.

金恆鑣教授簡介
Profile of Professor Heng-biao King

加拿大卡爾登大學地球科學博士。多年來持續推動國內長期生態學研究，也參與國際間的合作，與各國研究人員切磋，並擔任「國際長期生態研究網指導委員會」主席，目前為「亞熱帶生態學學會」理事長

PhD in Geosciences from Carleton University, Canada. Professor King has been promoting Taiwan's long-term ecological research and participating in international events to make exchanges with researchers from around the world. He was the chair of the Committee of the International Long-Term Ecological Research(ILTER) and is currently the director-general of the Society of Subtropical Ecology.