學生專欄

跳脫框架：我的官校研究日誌

Breaking the Mold: My Research Journal at the Naval Academy

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海軍官校正期 116 年班 Naval Academy, Class 116

提到軍校生，你想到什麼？是鏗鏘有力的步伐，還是絕對服從的命令？這些印象都對，但它們並不完整。在我身上，軍校生活還有另一個截然不同的註解——我是個能玩、會讀書、肯做事的研究生。做研究是一件多數人不會與軍校生聯想在一起的事，卻是我投入最多心血的所在。在這裡，我的武器是電腦，戰場是一次一次跟教官的會議，我的敵人是每一個不同的課題。它磨練的，是耐心、是洞察力，更是面對未知挑戰時，獨立思考並尋求最佳解的能力。這段經歷讓我深刻體會，未來的軍官，需要的從不僅是勇氣，更是奠基於知識之上的智慧與判斷力。而接觸研究，就是這一切的起點。

浪濤中的洗禮：我的第一堂海上實驗課

對海軍而言，真正的餐廳在海上。這句話的重量，直到我官校一年級的暑假，才真正壓在我的肩上。那是我第一次出海，雖然只是短期的航次，當我踏入那不到 15 平方公尺的船上實驗室時，一股獨特的氣味撲面而來——那是儀器、藥劑與海洋鹹濕空氣混合的味道，我當時並不知道，這個氣味將在這一年來成為我記憶中最深刻的標記，它混雜著航程中各種不同的海況，將暈船的感受推向了極致。

然而，船不會等你，實驗更不會，即使天旋地轉，我們也必須穿上實驗衣，繼續手邊的工作。真正的考驗，在於甲

板之上。濕滑的鋼板、不可預測的浪湧，以及團隊合作的精密要求，都讓這裡成為一個不容許絲毫分心的場域。在海上，沒有任何一項作業可以獨自完成。從儀器的吊放到了纜繩的固定，每一個動作都仰賴著夥伴的默契與呼應。

時光飛逝，如今的我在一年內已出海六次。當年的菜鳥已然成為學長，再次出海時，我的責任不僅是完成實驗，更是要成為學弟妹們安定的力量。我告訴自己，再也沒有暈船的權利，因為在風浪中，我必須是他們最穩固的依靠。

航行前的序曲：實驗室裡的點滴

每一次成功的海上研究，都不是從啟航那一刻才開始，而是始於實驗室裡無數個準備的片刻。每週二和週五，我們都會固定到中山大學的海洋科學系報到，與那裡的研究生團隊一同為即將到來的航行做準備。

這段時間，我們的核心任務非常明確：確保所有出海的設備都處於最佳狀態。我們會像進行一項精密的工程般，仔細清點每一件儀器、每一份備品。從確認儀器能否正常運作，到核對樣本瓶的數量是否足夠，任何一個微小的細節都不能放過。因為我們深知，一旦離港，海上就沒有補給的機會，任何一項疏忽都可能影響整個研究的成敗。這份在實驗室裡的堅持與細心，不僅是為了讓研究順利，更是在培養一種對科學、對團隊負責的態度。

我的雙重日常：在紀律與研究之間

回到學校，白日的我們，是恪守本分的海官生；課餘及夜深人靜的自習時間，我們則切換成另一個身份——初出茅廬的研究者。

每個人都有各自的題目跟負責項目，將每一次出海帶回的數據，視為待解的謎題。這意味著每天必須長時間坐在電腦前，從基本的 Excel 到專業的繪圖軟體，一點一滴地摸索。學長姐們能教的，是軟體的「用法」，但要真正將工具化為自己的延伸，靠的還是無數個夜晚獨自投入的時間。我們甚至學習利用程式碼，讓繁瑣的數據處

理流程自動化，只為了在有限的時間裡創造更高的效率。

每一次與教官的討論，都是一次高壓的思維碰撞。在他的嚴格要求下，任何微小的瑕疵都會被放大檢視，報告時的每個提問都極具挑戰性。這份壓力，迫使我們必須用最嚴謹的角度，去審視自己的成果，確保每個環節都無懈可擊。而這一切努力的最終目標，是站上學術發表的舞台。

從國內的海洋年會開始，我們最大的挑戰便是製作全英文的研究海報，並練習用流利的英文解說。這份看似苛刻的要求，其實是教官為我們鋪設的跑道，因為我們的目標，是爭取參加國外研討會的機會，除了讓我們到世界上看看，也能提升學校的能見度。

一封獲選通知背後的故事

去年年底，我開始著手準備國科會的大專生研究計畫申請。這是一項極具挑戰性的任務，需要將一份完整的學術構想，濃縮在十頁的計畫書裡。

起初，我的內心充滿了不確定感，因為自己當時的學習進度時常落後，深怕辜負了教官的期望。在準備過程中，教官的嚴格要求給了我巨大的壓力，每一次的討論，都像是一場嚴格的口試，讓我必須對自己的內容有百分之百的掌握。

雖然過程備感艱辛，但也正因為如此，我才得以飛速成長。在教官的不斷鞭策與幫助下，我一遍又一遍地修改計畫書，將每一個細節都打磨到最好。那些曾經陌生的軟體和理論，也在這個過程中，逐漸成為我能熟練運用的工具。

今年六月底，當我收到獲選通知的那一刻，所有的辛苦都有了回報。我想與學弟妹們分享的是：**努力的過程或許漫長且孤獨，但每一次的付出，都在爲未來的成功鋪路。只要你願意堅持，成果終將到來。所以，請相信努力的價值，永不放棄。**

The poster presentation was the most important part of this year's participation in the science and technology symposium. One of the major challenges we faced was how to confidently present our research

findings in a foreign language to representatives from other countries. During the event, all attendees gathered in a corridor where we could view the research work of various countries on the event's theme. Not only did we have the

A Baptism by Waves: My First Lab at Sea

For a naval officer, the real mess hall is at sea. I didn't truly understand the weight of that phrase until the summer of my freshman year. It was my first time heading out to sea on a short voyage aboard National Sun Yat-sen University's research vessel, the New Ocean Researcher III. Our mission was to deploy floating sediment traps in the Northern South China Sea.

When I first stepped into the ship's lab—a space of less than 15 square meters—I was hit by a unique smell. It was a mixture of equipment, chemicals, and the salty, humid sea air. I didn't know it then, but that scent would become the most profound marker of my memory over the next year. Combined with the varying sea conditions, it intensified the feeling of seasickness.

However, the ship doesn't wait for you, and neither does the experiment. Even when the world was spinning, we had to put on our lab coats and continue our work. The real test was on the deck. The slippery steel plates, the unpredictable waves, and the precision required for teamwork made it a place where not a single lapse in concentration was allowed. At sea, no task can be completed alone. From deploying instruments to securing lines, every action depended on the unspoken understanding and coordination of our partners.

Time flies. I have now been out to sea six times in one year. The rookie from back then has become a senior. When I go out to sea again, my responsibility is not just to complete the experiment, but also to be a source of stability for the junior cadets. I tell myself I no longer have the right to get seasick, because in the midst of the waves, I have to be their steadiest support.

Prelude to the Voyage: Moments in the Lab

A successful research voyage never begins at the moment of departure. It starts in the lab, during countless moments of preparation. Every Tuesday and Friday, we report to the Department of Oceanography at National Sun Yat-sen University to prepare for the upcoming voyage alongside their graduate student teams.

During this time, our core mission is crystal clear: ensure all equipment for the sea voyage is in optimal condition. Like a precision engineering project, we meticulously check every instrument and spare part. From confirming that equipment is functioning correctly to verifying the number of sample bottles, not a single detail can be overlooked. We know that once we leave the port, there are no second chances. Any oversight could jeopardize the entire research mission. This persistence and attention to detail in the lab is not just for the sake of the research; it's about cultivating an attitude of responsibility towards science and towards our team.

My Dual Life: Between Discipline and Research

Back at the academy, by day, we are midshipman fulfilling our duties. But during our free time and late into the quiet study hours, we switch to another identity: fledgling researchers.

Each of us is assigned a unique topic and set of responsibilities, treating the data brought back from each voyage as a puzzle to be solved. This means spending long hours in front of a computer, learning everything from basic Excel to professional graphing software, one step at a time. The senior students can teach you the "how-to," but turning those tools into an extension of yourself depends on the hours you invest alone at night. We even learn to use code to automate tedious data processing, all to achieve greater efficiency in our limited time.

Every meeting with our professor is a high-pressure collision of ideas. Under his strict standards, the smallest flaw is magnified, and every question during a presentation is a challenge. This pressure forces us to examine our results from the most rigorous perspective, ensuring every link in the chain is solid.

The ultimate goal of all this effort is to stand on the stage of academic presentation.

Starting with domestic oceanography conferences, our biggest challenge is creating research posters entirely in English and practicing our presentations in English. This demanding requirement is actually the runway our professor has built for us. Our goal is to earn the opportunity to attend conferences abroad, not only to see the world but also to increase our school's visibility on the international stage.

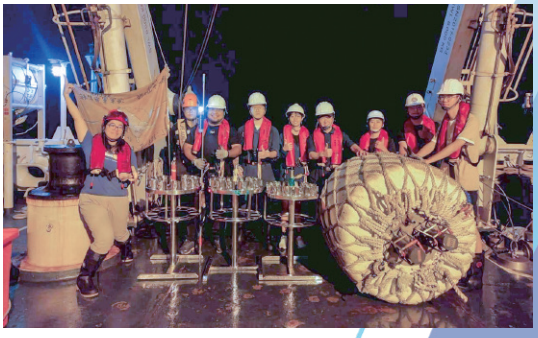
The Story Behind an Acceptance Letter

Late last year, I began preparing an application for the National Science and Technology Council's Undergraduate Research Program. It was an extremely challenging task that required condensing a complete academic proposal into a ten-page plan.

Initially, I felt a deep sense of uncertainty. My academic progress was often behind schedule, and I was afraid of disappointing my professor. During the preparation, his strict demands placed immense pressure on me. Every discussion felt like a rigorous oral examination, forcing me to have a 100% grasp of my research.

Although the process was arduous, it was precisely because of it that I was able to grow so rapidly. With our professor's relentless guidance and support, I revised the proposal over and over, polishing every detail to perfection. The software and theories that were once foreign to me gradually became tools I could use with confidence.

At the end of June this year, when I received the acceptance notice, all the hard work paid off. What I want to share with the junior cadets is this: the path of hard work may be long and lonely, but every ounce of effort paves the road to future success. As long as you are willing to persevere, the results will eventually come. So, please believe in the value of hard work, and never give up.



海洋年會成果發表

Achievements from the Annual Ocean Conference

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學生專欄

研究團隊的付出

首先，我要感謝我的教官、學長、學姐及同學們對研究團隊的付出，在研究過程中的無私奉獻及團隊合作中，每一份資料的蒐集、每一次實驗的調整都是結果呈現的結晶，使我有這個機會能夠發表海報向大家進行學術交流及分享。

實驗內容及成果

近年來，全球藍碳的碳循環及碳匯量是非常熱門的議題，透過光合作用固定大氣中的二氧化碳，形成碳匯，減緩氣候變遷，因此藍碳在全球碳循環中扮演了關鍵的角色，針對這次的海報內容，我所做的題目是「臺灣周遭海域海洋沉積物碳匯在海洋藍碳中扮演的角色」，透過我們研究

2025 臺灣地球科學聯合學術研討會

臺灣周遭海域海洋沉積物碳匯在海洋藍碳中扮演的角色

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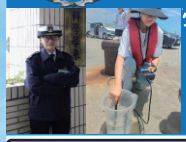
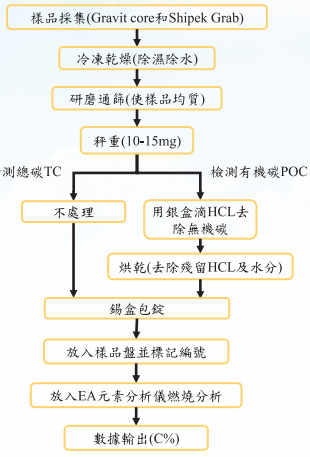


摘要

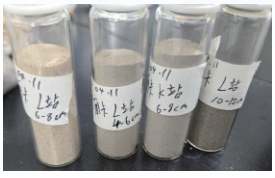
海洋沉積物碳匯量（Marine Sediment Carbon Sink）是海洋藍碳中重要的一環，利用海洋沉積物的碳含量（Carbon Content）及沉積速率（Sedimentation Rate）來估計每年的海底沉積物碳封存，被認為在海洋藍碳中不可或缺且極具潛力的一環。過去的研究中，有許多相關沉積物碳含量及沉降速率的報導或研究，因此本研究希望透過有系統性的整理過去發表的文獻或研究數據，以進一步理解我國周邊海域海洋沉積物碳匯量。在我們初步整理的文獻中，北部(東海南部）、東部(北太平洋西側)、南部海域(南海北部)及西部(台灣海峽)的碳含量分別是0.63、0.54、0.46 及0.37 %；沉降速率則分別為4240、2500、223及1200 g m^{-2} yr^{-1}。經過轉換，北部、東部、南部及西部海域海洋沉積物的碳匯量則分別是0.57、 0.38、 0.01及 0.08 Mt-C y^{-1}，透過本研究所獲得的數據分析，得以對海洋沉積物中碳匯量進行初步量化，並有助於強化對其碳儲存功能的科學理解，進而增進對其在全球碳循環中角色之認識。

研究方法



表層抓泥器（Shipek Grab ）

重力採泥器（Gravity Corer）



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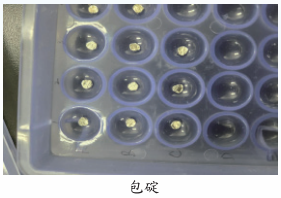


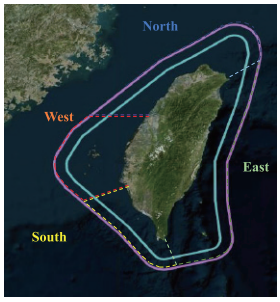
包碇

・沉積物碳匯量 (g-C y^{-1}) = 碳含量 (%) ×沉積速率 (g m^{-2} y^{-1}) ×面積 (m^2)

研究結果

北部

面積(m^2)	沉積速率 (g m^{-2} y^{-1})	C%	(Mt-C y^{-1})
2.17×10^{10}	4.24×10^3	0.63	0.57



東部

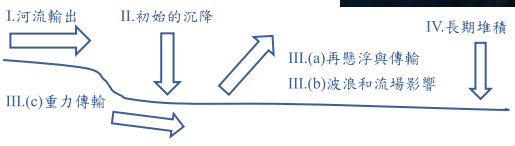
面積(m^2)	沉積速率 (g m^{-2} y^{-1})	C%	(Mt-C y^{-1})
2.85×10^{10}	2.50×10^3	0.54	0.38

西部

面積(m^2)	沉積速率 (g m^{-2} y^{-1})	C%	(Mt-C y^{-1})
1.85×10^{10}	1.20×10^3	0.37	0.2

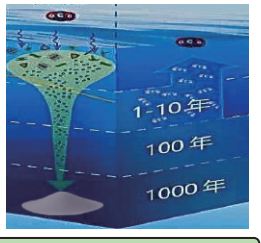
南部

面積(m^2)	沉積速率 (g m^{-2} y^{-1})	C%	(Mt-C y^{-1})
1.17×10^{10}	0.22×10^3	0.46	0.02



此圖為陸源沉積物傳輸過程的四個階段，由此顯現出海洋沉積物有可能受到陸地傳輸而影響海底沉積物的數據在未來的研究中值得探討 (修改自 Wright and Nittrrouer,1995) 。

生物幫浦是透過浮游植物進行光合作用將溶解於水中的二氧化碳轉化為顆粒態有機碳沉入深海，而掉落的有機碳沉降到海底被長期保存於海洋沉積物中，為海洋藍碳中扮演重要的角色 (修改自 Revisiting Oceanic Carbon Sequestration:Evidence for Enhanced CO_2 Uptake Capacity,2023) 。



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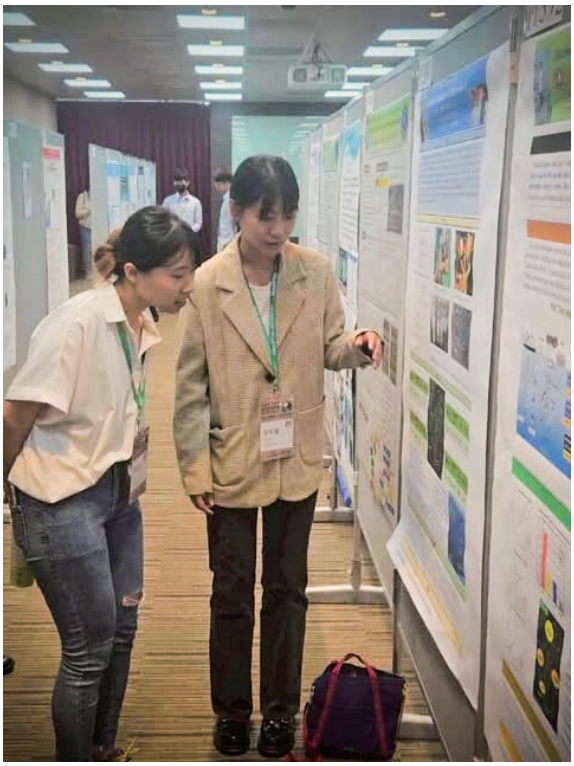
致謝

感謝農業部漁業署及國立中山大學洪慶章教授研究室團隊對本研究的支持與協助。

團隊採樣後的結果進行數據分析後，並將海洋碳循環做了一個系統性的統整，量化出臺灣周遭海洋藍碳的碳匯量分別是多少。

海報展示及介紹

能夠有機會在此次活動中發表海報，對我而言是莫大的榮幸，這不僅是對研究成果的一種肯定，更是一個難得的學習與交流機會，透過海報展示，能與來自各領域的專家學者分享想法、獲得寶貴的回饋，



對於未來的研究方向有很大的啟發與幫助，也感謝主辦單位提供這個活動，讓我能夠呈現自己的研究成果，也感謝一路上指導與協助我的師長與夥伴們，使我能夠成功的站在舞台上向大家發表我的成果。

學術交流

參與這次的學術交流活動，讓我受益匪淺，能與來自不同領域的學者與研究人員互動，不僅拓展了我的視野，也激發了我對研究議題更深入的思考，在交流過程中，我有機會介紹自己的研究成果，並獲得許多不同的建議與回饋，讓我重新思考研究的方向與方法，特別是在討論中，看到他人如何應用不同的理論與技術解決問題，對我而言是一種全新的啟發，除此之外，也認識到了世界各地的學者們，並且

在交流中訓練自己的台風及自信，促進了世界交流及跨領域的合作。

心得與反思

這次的經驗使我得到了許多寶貴的經驗，與來自不同學術背景的研究者互動，我不僅有機會展示自己的研究成果，也聽取了他人寶貴的意見與建議，這樣的交流過程讓我意識到，學術研究不應只是封閉地進行，更需要透過討論與合作來激盪出新的想法，此外，從其他參與者的研究中，我學習到不同的研究方法與視角，這對我未來的研究設計有很大啟發，整體而言，這次經驗不僅豐富了我的學術視野，也提升了我對研究議題的理解與反思能力，我相信這樣的經驗對個人的專業成長極為重要，也期待未來能有更多機會參與類似的交流活動，持續精進自我，拓展學術人脈與合作機會。

Contributions of the Research Team

First of all, I would like to express my gratitude to my advisor, seniors, and fellow classmates for their dedication to our research team. Every piece of data collected and every adjustment made during the experiments represents the crystallization of teamwork and selfless contribution. Their efforts have made it possible for me to present this poster, share our findings, and engage in academic exchange with others.

Research Content and Results

In recent years, the global carbon cycle and carbon storage of blue carbon have become highly significant topics. Through photosynthesis, atmospheric carbon dioxide is fixed and stored as carbon sinks, helping to mitigate climate change. Thus, blue carbon plays a crucial role in the global carbon cycle. The topic of my poster presentation is "The Role of Marine Sediment Carbon Storage in Taiwan's Surrounding Waters within the Oceanic Blue Carbon Cycle." By analyzing the data obtained from our team's sampling efforts, we systematically integrated the processes of marine carbon cycling and quantified the amount of blue carbon stored in the

sediments around Taiwan.

Poster Presentation and Introduction

It is a great honor for me to present my poster at this event. This opportunity not only serves as recognition of our research results but also provides a rare platform for learning and exchanging ideas. Through the poster presentation, I was able to share my research with experts and scholars from different fields, receive valuable feedback, and gain inspiration for future research directions. I am also deeply thankful to the organizers for providing this opportunity to showcase our work, as well as to the mentors and teammates who guided and supported me along the way, enabling me to confidently present our result on this stage.

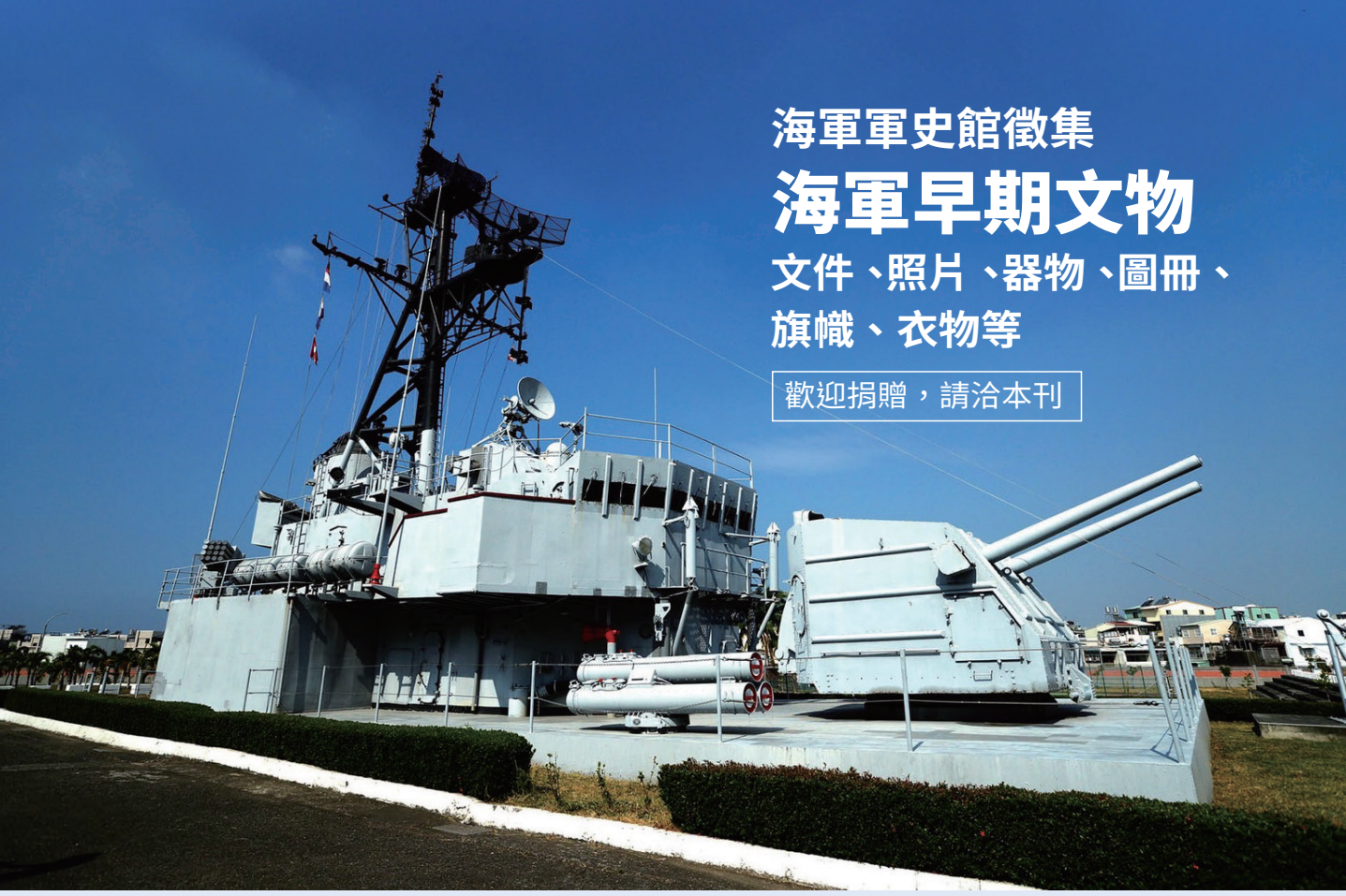
Academic Exchange

Participating in this academic exchange has been an immensely rewarding experience. Interacting with scholars and researchers from diverse disciplines broadened my horizons and stimulated deeper reflection on my own research topic. I had the chance to introduce my work, receive a wide range of feedback, and rethink both the direction and methodology of my research. Particularly during discussions, observing how others applied different theories and techniques to address challenges was a completely new source of inspiration for me. Moreover, meeting researchers from around the world helped me improve my presentation skills and confidence, while fostering international exchange and interdisciplinary collaboration.

Reflections and Insights

This experience has provided me with many valuable lessons. Engaging with researchers from different academic backgrounds gave me the opportunity not only to present my own work but also to learn from the insights and suggestions of others. I realized that academic research

should not be conducted in isolation; rather, it is through discussion and collaboration that new ideas emerge. Additionally, learning about the diverse research methods and perspectives of other participants offered meaningful inspiration for the design of my future studies. Overall, this experience enriched my academic vision, deepened my understanding of research issues, and strengthened my ability to reflect critically. I believe such experiences are crucial for personal and professional growth, and I look forward to participating in more exchanges of this kind in the future to continue improving myself and expanding academic networks and collaborative opportunities.



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