

# 緊湊有序的知識寶盒

國立自然科學博物館

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現代建築強調功能性和理性，  
採用幾何外型達成美感；  
其簡約的精神呼應工業化時代的特點，  
強調機能與形態的對應。  
國立自然科學博物館由科學中心、太空劇場、  
生命科學廳、人類文化廳、  
地球環境廳與植物園共同組成，  
延續現代建築無裝飾的信念，  
使它的表徵不同於古典建築，  
不再以繁複的雕刻、圖樣來彰顯財富、權力或神聖。  
博物館做為普及教育的一環，  
人們在享用這樣的知識殿堂時，  
可以更進一步省思文明進步的真義。



〈本期專欄輪值作者〉

**陳嘉芸**

大學主修建築，研究所到倫敦攻讀都市設計後，並取得營建管理碩士學位。  
左右腦同時構思設計與管理，兼顧執業及教學。  
將熱情與活力貫注在生活與專業，追求事事完善的建築師。  
相信美好的建築能撫慰人心，都市空間的價值在於公眾共享。  
考選部建築師考試審議委員會委員，十匯聯合建築師事務所負責人，  
國立成功大學建築系兼任講師。

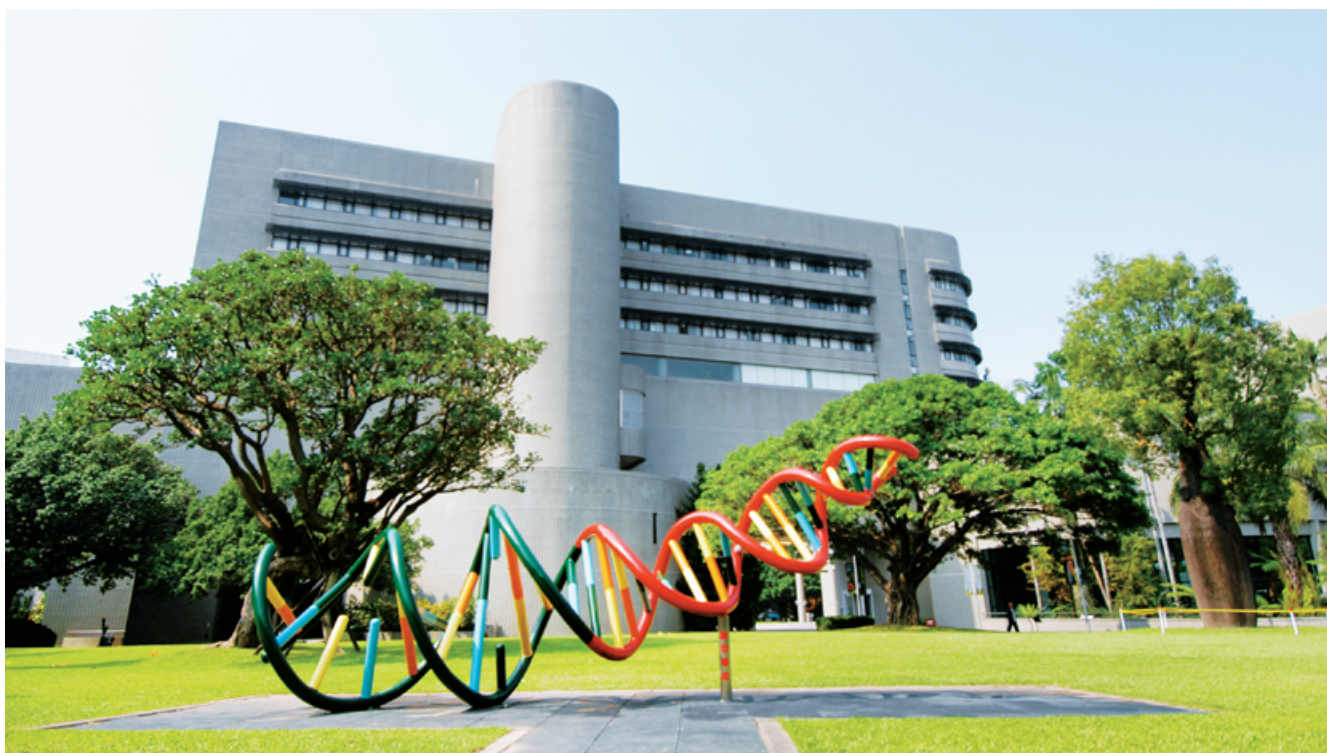
坐落於台中市區的國立自然科學博物館，從著手規劃到全館對外開放，整整花了超過十五年的時間。它是國家設立的第一座科學博物館，擁有現代化設備，戮力將自然科學生活化。當年行政院聘任漢寶德先生主持籌備處，要求整座建築物須包容以科技整合、生活化、藝術化及以人為中心的主題展示。千變萬化的需求條件，及因時間遞延產生的變數，使本座博物館的設計成為一大艱鉅挑戰。

### 建築計畫與空間布局

在一開始條件並不明朗的情形下，國內外專家協力合作，逐漸摸索出適合建館目標的空間規劃，既要能讓空間輔助展示自然科學的原理與現象，以啟發參觀者對科學的關懷與興趣，也要提供空間收集全國代表性的自然物標本及其相關資料，以供典藏、研究，並為展示及教育使用。整體設計方向要搭配結合科學精妙與藝術之美的展示內容，輔助呈現並傳達地球演化的自然史觀念及生命故事。

主要工程分為四期，第一期為太空劇場、科學中心，第二期為生命科學廳，第三期是人類文化廳，第四

期是地球環境廳。館內六大展區在基地上，大致由東南向西北展開配置，除四期工程外，尚包含擴增展示主題而設置於東北側的植物園區。科學中心與太空劇場兼具娛樂價值及大眾教育功能，開宗明義集中在館區入口軸線上做為端景，以垂直向上的量體攫獲目光；生命科學廳展示以自然史和自然現象為主題，配置在入口廣場西北側，水平展開空間序列；人類文化廳旨在傳達中國的科學與文明，繼續向西擴展，對外面對博館路，對內面對中庭；地球環境廳以闡釋環境能量與生態之相互關係，轉向面對西北側廣大草皮。各個展廳都有自己的主要立面，各自朝向館區四方。深具本土化特質的植物園，則順著基地輪廓配置在北側，於端點以嶄新的形象成為地標。建築計畫（請見小辭典）可謂為建築設計過程中之前置作業，本案不僅須顧及目標、空間型式、設施規模，也要整合各項專門設備，包括燈光及空調，這兩大項是展示及儲存功能最敏感的工程專項。參訪者的動線不能與後場的服務動線交錯；偌大展示區的銜接，也要考慮人們的體力及心情轉換，並設置休息的處所。樓梯和電梯肩負運輸不同目的使用者或物品的任務，要考慮其載具最合適的位置，既不干擾參訪動線，又能達到有效運送功能。更不用說尺度的控制，要能符合



科學與美學對話。



市民共享的空間。

各項展示品的規格；空間感的塑造與使用主題相輔相成，例如：巨大的動物骨骼不適合侷促的放在緊臨天花板的場所，而應搭配高敞的空間，凸顯它與人體大小的差異，來闡明人類的渺小，進而提醒人們要以更加謙卑的態度面對世界的理念。這些有形、無形的事項，均要靠建築師及許許多多設計者的整合能力，一一破解相互之間的衝突、矛盾。

### 專業分工與整合

設立博物館曾是富裕階級的特權，收集奇珍異寶，利用私人宅邸開放特定對象欣賞，以彰顯主人品味及財富，深具社交的意圖；在現代，則是轉化為供普羅大眾共享的社會資源，其目的與使用者類型多樣化，使設置博物館的條件亦趨複雜。館藏包羅萬象的展示品、收藏品，及各種目的的參觀者、參與者，對建築計畫的要求多而繁雜，實在需要各種專業者細心釐清、周全規劃。

宗邁建築師事務所負責建築設計，配合美、日、英等國著名專業展覽設計公司的展示設計，例如生命科學廳展示委由葛登納（James Gardner）操刀，由英國Beck and Politzer公司負責製作，在緊密合作下，才能完美呈現展示品的特色。如此規模的國家級博物館因為是首創，並沒有成規可循，初期是在參借外國資料，再斟酌國內環境及條件下摸索前進。在一連串嘗試錯誤與學習的過程中，逐漸確立規格與營造特色。這樣的場景屢見於建築專業中。

事實上，沒有單一建築師、工程師或任何設計者，可以知道全部的細節；與人相關的事物，再加上感知的面向，須要考慮的因素多而繁雜，要靠科學數據輔助才能決定最佳條件。例如，空調換氣次數不足，將有害館內使用

### 國立自然科學博物館

位置：台中市北區館前路1號

竣工時間：1986年1月第一期完工，陸續對外開放；在1999年主要館場全館落成。

設計者：宗邁建築師事務所，博物館展示專業為James Gardner, UK等。

建築特色：簡約穩重的造型，運用軸線原則配置建築物，以特殊幾何形做為中介，轉換不同性質的空間。

者的安全、健康及舒適度；而溫度、溼度過高，除對人體不好外，也傷害物品的保存年限。燈光不只是照度夠亮就好的問題，動物模型若因燈光色溫太高而慘白，會使它變得陰森；化石若不考慮波長而亂照一通，可能大大折損保存的效果；忽明忽暗不加緩衝調光，則可能傷害視覺，也干擾觀賞的樂趣。廁所布設的位置，千萬不能在展示區的正中，雖然可能放在建築物邊緣以方便配管配線，但也要考慮使用者的步行距離，以免方便性不足造成使用行為失序。

除了展示空間外，以上這些專業項目也常見於其他各式工程中，不管其規模大小，耗費的心力並不會因用途單一或面積小而減少。業主願意投資時，可讓專業者適當發揮知識與技能；專業者之間的整合，與業主溝通順暢，均很重要，在凝聚共識下，才能將總體建築成果推向環境美學成就的高峰。

## 都市空間發展政策與環境脈絡

科博館全館基地占地87,276平方公尺，後續開發擴增44,856平方公尺，建設了植物園，以促進地方繁榮，提升城市景觀。既然館區展示的內容強調「人與自然」的觀念，藉以教育社會大眾從不同角度去了解人類，以及人與自然互相依存的關係，本館的建築設計自然難以自外於這樣的期許，必須積極對應，透過規劃設計的手法，體現人與自然、人與生活環境的緊密互動關係。

從臨近台灣大道的風車開始，即為館區的一部分；以演化史步道，引導行進及視覺方向，朝入口廣場前進。順利將人群及空間氛圍，由嘈雜的交通要道，透過長長的路徑，過濾、沉澱、整理，轉換為沉穩安靜的氣息，順暢銜接館區正面廣場。廣場前方再以階梯引導向上，正式進入安全無車、僅予行人步行、活動的露天集會空間。太空劇場及科學中心扮演了入口角色，建築物的配置採L型，並設計的比二、三、四期高，成為入口地標，整體造型簡潔俐落，以形式暗示西側後續工程的發展。生命科學廳完工後，建築量體強化了包覆都市空間的動作，搭配前期挑空的底層通廊，使廣場寬闊之餘具有活躍的氛圍。人類文化廳及地球環境廳以有迴廊的戶外橢圓形廣場，收納所有周邊複雜的博物館機能，實虛之間的對比可讓參訪者休息心情、舒緩情緒；此中庭式廣場的上方漸次退縮開放向天空，形成較有層次的



工程上的精準與構圖。

戶外空間。相對於館區入口引導式、開放、形狀流動的外部廣場，以各廳包覆環繞的橢圓形廣場，則是內斂、幾何、穩定的內部休憩空間，形成博物館一內一外的有趣對照。藉由橢圓形大廳將館區軸線在此處偏轉，平移軸線後的通路，通往偏位的植物園溫室。這些動作著實串起了都市發展的脈絡，將實體建築物、道路、綠地及人文等非實體的空間與社群活動分布狀態，做了順暢的連結。

以往公共性的空間，常以神聖殿堂的姿態矗立都市之中，例如教堂、市政中心或警察局等，都是以巨大尺度、中軸對稱、及誇大的空間結構，加上精美華麗的建築裝飾來震懾人心；隨著時代演進，自然科學博物館以寶盒的形象出現，觀念上更加親民。細細品味其中緊湊有序的空間安排，在享受浩瀚知識之海的浸潤之餘，也折服於創造這個場所的各位先進前輩其智慧與合作無間啊！

### 〈名詞小辭典〉

**建築計畫：**設計前置作業，須關注人之行為、意識與空間之關係，而研擬的建築內容，包括策定目標、確立空間型式、掌握空間設施規模等。

# A treasure chest of knowledge:

National Museum of Natural Science

Words and photos by Chen Chia Yun  
Translated by S. Ying



*Modern architecture emphasizes functionality and geometric shapes with a focus and simple spirit that echoes the characteristics of the industrial age.*

*The National Museum of Natural Science--made up of the Science Center, Space Theater, Life Science Hall, Human Cultures Hall, Global Environment Hall and Botanical Garden--maintains the spirit of modern architecture, as distinguished from a traditional classical architecture where complicated sculpting and carving aims to showcase wealth, power, or grandeur.*

*The museum thus serves a universal education role, offering a setting where people can enjoy a rich temple of knowledge and reflect on the true meaning of civilization and purpose of modern advancement.*



## Writer Profile **Chen, Chia-Yun**

Writer Chen Chia Yun majored in Architecture for her bachelor's degree and earned two master's degrees in Urban Design and Construction Management in London. She is used to applying both the left and right sides of her brain via creative design and business management, and practice as an architect while teaching and pursuing excellence in her architectural work. She applies passion and energy to both her life and profession, with the belief that beautiful architecture can bring comfort, and that the value of urban public space lies in resource sharing.

- R.O.C. Ministry of Examination Architect License Test Committee Member
- Owner at Point Architects and Planners
- Part-time lecturer at the Department of Architecture, National Cheng Kung University



A dialogue between science and aesthetics.

It took more than 15 years for Taichung's National Museum of Natural Science (NMNS) to progress from the initial planning stage to being fully open to the public, and it was the first national museum in Taiwan with modern facilities and designed to showcase the application of the natural sciences in real life. At the time, Professor Han Pao-teh was brought on as museum director, overseeing this huge challenge with the changing requirements of planning a museum that stimulated the public's interest in applying the natural sciences to life and educated visitors via engaging artistic and culturally diverse exhibitions.

### Architectural plans and spatial layout

In the beginning, space requirements were not clear and both local and foreign experts collaborated to explore the best spatial plans for creating a space suitable for displaying and showcasing the phenomena and principles of the natural sciences while stimulating visitors' interest in science and allocating sufficient space for exhibiting the collections of natural specimens, objects and samples for promoting zoology, botany, geology and anthropology. This is all part of the museum's mission to display, collect, research, and educate. The main philosophy behind the design concept is to integrate science and art when holding exhibits that depict natural evolution and stories of life on Earth.

There were four phases to building this museum. The first phase launched the Science Center and Space IMAX Theater; the Life Science Hall was opened in the second phase; the Human Cultures Hall opened in the third phase; and the fourth phase launched the Global Environment Hall, including the Bird's-Eye View Theater, Environment Theater and 3D Theater. As the museum is dedicated to preserving and collecting related research and showcasing relevant specimens, its overall design and spatial layout must allow sophisticated science exhibitions and displays while maintaining an artistic element in order to convey the message of global advancement and human evolution in natural sciences.

There are six exhibition areas and a southeast-to-northwest alignment to the layout. In addition to the four construction phases, there were expansion plans to set up themed displays in the northeastern side of the Botanical Garden. The Science Center and Space IMAX Theater serve to entertain and educate the public and are thus a main focus at the museum entrance, designed on an axis to grab the attention and forward gaze of visitors as they enter. The Human Cultures Hall promotes the sciences, culture and civilization of China and expands towards the west, facing toward the road outside and the courtyard inside; the Global Environment Hall, depicting the close relationship between ecology and the environment, features a design that curves and turns toward the huge grass space on the

northwestern side. Each exhibition has its own side and faces the four corners. The Botanical Garden, built later on the northern side, created a brand-new landmark for this museum. Architectural programming (see terminology at end of article) is the pre-planning stage of the architectural design process, which entails that planning take into account the mission, spatial layout and facilities, plus the need to integrate specialized equipment, special lighting and air conditioning, as those aspects were an important part of this architectural project to ensure proper ventilation and storage of the display items. Also, this meant that the architectural team needed to design space and a workflow for service staff while thinking about how to create moving space for visitors and connect the large display areas wisely, allowing visitors to rest and maintain enough energy to walk through the various displays, while also considering the transition of moods between the exhibits as one goes from one area to the next. All these were important factors to consider during the planning stage, including the placement of stairs and elevators for different purposes so that they did not disrupt the flow and could serve well in their functions. The sizing and requirements of each displayed specimen was important, as huge animal skeletons couldn't be showcased in areas with low ceilings and required a high-ceiling space to depict their enormous scale by comparison to small humans, underlining the philosophy that people need to maintain a humble attitude toward the world and sciences through such exhibits. In all such cases,

architects and exhibit designers had to combine their wisdom to resolve any conflicts between designs or space usage.

### Specialization and integration

The establishment of museums was once the privilege of the wealthy and elite, who collected treasures and antiques and used their private residences to display them to a select audience for the social purpose of showcasing their exquisite taste and abundant wealth. Today, museums are shared with the public as a social resource serving various functions and audiences, necessitating a more diverse set of requirements. The vast collections of exhibits and specimens are so diverse that experts are required to carefully and comprehensively design architectural plans to take all of these factors into account.

Fei & Cheng Associates were responsible for the museum's architectural design, with joint efforts with expert exhibition design firms from the United States, Japan and Britain. For example, the Life Sciences Hall was designed by well-known British museum and exhibition designer James Gardner in a close collaboration with builders Beck and Politzer, also from the UK, in order to achieve such a perfect masterpiece for showcasing exhibits. The NMNS was the first of its kind in Taiwan at the time with no previous precedents to follow. Therefore, a lot of research was carried out to study overseas architectural design plans. Through a trial and

error learning process, the structure was slowly planned and created with unique aspects designed to suit the local environment.

In fact, no single architect, engineer or designer can master all such details. Numerous factors and knowledge was used to determine the best measurements and requirements including, for example, humidity, ventilation, air quality, safety from toxins, and comfort levels for the visitors. High temperatures and humidity are bad for the body and have the potential to damage displayed objects, while lighting can affect not only the brightness but



A relationship between man and nature.

also the discoloration of displayed models, or result in a mood that is not true to the design. Visually, the placement of toilet facilities cannot be too near central exhibit areas, but also requires the consideration of distance, placement of water lines, and convenience for visitors.

This project shows that efforts inverted by architects in any professional architectural projects are not reduced by project scope or the number of building functions. Also, owners are only willing to invest in architectural plans that have integrated their ideas while showcasing the architects' professional skills in order to create a masterpiece that is aesthetically pleasing and melds well with the environment.

## Urban space development policies and environmental context


The NMNS originally covered 87,276 square meters of land and was expanded with the addition of 44,856 square meters. The construction of the Botanical Garden served to boost the local economy and beautify the urban landscape. Since the emphasis of the museum is to highlight the relationship between man and nature, the architectural design educates the public about a co-existence with nature and understanding different perspectives on humans, and how these are tightly connected to the surroundings.

A rotating windmill structure reminds visitors of the evolution of wind and leads visitors across the Path of Evolution to the Museum. The Path of Evolution guides visitors to the entrance plaza, transitioning from the noise of the crowds to a quieter ambiance and more restrained mood. Stairs lead to the entrance area, so that no cars can enter, and a space set aside for outdoor events and activities. The Space Theater and Science Center also serves as an entrance with an L-shaped design, creating an iconic entryway with a simple design that allowed further development as it was designed at a height much higher than the buildings built in the later three phases. When the Life Science Hall was completed, it fulfilled the overall design concept and strengthened the architectural design. The Human Culture Hall and Global Environment Hall have a dome design that can shut out all the noise and create a more relaxing



Virtual design vs. actual structural style.

mood for visitors to slow down in as they experience the museum's various functions. The courtyard plaza opens to the sky with layered outdoor space, and is a nice contrast to the museum's geometrically-shaped design, creating a botanical greenhouse on the side. The spatial layout connects the structures, roads and green space and allows a smooth, unimpeded flow to the community and visitors' activities at the museum.

In the past, public structures such as cathedrals, city halls or police stations stood tall and distinct in the city with grand designs and an exaggerated use of space. With the progression of time, the NMNS has stood tall as a vast treasure chest with a much more friendly ambiance. Visitors continue to be welcomed to come and savor its designs and explore as they enjoy the collections and displays and immerse themselves in the knowledge left behind by our predecessors, in an institution that showcases the importance of collaboration and integration. 

## National Museum of Natural Science

**Location:** 1, GuanQian Rd., North Dist., Taichung

**Date:** Phase I completed in January, 1986 and opened to public; final phase completed in 1999

**Design:** Fei & Cheng Associates, James Gardner, UK

**Specialty:** Simple, yet sophisticated, design using the principles of axis configuration and geometric shapes as a medium to create a transition to spaces and areas that serve different functions.

## Terminology

**Architectural Programming:** Pre-planning of the design stage to consider people's behaviors and their relationship to the space, and to set out a spatial layout that takes into account the goals and missions of the architectural project.