

運用攝影，能捕捉大自然瞬間發生的脈動。/Wong Hock Weng 攝  
Instant pulses of the Nature can be captured by using photographic techniques. / by Wong Hock Weng

# 看見， 就會更珍惜

## To See is to Value

### 紅外線自動相機 與傳統攝影的生態觀察

#### Ecology through Lens of Infrared Automatic Camera and Traditional Photography

《天羅地網》影片中，皮爾斯·布羅斯南將公事包遺留在博物館內，公事包內的加熱器，緩緩將室內加溫，直到室內溫度等於人體溫度，紅外線熱感應防盜器無法偵測到大搖大擺闖入的雅賊，莫內名畫不翼而飛……。

謝天謝地，野生動物還沒有發展出如此的對策。今天，相同的紅外線熱感應技術，使得瀕臨絕種的台灣黑熊、帶著小山豬的母山豬、颱風過後身形消瘦的山羌，以及更多行蹤隱密的野生動物，在過去19年來，紛紛透過台灣山林各處的紅外線自動相機現身。

In the movie *The Thomas Crown Affair*, Pierce Brosnan left in the museum a suitcase containing a heater that slowly brought room temperature to body temperature to confuse the infrared anti-theft device before he broke in and stole a Monet.

Thank goodness, wildlife hasn't learned such strategy. With the same infrared technology, we've been able to capture activities of nearly extinct species in Taiwan, e.g. Formosan Black Bears, Boars, and Formosan Reeve's Muntjac, among other mysterious wildlife, in the past 19 years.





### 紅外線自動相機：我抓得住你

所謂的紅外線自動相機，是一種只要動物走進偵測範圍，其體溫發出的熱（亦即紅外線），感應了連結相機的紅外線熱感應器，就會觸發相機自動拍照的裝置。這種裝置結合傻瓜相機與紅外線熱感應器，使用一般常見的底片，拍出來的照片就像普通彩色照片，而非 X 光片的灰階色彩。

拍攝野生動物需要長時間追蹤守候。數十年來熱愛拍攝野生動物的人，不斷研發自動拍照裝置，包括利用食物引誘動物拉桿子，觸動拍照機制；在地面鋪設雙層不接觸的鐵板，待動物踩到鐵板，壓下接觸後就連通電流觸動拍照等。一直到快要進入 90 年代，技術較成熟的蒙大拿型電子感應式自動相機終於問世。

### Camera Trapper: Gotcha!

A camera trapper contains an infrared sensor that detects an animal by its body temperature once it enters the detection range and automatically takes pictures with triggers from the sensor. The camera uses ordinary negatives and the pictures taken are common color pictures, not the gray-scale ones like X-ray films.

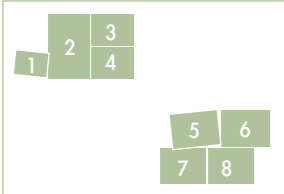
In light of the long time required to trace wildlife, photographers have been devoted to developing various devices for decades, e.g. food-trap-triggered cameras and iron-plate-trap-triggered cameras, etc., until the introduction of the Montana sensor-triggered electronic camera before the 90's.

屏東科技大學野生動物保育研究所教授裴家騏，是台灣應用自動相機記錄野生動物資訊的先驅。1990 年他從台灣師範大學生命科學系教授王穎的「墾丁國家公園梅花鹿復育計畫」，得知蒙大拿型自動相機。隔年購置 10 台，應用在大漢山區的「台灣穗花杉自然保留區」，成功的拍攝到黃喉貂、熊鷹、麝香貓等。證明了相對於傳統觀察，自動相機具有補足稀有動物、夜行性動物資料不足的優點。

這款美國蒙大拿州人開發的自動相機，在地形、氣候截然不同的台灣使用，一開始並不順利。當年在墾丁的初次應用，就不是很成功，往往單單只是風吹草動，一卷 36 張底片就迅速消耗。原來，蒙大拿型自動相機的感應機制，有紅外線熱感應功能，還有微波偵測移動物的功能。相對於地表比較光禿的蒙大拿州，地被植物茂密的台灣郊野，動不動就會出現風吹草動觸動微波的錯誤拍照。

Prof. Jai-chyi Pei was the first one adopting the technology in Taiwan. He learned of the device from Prof. Ying Wang and purchased 10 sets for his Dahanshan project. He successfully captured images of Formosan Yellow-Throated Marten, Hawk-Eagle, and Small Chinese Civet to supplement information on rare species and nocturnal animals that was deficient through traditional observations.

The first application of this Montana developed camera in Kenting, Taiwan was unsuccessful. Because the camera could sense both the infrared and microwaves, it took pictures at every single movement of the wind and the grass. A roll of 36 negatives was quickly wasted without a valid picture taken, for the camera was developed to be used in Montana where there has relatively little plant cover unlike Taiwan.



1. 被黑熊破壞的自動相機 / 玉管處提供  
The destroyed camera trapper by black bear. / Photo provided by YSNPH
2. 紅外線自動相機必須架設於樹木主幹，最好的裝設時機是在中午 / 玉管處提供  
The camera trapper had to be placed on the trunk and the best setup time was noon. / Photo provided by YSNPH
- 3-4. 陽管處在生態廊道口設置的紅外線自動相機 / 陽管處提供  
YMSNPH's camera trapper of ecological culverts / Photo provided by YMSNPH
5. 瀕臨絕種的石虎，行蹤隱密極難發現 / 裴家騏提供  
Endangered leopard cats (*Prionailurus bengalensis bengalensis* Gray) are very difficult to discover due to its covert nature. / Photo provided by Jai-chyi Pei
6. 直視鏡頭的白鼻心 / 裴家騏提供  
A gem-faced civet (*Paguma larvata taiwana*) looking directly at the camera. / Photo provided by Jai-chyi Pei
7. 母猴懷抱著新生兒 / 裴家騏提供  
A female monkey with a baby in her arms. / Photo provided by Jai-chyi Pei
8. 頸部掛了無線電發報器的梅花鹿 / 裴家騏提供  
A Formosan sika deer (*Cervus nippon taiouanus*) with a radio transceiver on its neck. / Photo provided by Jai-chyi Pei



裴家騏在大漢山區使用時，從各種誤拍狀況歸納出適合台灣使用的技巧。他發現，相機鏡頭最好面對地面，讓背景單純化；樹木分枝容易隨風搖曳，相機必須架設在樹木主幹；至於架設時機，最好選擇中午。趁著太陽大挑選林蔭最濃密的地點，並將相機架設在主幹的背陽面並將相機架設在主幹的背陽面，以避免陽光從林蔭稀疏處直射，或導致地面增溫誤觸紅外線熱感應器。

除了架設技巧，硬體方面也花費長時間改良。蒙大拿型相機一組重量將近12公斤，並且體積大，一個登山背包只塞得下一、兩組設備。在蒙大拿州，研究人員可以用貨車載運設備直達架設點，台灣山路陡峭崎嶇，太重太大的設備對徒步搬運的研究人員是很大負擔。最後，裴家騏找來電子背景的學者，共同研發出夠輕、夠小、使用一般電池、省電的「適合台灣使用」的紅外線熱感應自動相機。

有了合適的自動相機，台灣野生動物調查人力大大提昇。裴家騏眼中，自動相機每天連續工作24小時，風雨無阻，無怨無悔，「沒有一個研究助理可以辦的到！」而且，這套設備特別適合普及應用。巡山員不清楚物種辨認也沒關係，只要將照片帶下山由學者判斷即可。否則，想提昇資料蒐集密度，「哪來這麼多的動物學家？」

Professor Pei practiced various filming conditions in his Dahanshan project and found that it worked the best when the lens of the camera faced the ground. Because tree branches were likely to move with the wind, the camera had to be placed on the trunk and to choose a well-shaded location that could avoid high ground temperature triggering the sensor, and the best setup time was noon.

The hardware was modified, too. One big backpack could only hold one or two sets of the bulky and nearly 12kg Montana camera. The cameras are easy to carry in Montana where trucks are the transportation tools but not in Taiwan where researchers have to carry them on their back. Prof. Pei and some electronics scholars hence developed the light, small, battery-powered, and energy-saving version of camera trapper suitable for Taiwan's environment.

These camera trappers are a great save on the manpower of wildlife investigation in Taiwan. They work 24/7, rain or shine, without complaints. "They're perfect research assistants!" says Pei. Users only have to set up the cameras and leave the interpretation of pictures to experts and scholars. "Why worry about the shortage of zoologists for field data collection?"

約莫10年前，這套設備成為台灣觀測野生動物的基本配備，包括：國家公園管理處、林務局都用作各種監測用途。例如陽明山國家公園，區內道路總長超過200公里，每年至少上千隻野生動物被車輛壓死。2004年起陽管處施作生態廊道，提供動物穿越道路替代途徑，為了解廊道成效，在入口處架設紅外線自動相機監測。廊道完工頭兩年，已拍到超過3,800隻動物。又如玉山國家公園管理處，為了解雪季靜山政策對野生動物的影響，2007年靜山、開山期間，分別在排雲山莊附近架設。初步監測照片透露，部份動物的活動模式可能因靜山、開山而有差別。

### 一次拍到，長期有效

事實上，自動相機拍到的資料，更能幫助動物學家進行以前無法進行的各類型研究。例如：動物對棲息地的喜好研究。

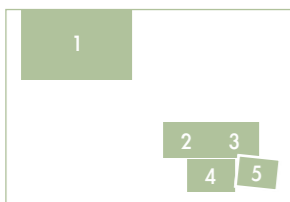
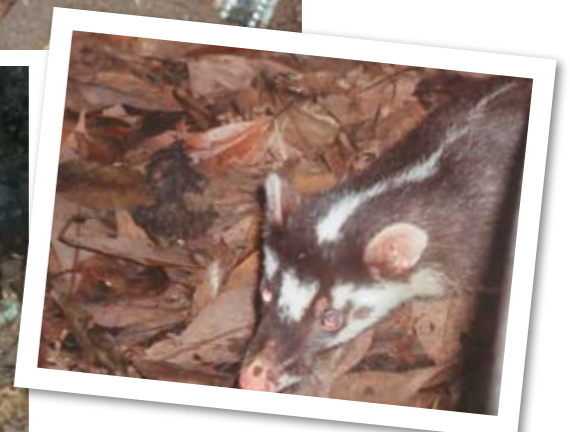
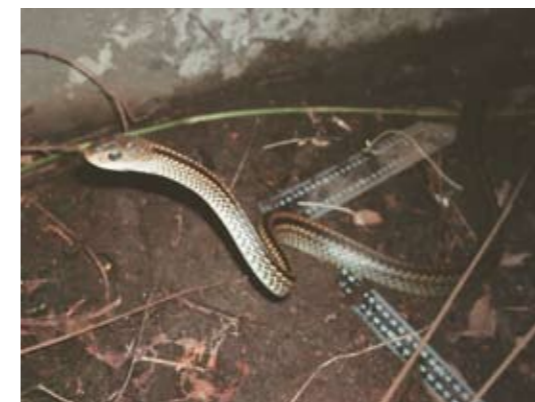
裴家騏舉例，當甲地的相機一直拍到山羌，乙地的相機老是拍不到山羌，就可以推測山羌比較喜歡甲地類型的棲地。當相機數量夠多，還可以進行更細緻的分析，取得山羌最喜歡的、有點喜歡的、有點不喜歡的……等等棲地資料。又如：只要拍到山羌的地方，一定拍得到長鬃山羊，或是一定拍不到長鬃山羊？就可以研究兩者間存在的是共域、依存或競爭關係？而這就是所謂的跨物種族群關係研究。

Around 10 years ago, the improved camera system became standard equipment for observing wildlife in Taiwan and used by national park headquarters and the Forestry Bureau for various purposes. Yangmingshan National Park Headquarters uses it to monitor the efficacy of the newly built micro corridor system in reducing the number of animals run over by vehicles. The camera has captured 3,800 animals for the past two years. Yushan National Park Headquarters sets up cameras around Paiyun Lodge in 2007 to record impacts of mountain clearance policy in snow season.

### Photos Taken Last Long

In fact, information collected through the camera trapper can also help zoologists with various studies impossible in the past, e.g. on animal preference over habitats.

For example, when the camera in Place A always captures Formosan Reeve's Muntjac but that in Place B never does, it can be inferred that Place A is a preferred habitat. The more the cameras, the more detailed analysis can be conducted. If a Formosan Serow is always or never found in places with appearance of Formosan Reeve's Muntjac, a cross-species relationship study can be conducted.



1. 當我們用心去體驗另一個生命，便能更珍惜自己得不來的生命 / Peng -guang Chen  
When we observe a life carefully, we get to cherish our own lives/ by Peng -guang Chen
- 2-5. 陽管處在生態廊道口所設置的紅外線自動相機在完工頭2年，已拍到超過3,800隻動物。圖由左至右分別為過山刀、穿山甲、麝香貓及鼬獾 / 陽管處提供  
YMSNPH's camera trapper of micro corridor system has captured more than 3,800 animals for the first two years after it has been finished. Pic. right to left are Big-eyed Snake(*Zaocys dhumnades*), Formosan Pangolin(*Manis pentadactyla pentadactyla*), Small Chinese Civet, Lesser Oriental Civet (*Viverricula indica pallida*) and Formosan Ferret badger (*Melogale moschata subaurantiaca*) / Photo provided by YMSNPH



母山豬正巧躺在鏡頭前哺乳，這是十分珍貴的畫面。/ 裴家騏提供  
Female Formosan wild boar (*Sus scrofa taiwanus*) nursing in front of the camera. / Photo provided by Jai-chyi Pei

2000年時，裴家騏還利用照片資料進行了動物族群數量的估算研究。研究人員先捕獲4隻山羌，掛上頸圈再放回原本山林。估算方法很簡單，假設當地架設的自動相機最後拍到12張山羌照片，其中有一張戴了頸圈，利用 $1:4=12:X$ 的數學式，就可以估算出當地約有48隻山羌在同一個範圍內活動。

不只對當下的研究有價值，紅外線相機拍到的影像更是絕佳的長期研究材料。裴家騏近年正在進行長鬃山羊的「季節 vs. 皮膚病」研究。儘管十幾、二十年前他根本沒想到今天會投入這項研究，但現在只要調出照片，就能知道當年的長鬃山羊有無皮膚病。「換作是傳統直接觀察，我不可能把10年前的研究助理找回來，要他回想當年看到的那隻長鬃山羊有沒有皮膚病。」

話說回來，儘管紅外線自動相機優點繁多，裴家騏提醒，傳統直接觀察依然很重要。動物健康狀況很難僅靠照片觀察，捕捉法還是必要；想了解飲食習慣和營養，還是必須撿拾動物大便；特別是動物行為研究，更需要長時間直接觀察。而這些，都非定點架設的相機所能代勞。今天，動物學者依然必須跑野外，「只是我們有更多時間可以做以前沒有時間做的事。」

In 2000, Pei used picture data to estimate quantity of Formosan Reeve's Muntjac. First, four Formosan Reeve's Muntjac were caught, placed a neck collar, and set free. Then, 12 pictures were taken, one with the animal wearing the neck collar. By  $1:4 = 12:X$ , it was hence estimated that the area was home to around 48 Formosan Reeve's Muntjacs.

Besides contemporary value, images captured by the camera are great for long-term research. Pei is keen on studying the "season & skin disease" of Formosan Serow recently, which he did not expect 10 or 20 years ago but he can easily observe the animal for the disease through pictures taken during that time. "It is impossible for a flesh and blood research assistant to recall things that happened 10 years ago."

Nevertheless, Pei emphasizes the importance of traditional naked-eye observations. To understand the nutrition status of an animal, its feces must be collected and observed. Direct and long-term observations are still required for animal behavioral studies besides pictures taken by a camera. Modern zoologists still have to go on field trips "but we have more time saved for things impossible in the past."

### 紅外線自動相機之前

的確，沒有自動相機之前，僅靠人力進行野生動物觀察，是非常耗費時間的事。不可思議的是，野生動物紀錄片導演劉燕明，從27年前開始，至今依然堅持著這樣的紀錄方式。

劉燕明最早在1990年推出「台灣獼猴」紀錄片。這部以墾丁地區台灣獼猴為主角的紀錄片，在當時就讀台大動物系博士班的吳海音協助下，費時兩年拍攝，上映後轟動一時。

看見，讓人懂得珍惜。在那個只有三家電視台、偶爾才播放國外野生動物影片、國小課本從未教過台灣有野生動物的年代，這部本土獼猴生活紀實，感動無數台灣人，引發保育浪潮；甚至在新聞局推動下參加國際影展，大大提昇台灣保育形象。

事實上，當時劉燕明已經拍攝野生動物許多年了。早在1983年，上街架起攝影機馬上會引來便衣警察關心的戒嚴時期，劉燕明就利用拍攝商業廣告間暇拍攝個人感興趣的主題，他挑上的是無政治敏感性的野生動物。而「台灣獼猴」造成巨大轟動，他使用的其實是很一般的裝備的裝備。一部16厘米電影攝影機、幾顆長短鏡頭，以及到了今天依然沒改變的普通行頭。吸濕排汗衫？「不需要。」專業登山鞋？「沒有。」Gore-Tex 透氣防水外套？「流汗是很自然的事，一般雨衣就很好。」

那麼，不靠先進科技，劉燕明都靠哪些過人的拍攝技巧？拍攝野生動物27年，他是如何追蹤、靠近野生動物？

「野生動物不可能追蹤，只能靠等待。」劉燕明解釋，台灣山區陡峭，不像非洲大草原可以開吉普車追蹤動物。加上許多動物有四條腿，我們只有兩條腿，腿力相較之下還退化；並且攝影師要扛裝備，動物一身輕裝，再怎麼說，都不可能追上野生動物。想接近，只能靠等待。

但，天地之大，上哪裡等待？劉燕明說起鞍馬山上的一棵山桐子樹，那樹每到冬季約莫12月到隔年1、2月，都會結實纍纍。時間一到熟門熟路的各種鳥類自動出現，想拍鳥到時去守候就對了。「動物不是演員，怎麼可能叫牠去哪裡等你？想接近，當然是你要了解牠的習性。」

至於等待通常要花多久時間，劉燕明表示：「不一定，要配合動物的工作時間。」拍攝野生動物需要碰運氣，即便長途跋涉外加等待多日，也不能保證拍到目標。幸好，劉燕明從不覺得等待是件累人的事。「小孩可以玩玩具幾小時不累，但寫功課三分鐘就喊累。累或不累決定於個人態度。」

### Before the Advent of Camera Trappers

Surprisingly, though time-consuming, Director Yen-ming Liu, who started to document wildlife through naked-eye observations 27 years ago, continues to do so without using camera trappers.

The popular "Formosan Macaque" in 1990 was the first film produced by Liu over two years with assistance from Hai-yin Wu, Zoology Ph.D. candidate in National Taiwan University at the time.

To see is to value. The documentary touched numerous Taiwanese and inspired conservation with clearly depicted details of the life of the Macaque. It was later known to the world in an international film festival and boosted the conservation image of Taiwan.

Liu had been filming wildlife long before that. He started to take photos of wildlife subjects of his interest besides filming commercials in 1983 in the martial law period. "Taiwan Macaque" was actually produced with assistance of ordinary equipment, a 16mm movie camera, a few long-take and short-take lenses, and same old gears. Fast-dried sweat shirts? "No need." Professional hiking shoes? "Not any." Gore-Tex vented and water-proof coats? "An ordinary raincoat will be fine."

Without advanced technology, what were the outstanding filming techniques Liu used to trace and approach wildlife over the past 27 years?

"Wildlife cannot be traced and must be waited for," explains Liu because terrains in Taiwan are stiff and unfavorable, unlike African Serengeti, many animals run on four legs and humans on two legs and photographers carry equipment on their shoulders while animals are unburdened.

But where to wait for the animals? Liu says, if you want to take pictures of birds, you can wait by the *Idesia polycarpa* Maxim on Anmashan because it is laden with fruit around December each year to January and February of the next year and birds know that. "It is always us approaching the wildlife and not the other way around."

How long is the wait, then? Liu indicates that "it depends on the animals." It takes a bit of luck, too. Sometimes you go a long way and wait many days only to get nothing. Fortunately, Liu never found waiting to be tiring. "Sense of tiredness varies with the attitude just like children playing toys and doing homework."

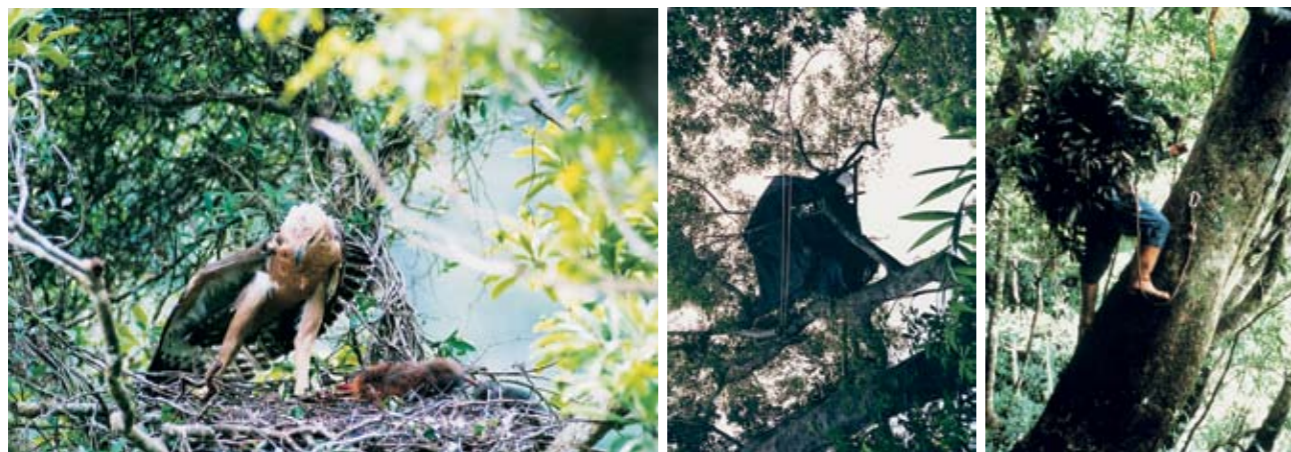


### 熊鷹為伍 樹屋為居

近10年，劉燕明投入熊鷹的拍攝工作。熊鷹是台灣最大型猛禽，雙翅展開寬幅可達2公尺以上。為紀錄這種瀕臨絕種的動物，連續幾年一到熊鷹繁殖季，劉燕明就與6、7名挑夫，扛著約30公斤的攝影設備，以及更繁重的食宿裝備深

### Hawk-Eagle and Tree House

In the past 10 years, Liu has been devoted to filming Hawk-Eagle, the largest raptor in Taiwan with wings as long as 2 meters in span. To record this nearly extinct animal, Liu and some porters carried 30-kg filming equipment and even heavier lodging gear during several



1

1. 拍攝淡水候鳥，劉燕明一蹲數小時。/ 劉燕明提供  
Yen-ming Liu squatted several hours to get a good shot when photographing migratory birds in Danshui. / Photo provided by Yen-ming Liu

2 3 4

2. 熊鷹是台灣最大型猛禽，瀕臨絕種。/ 劉燕明提供  
Hodgson's Hawk Eagle (*Spizaetus nipalensis*) is the largest raptor in Taiwan, and is nearly extinct. / Photo provided by Yen-ming Liu

3. 拍攝熊鷹時，劉燕明住過高約7層樓的樹屋。/ 劉燕明提供  
Yen-ming Liu lived in a tree house with a height of about seven floors when photographing Hodgson's Hawk Eagle. / Photo provided by Yen-ming Liu

4. 趁成鷹離巢覓食，劉燕明才敢進出樹屋。/ 劉燕明提供  
Only when the adult eagles left the nest to hunt for food would Yen-ming Liu go in and out the tree house. / Photo provided by Yen-ming Liu

入台東高山。期間，他曾在離地約20公尺高的樹屋，一待了29天。29天內，附近沒有基地台，不能打手機跟外界聯絡；天天吃麵食，米飯只吃過一餐。

那是朋友上山幫忙側拍工作紀錄，為表達感謝，即便樹屋上沒水，煮飯又特別浪費水，他還是煮掉帶上山的唯一一點白米。劉燕明笑說：「這才是真心誠意的『請吃飯』」。當然，省吃省喝過了近一個月，下山後他瘦了幾乎15公斤。

有熊鷹為伍，以樹屋為居，這樣的工作聽來精彩刺激令人艷羨。奇怪的是，27年拍攝經驗中，劉燕明的家人從未想過跟去體驗。

「沒必要，我的工作沒什麼特別。」劉燕明認為物以稀為貴，這樣的工作機會少才讓一般人誤以為貴，並且，他自認沒什麼使命感，從一開始就沒刻意達到什麼遠大目標。「天天想要特別，不可能，我的工作就是平淡無奇，不接受做不下去。」

是的，保育從來就不輕鬆浪漫。拍攝野生動物，講究的與其是使用哪種攝影機或技巧，不如說是鏡頭背後那顆耐得住平淡乏味的心。即便運用現代科技也一樣，架設完紅外線自動相機，還需要研究者事後用專業知識，一張一張辨別，耐心分析。

breeding season and lodged in high mountains in Taitung. He once stayed in a tree house over 29 days without contact with the outside world and lived on noodles only. Liu had some rice with him but he cooked it for a friend helping him film the whole process, even though cooking rice took lots precious water in the tree house. Of course, the belt tightening days paid off because he lost around 15 kg of weight at the end of the mission.

Working with Hawk-Eagle in a tree house sounds exciting but strange enough, Liu's family has never thought of coming along for the past 27 years of Liu's career.

"They don't have to because there is nothing special about my work." Liu says that people often mistake scarcity for value but he never thinks that he has any mission and never wants to achieve something big. "My work is ordinary but I never quit."

Yes, conservation is never easy and romantic. Filming wildlife is not about the camera or technique but about the photographer who can withstand the plainness and boredom. Even with the modern camera trapper, it takes professionals to analyze each picture with patience.

### 裴家騏教授簡介 Profile of Prof. Jai-chyi Pei

畢業於美國蒙大拿大學，獲哲學博士學位，目前任教於屏東科技大學野生動物保育研究所。專業領域為野生動物族群生態學與經營管理、哺乳動物學、保育人文學等。

With a Ph.D. degree at University of Montana, U.S.A., Pei is currently a faculty member of the Institute of Wildlife Conservation at the National Pingtung University of Science and Technology, and specializes in wildlife ecology, wildlife management, Mammalogy, human dimensions on natural conservation, etc.



### 劉燕明先生簡介 Profile of Mr. Yen-ming Liu



知名生態攝影家，曾經以〈藍鵲飛過〉、〈台灣野鳥百年紀〉及〈朱鷲〉等生態紀錄片聞名國內外。期望透過鏡頭，讓大家可以了解生態環境的真實面貌，以及物種保育的重要價值。

As a distinguished eco-photographer, Liu is best known worldwide for some of his eco-documentaries including *Formosan Blue Magpie*, *A Century of Taiwan's Wild Birds*, and *Maroon Oriole*. He has been striving to show through his camera the true faces of ecological environment as well as the importance of conservation.