
書簡北極
香港中文大學善衡書院北極考察之旅


美鹰北海

目錄

序

極地，乃大自然力量之所在，也是整個地球生態非常重要的一環。這次善衡書院舉辦極地考察之旅，讓年輕學子跳出香港，直接感受氣候變化對地球帶來的影響。承蒙辛院長之邀，我為同學提供意見，亦十分期待他們回港後，能努力研究成果。

極地考察之旅需要認真看待。同學或許會在旅途上探索到不少新奇的事物，讓人雀躍萬分；但作為考察隊隊員，以認真的態度去觀察，才能有所得著。見過同學後，我發現大家都精神奕奕，而且認真看待考察之旅的籌備工作，我對他們非常有信心。

時下孩子面對困難的時候，很多時會輕言放棄。在此旅程之前，我特別囑咐各位同學千萬不可輕言「辛苦」或「放棄」。其一，同學是經挑選才得以加入考察隊伍，若遇上困難就捱不下去，等同辜負大家的期望；其二，到極地接受更嚴峻考驗的科研人員大有人在，同學已是非常幸運的一群了；其三，到極地考察是一種身心的磨鍊，正如孟子所言：「天將降大任於斯人也，必先苦其心志，勞其筋骨，餓其體膚，空乏其身」。同學將來要成大事，必須先學會刻苦。幸而在大家回港後，喜聞同學無恙，亦經歷過一連串的挑戰，我為此感到相當欣慰！

作為第一隊由中大派出遠征北極進行多項研究的考察隊，善衡書院的同學已將北極考察得來的成果編輯成書。我在此致以衷心的祝福，亦寄望同學會向身邊的人分享在極地體驗到、學到的東西，並在日常生活為環保出一分力！

李樂詩博士

中國極地博物館基金創辦人
香港中文大學善衡書院榮譽院務委員

善衡書院一向努力發展同學的潛能，歷來投放資源推出多項計劃，讓同學獲得更豐富的人生體驗，以達至全人發展。書院成立不足十年，至今已頗具規模，今年更有幸邀得榮譽院務委員李樂詩博士之助，於暑假舉辦北極考察活動，確是令人雀躍。是次考察活動反應非常熱烈，約六分一的善衡同學爭相報名；經過一輪篩選面試，書院終於從中挑選出十七位多樣性領域的同學，包括文學、商學、工程、法律、醫學、科學及社會學，參與是次遠征計劃。

善衡北極考察隊乃全中大首隊遠征北極的考察隊。雖然籌辦過程幾費周章，幸得多方相助，終成美事。作為學術界一員，我當然期望是次考察能使同學之學術水平更上一層樓；但作為院長，我同樣關心他們能否從中深入發掘到自己的長處，又或是認識自我，得到一些人生的感悟。幸聞同學凱旋而歸，於言談間，我得知同學經過一番刻苦歷練以後，變得更為堅強和自信。如此看來，是次考察已在同學漫長的人生當中，留下了一個重要的印記，而這個印記更促使他們成長。在我心中，已於願足矣。

這本小書是考察隊員回港後，傾盡心思而成之結集。負責研究的隊員，在時間短促及各種不確切及極具挑戰的環境及外內因素限制下，仍能堅持他們這次極具創意的研究思維及計劃，把所能取得的結果，寫出令人亮目的論文。而負責編輯的隊員，無論用文字或影像，都一點一滴，巨細無遺的捕捉及記錄了整個旅程，不論是震人心魄的極地光影境象，或是觸動靈魂深處的天人感受，你們匠心獨運，巧思無窮，記載了這次罕有及寶貴的人生歷程，以及善衡敢為先鋒的精神。科學主任鍾國昌博士對科學的認真及堅持，考察團領隊梁祐誠先生的善解及悉心，各位隊員的投入及友情，令你們在北極綻放光芒。這是善衡之光，我感動至深，以你們為榮！

辛世文教授

善衡書院創院院長

前言

我們這一團

考察團科學主任鍾國昌博士（KC）

香港中文大學生命科學學院講師、香港中文大學理學院科學教育促進中心副主任、香港中文大學理學院「少年科學英才計劃」科學院委員

當辛院長通知我要帶領一批同學到格陵蘭作考察和研究的時候，我認為這是對我極佳的挑戰。能夠在高緯度的地方輔助同學們作生態學及其他不同範疇的研究，肯定是難得的經驗，無奈原本已排得密密的暑期教學全要作出調整。衷心感謝生命科學學院許浩霖教授在短短數小時內答應替我執教早已定下的課程。生命科學學院張國柱先生及曾偉良先生在研究器材的準備上悉力支援，黎瑞好女士及黃惠華先生亦在我離港期間代為照顧教學用的動物，在此一併感謝！由於受運輸重量及體積的限制，很多器材都要在極短時間內購置，甚至乎要特別設計及製造。感謝物理系李小剛先生，他幫忙製作了浮游生物網繩索的拉力測試，使有關器材設計得以順利進行。在極短時間內培訓同學在生態學及野外生物學方面的知識，也是充滿挑戰，謹此致謝善衡書院梁祐誠先生極力配合。除了在繁忙的教學工作中抽時間作各項的預備工作外，我亦不斷與各同學接觸，以落實整體的研究計劃。我只希望在行程中能儘量將研究做好，使各位參與考察的同學都能按既定計劃進行及完成有關研究，不負書院的所托。

考察團領隊梁祐誠先生（Ivan）

香港中文大學善衡書院助理書院發展主任

二零一五年三月，獲悉書院計劃於五月派出我帶領一隊由善衡書院本科生組成的考察團到北極，這次探索之旅是中大第一隊到極地的本科生考察團隊，亦是書院成立以來出走得最遠的一次海外考察計劃。在此，我感謝書院給了我這次難得的機會，不單是到北極見聞的機會，還有統籌一個大型計劃及能與學生日夜相處兩星期的機會。由衷地感激書院對我的信任和栽培。

由於要在六星期內完成所有準備工作，從宣傳到面試、安排工作坊、辦簽證、訂機票等工作都刻不容緩，加上學生正值年終考試，書院亦有大型維修及退宿的工作需要籌備，學生和自己都面對著不少壓力。未到極地，挑戰已經開始。

這趟旅程中，我們將會進行多項研究，亦有學生負責紀錄我們的行程和感想。我預計團隊將會遇到不少問題和需要面對難以預料的狀況，期望我們能迎難而上，以體諒和溝通來解決各種挑戰，一起跳出自己的安舒區，好好體會這次畢生難得的經歷，為人生立下一個美好的里程碑。

前言

科學小組

林世傑（Erio）

環境科學系四年級生（二零一四至一五年度）

我最大的期望是能夠看到一個和香港很不同的環境，作為修讀環境科學的學生，我在課堂學到的知識都集中於香港或南中國地區，很少機會接觸關於沙漠或極地知識，但後者本身都十分重要。所以，我真的很希望這趟旅程可以帶給我一個課堂以外的體驗。

畢仟霖（Veronica）

生物系二年級生（二零一四至一五年度）

我希望能夠看到不同種類的鯨魚，因為這是我最喜愛的動物之一，而北極有很多品種的鯨魚是香港沒有的，所以我希望趁這個機會親眼於野外觀察牠們。另外我也希望能夠與當地居民甚至船員聊天，藉此了解世界和氣候的變化會如何影響他們的生活。

陳毓雋（小明）

地球系統科學系三年級生（二零一四至一五年度）

我厭倦了平淡的學生生活，厭倦了迎合羊群的生活，厭倦了被社會壓迫的生活。我常常幻想到外國流浪，想像遠征冰山的畫面、想像自由自在的生活。希望極地之旅能夠帶給我所渴望的遊歷。

程雋鈞（阿鈞）

生物系二年級生（二零一四至一五年度）

因為時間的限制，我不敢有太大的期望。最重要是有個愉快的旅程，以及能夠完成自己被委派的工作。最好能夠把在極地的研究成果帶回來，免得浪費書院的資源和各位隊員的努力。另外，因為生物學是自己的本科，所以我期望能看到多些動物。

梁頌輝（Jonathan）

環球醫學系二年級生（二零一四至一五年度）

作為醫學系的學生，我今次會在極地進行一些生理上的研究，希望能夠帶回有用的成果，也祝願我們有個開心的極地之旅。我們應該會在極地有很多不同的阻礙，如寒冷的天氣、暈船等等的問題，希望我們能夠一一克服吧。

醫學小組

麥傲冬（Dominic）

醫學系三年級生（二零一四至一五年度）

我對這個旅程有很高的期望，因為始終長途跋涉去到極地，是自己從未有過的經歷，希望能夠盡量接觸到新事物。我平日只能在電視看到冰川和北極熊，而現在則有機會可以親身經歷及體驗當地的文化，我認為這個旅程會十分有趣，更會帶給我很多得著。

鄧蕙盈（Monica）

中醫學系三年級生（二零一四至一五年度）

我對這個極地之旅有很大的期望，因為去極地是我的夢想，我於中學時期已經聽聞過香港有舉辦極地考察團，但礙於要準備公開試所以無法參加。想不到在大學時能再次有一個機會可去到極地。踏足極地，不只是圓了我自己的一個夢想，也是對自身的一個挑戰，能夠跳出界限，發掘自己不同的可能。

前言

謝昀臻（Regina）

法學系三年級生（二零一四至一五年度）

沒什麼特別大的期望，因為我的研究本身都比較個人和小型，而且旅程只有短短十二日的時間，但我都希望可以挑戰自己。因為我本本身比較少做運動，體能也不太好，今次的旅程則需要每日行六小時雪山，對體能的要求很高。所以我現在開始做一些體能鍛練，如游水、行山等，希望能夠證明只要努力，其實什麼事情都可以完成的。

夏倩儀（Yoland）

食物及營養科學系三年級生（二零一四至一五年度）

我希望到當地了解他們的飲食文化，因為極地的飲食文化比較特別，會吃生肉，是我從來都沒有試過甚至看過的事情。而且當地正經歷一個飲食文化的轉變，在受到外來文化的衝擊時，又應該怎樣去維持自己本身獨有的文化呢？希望能藉著這個機會去親身訪問當地的居民，了解他們的看法。

獨立研究

蔡俊輝（Fran）

計算機科學系二年級生（二零一四至一五年度）

首先，我當然希望能夠為自己的研究採集到充足的數據，其次是希望能夠看到北極光、北極熊及滿天的星星。在類似香港的城市生態呆得太久了，很希望能夠去到一個不一樣的地方，同時挑戰自己的極限。

許文聰（薯仔）

心理學系二年級生（二零一四至一五年度）

我很希望能夠完成一個自己想做的研究，從一開始我便對當地人很有興趣，因為能夠到達一個如此偏遠的地方實在難得，真的很想藉此去了解當地文化。另外，當地嚴峻的環境、教授的期望、甚至隊員們的相處也可能是壓力的來源，我希望透過這趟旅程與隊員們建立深厚的友誼，以及學習如何應付壓力。

阮康穎（Natalie）

英文系三年級生（二零一四至一五年度）

千里迢迢去到極地，當然想看到一些在香港沒有的東西，例如當地獨有的動植物。不過因為我自己本身很怕冷，最希望能夠了解到當地的人是如何在一個嚴寒的環境下生活，從而認識當地的社區。希望我們能夠有多點時間在戶外活動，那我們觀察到動物或與當地人溝通的機會都會大些。

出版小組

張曉瑩（Zoey）

中國語言及文學系三年級生

（二零一四至一五年度）

我是一個很喜愛冒險的人，也亟欲到世界各地體驗不同的文化，拓闊自己的眼界。這次我們跨越半個地球，到世界的另一端去進行考察，想必對我的生命會帶來很多衝擊——我已急不及待要出發了！

蘇衍安（So On）

心理學系三年級生（二零一四至一五年度）

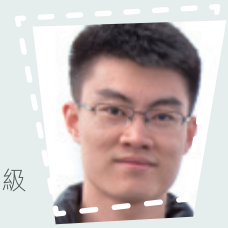
平時我們大概都是在電視上聽到極地的消息，冰川融化、溫室效應、海洋污染等等，這些距離我們好像很遙遠。今次極地之旅，我希望能夠親身感受大自然的力量以及人類對地球造成的破壞，然後以我的文字、圖片和聲音去喚醒大家對地球和環境的關注。

前言

陳家明（家明）

新聞及傳播學院三年級生（二零一四至一五年度）

- 真係咁大個仔第一次去咁遠
- 去極地真係幾威嘅
- 其實去極地呢件事仲係好唔真實
- 出發前成日諗緊會返唔到香港



王策（Charles）

工商管理學士綜合課程五年級
（二零一四至一五年度）

極地，格陵蘭，因鮮有人有幸踏足，而讓人充滿想像與期望。我希望在這裡感受冰天雪地的自然景觀，瞭解當地居民獨特的生活習慣，並記錄善衡學生在這裡的研究進展。畢業在即，希望這次旅程能夠為我的大學生涯畫上圓滿的句號。

殷芷彤（Hidy）

機械與自動化工程學系畢業生

進入社會大學將近十一個月，在不斷為事業打下基礎的同時，好像已忘記為自己留下喘息的時光。在一家工程顧問公司上班，每天與同事跟電腦相處的時間比家人還要多，每一個假期都顯得十分重要。不過我選擇用這一整年的假期去逐夢——圓一個極地的夢。

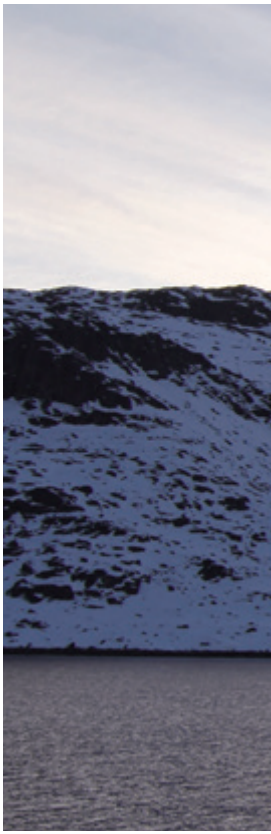
小百科

樽裝水會否結冰？

在極地四處也是冰，那我們飲用的樽裝水會不會都結冰呢？出發前，隊員們的意見不一，有些隊員用保暖壺裝了熱水，有些隊員只帶了樽裝水。當我們行了差不多一小時的路程，大家都因為口渴口乾而取出水樽，結果樽裝水沒有結冰，溫度亦沒有大改變，非常適合飲用。相反，保暖壺內的熱水仍然滾燙，最終帶了熱水的隊員反而要用樽裝水調和才能飲用。















在這部份，
我們將會詳細介紹隊員的裝備。

整裝待發

毛帽

在極地寒冷的天氣下，保暖衣物很重要。在香港的冬天，我們可能不需要戴上帽子。但原來，身體有百分之五十的熱能都是由頭部流失，因此一頂保暖的帽子能有效地為我們禦寒。

魔術頭巾

這個東西可真是神器，價錢便宜又方便、實用而用途變化多端。它可以當頭巾、頸巾甚至面罩。它防風又透氣、吸汗更速乾、柔軟而舒適，配合上毛帽及雪鏡，整個頭部便得到了全面的保護。

雪鏡

冰天雪地的世界夢幻漂亮，但白雪會大量反射紫外線，傷害我們的眼睛，加上冷凍的寒風對眼睛的刺激很大，所以人在極地，要好好保護靈魂之窗。普通的太陽眼鏡與眼睛中間會留有空位，未能全面地阻擋紫外線及冷風，加上鏡面容易有霧氣，所以更加專業的雪鏡就成了我們帥氣又可靠的旅伴。

排汗內衣

這屬於「洋蔥式穿衣法」的內層，通常是以人造纖維製造，除了有效保暖之外，還十分透氣。穿了以後可以保持身體乾爽，避免因汗水積聚及冷卻而著涼。

羽絨

「洋蔥式穿衣法」的中層，羽絨主要是用來隔絕外界的冷空氣，使到身體的熱能得以保存下來。

手套

手套可以減少皮膚接觸冷空氣，防止熱量散失；隊員有時在攀爬雪山時，也需要手腳並用，又或是在冰水中採集樣本。手套能夠好好保護雙手，以免凍傷。

防水風衣

最外層的衣服則著重防風防水的功能，因為極地的天氣變幻莫測，在攀山或進行研究時總不可能拿著雨傘，一件優質的防水風衣配合中層及內層的衣物，才可以防禦惡劣的天氣變化。

水靴

要尋找適合做研究的場地不但要上山，還要下水，普通的防水行山鞋不足夠提供保護作用，只有穿著水靴才能避免被零度的水弄濕的鞋和襪，使腳掌及腳趾頭免於凍傷。

雪爪

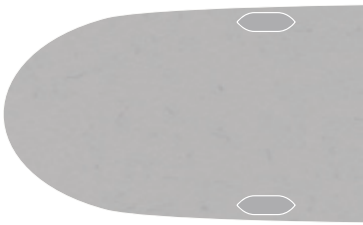
極地的地上有大量積雪，若穿著普通的鞋子行走，就會很容易陷入雪地之中。雪爪能廣泛分散人體的重量，從而減少下陷的機會。不過很多隊員即使穿著雪爪，仍是舉步維艱。

家在極地

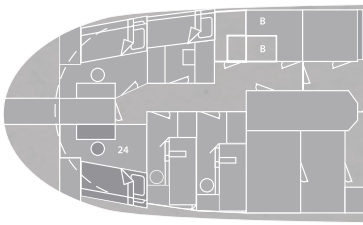
倫勃朗號（Rembrandt van Rijn）建於一九二二年，最初為斜桁四角帆漁船，後來成為縱帆沿岸的貿易船，曾揚起荷蘭、德國、丹麥和巴拿馬國旗。

倫勃朗號現為三桅縱帆船，船全長約四十五米，可藉帆力或柴油發動機推動。倫勃朗號有一個共十二人的航行團隊，而且可載客三十三位。美國科幻作家弗雷德里克・波爾（Frederik Pohl）亦曾將他寫於一九九七年的 The Siege of Eternity 獻給與他一齊乘坐倫勃朗號的朋友。

帆船雖小，但五臟俱全，倫勃朗號可分為三層：頂層為甲板區域和船長室；中層為餐廳、小型酒吧和廚房；底層則有十六個休息艙，讓勞累了一整天的隊員都能舒適地休息。船的兩旁各綁有一隻橡皮艇，方便旅客在淺灘登陸，增加觀賞野生動物的機會。此帆船擅於沿岸航行，加上擁有廣闊的露天甲板觀賞區，因此非常適合科研考察。



← stern

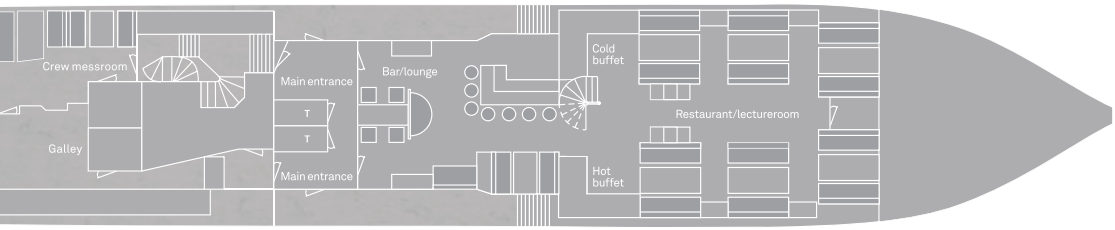


← stern

← stern


Captain
Bridge

bow →


Crew messroom
Galley
Main entrance
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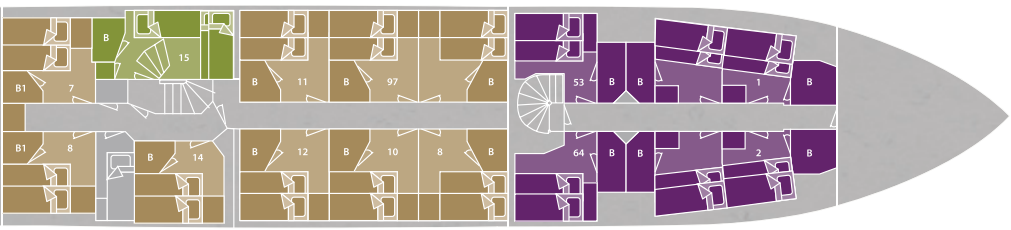
T
Main entrance
Bar/lounge
Cold buffet
Restaurant/lectureroom
Hot buffet

bow →


B
15
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B
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1
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64
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B
2
B

bow →















啟航

行程日誌

從香港到曼尼蜀 (Maniitsoq)

2015.5.10

小百科

最大的機場為何不在首都

坐飛機到訪格陵蘭，是最快捷舒適的方法。不說不知原來乘坐格陵蘭航空出入格陵蘭的旅客都必需從丹麥經過堅賈路蜀（Kangerlussuaq），再轉機到格陵蘭其他地方。為何這個轉機機場不設立在首都努克，反而設立在堅賈路蜀這個無名小鎮呢？原來努克的機場受限于山區位置及其惡劣的天氣狀況，無法滿足前往丹麥的大型航班的起降需要。相比之下，坎克爾路斯斯雅克有較穩定的天氣，以及遠離海岸，因此不容易被霧和風影響，使該機場成為格陵蘭航空的國際樞紐點。

五月十日晚上，我們一行人在機場整裝待發，對於去北歐以及北極都十分興奮。不過興奮之餘，我們都不忘整理研究用的裝備，然後浩浩蕩蕩出發。

經過約八小時，我們終於到達轉機點——杜拜（Dubai）。我們會在杜拜待三小時，再轉乘另一航班飛機前往哥本哈根（Copenhagen）。由於差不多所有隊員都未曾到過杜拜，所以大家都十分好奇和興奮，即使只在機場禁區範圍，仍爭取時間四處逛逛。此時，有一名坐同一航班的香港人告訴我們，他在飛機上被偷了財物，一筆公款不翼而飛，懷疑在機上被人看見擺放財物的位置，一不小心被賊人有機可乘。我們聽後不僅為他感到擔心，更提醒我們身在外地更要小心保管財物。

在杜拜逛機場數小時，足以令我們窺探了當地的中東文化。免稅店整齊排列了各式各樣的銀造餐具、「阿拉丁」神燈及民族服裝、當地傳統的乾果小吃如無花果乾等，均令我們食指大動。我們當然也購買了不少明信片及當地特產給親友作手信。

短暫停留杜拜三小時後，我們再登上前往哥本哈根的客機。在五月十一日下午，我們到達了哥本哈根酒店，隊員把握時間到市中心感受一下北歐風情。

翌日早上，我們一行人在酒店吃了一頓很豐富的早餐，隊員都開玩笑說未來七天都不會再有這麼好的膳食了。整理及點算好行裝後，我們便出發往機場，因為是內陸機的關係，行李重量和體積都有很嚴格的限制，雖然事前已有準備，但仍有三件用作科研的器材超重和超過寄艙行李的體積，最終地勤職員表示要當作貨物將它們運送到曼尼蜀。隊員們知悉後都非常緊張，因為那些器材要和我們當天下午一同上船出發，否則船開走了才送到便等於白帶了！

幸好地勤職員告訴我們，這些「貨物」可以和我們同一班機前往曼尼蜀，我們立時鬆了一口氣，可以安心入閘登機，飛往中途站堅賈路蜀（Kangerlussuaq）。

在四小時的航程中，隊員們分別和不同的乘客開始交流，有的是到格陵蘭旅遊，有的是在格陵蘭經營捕魚生意，還有一位是在格陵蘭居住的原住民，可能我們是較少遇到的亞洲人面孔，所以乘客對我們很感興趣，特地與我們傾談和分享。我們於下午抵達堅賈路蜀，她是一個用來轉機的機場，我們待了半小時後便再登上螺旋槳飛機到曼尼蜀。經過半小時的航程，我們一行人安全到達曼尼蜀，再登上留宿七天的帆船——倫勃朗號（Rembrandt van Rijn）。

啟航

航海日誌

航海第一、二日

2015.5.12 - 13

曼尼蜀（Maniitsoq）→ 咸波賈算（Hamborgersund）
→ 拿錫（Narrsaq）→ 永恆峽灣（Evighedsfjorden）

我們的船，由曼尼蜀出發慢慢北上，航向冰封的海峽。第二天，我們到達第一個靠岸點——位於咸波賈算的拿錫一帶的雪原，一嚐攀雪山的滋味！然而踏雪的話，一雙行山鞋並不足夠，我們需要更加可靠好幫手，那就是雪爪了！雪爪能把人體的重量較平均地分散，使我們行走時不至於泥足「雪」陷（咦咦咦，我們有一位怕冷的好團員因為腳下貼了暖貼而經常跌倒，哈哈！）。可是穿著雪爪也實在要費一番工夫的，本來穿了厚厚的衣服和鋼頭雪靴，活動起來已經不容易，再加上風雪冷得指頭失去知覺，要穿那雪爪真是難上加難！後來我們發現，還是互相幫大家穿雪爪會比較省時省力，於是大家就發揮團結精神，終於整理好，向雪頂出發！

爬雪山的時候，因為裝備比平日來得重，所以走起來也比較費勁。可是有趣好玩的地方也不少呢！比如說在比較斜的地方，我們就在坡上用雪爪鑿開一個個著力點，然後用力把雪踏實，就成了一道道雪梯，借借力就攀得上去了。當然，那還是要冒著雪梯塌陷的危機的。然而，不少平日比較膽小，又或是沒什麼爬山經驗的同學，在爬雪山的過程中突破了不少心理關口。沿路走來，不難看見地衣植物在溶雪間嶄露頭角，遠處還有不少北極狐或其他野獸的足印呢！後來下坡的時候，走的比較慢，還是一屁股滑下去比較痛快！於是，雪谷中就這樣突現幾道彎曲的道痕了。

小百科

曼尼蜀（Maniitsoq）房屋顏色

格陵蘭最有名的風景，除了冰川外就是色彩豐富的小屋，原來這些不同色彩的房屋，是丹麥政府有意安排的。因為居民在白茫茫一片的雪地上很難知道方向及認路，所以便將所有政府建築物的外牆塗成紅色，醫療建築物塗成綠色，藍色和黃色就是一般居民以方便當地居民生活。

由於減少破壞生態和保障安全的關係，我們都是一個跟著一個地走。走到一半，望向前方的同伴，心中突然有一種「萬里長征」的感覺。在那無際的雪中，我們只是一個個渺小的黑點。對比於香港這個人煙之地，這種神聖潔淨之境，就像走到另一個世界似的。此刻我們望著天、地、海，與大自然同呼同吸，好像開始明白何謂「天人合一」。

經過一天奔波後，帆船晚上就在永恆峽灣下錨。當晚麥傲冬和梁頌輝為船上各位介紹他們的醫學研究，成功說服了來自不同國家的乘客和船員參與他們的「寒冬實驗」！飯後，各位隊員為了未來數日的實驗，捱著甲板上的冷風，加緊步伐準備工具，甚至到了凌晨三四點才能休息。

Day 1

旅程感想

我有預感，這將會是一趟改變我人生的旅程。當我再回到香港時，那必定是個全新的自己。

張曉瑩

當地人的熱情令我有很深的感受，他們的單純和人與人之間的信任，正正就是香港現今所缺乏的。

夏倩儀

在城市中呆得太久，總希望能去到一個不一樣的地方，同時挑戰自己的極限。

蔡俊輝

北極之旅終於都開始了，背負著眾人的期望，我們一行十九人浩浩蕩蕩地向北極進發。尚未到達目的地，已能感受到前往極地的不容易。

蘇紓安

Day 2

我好享受行雪山的感覺，風景真的很漂亮，令人興奮。這真是出生命來的第一次，也沒有想像中那麼難。

陳家明

想不到大家都很團結，拿互相合作。當你差點倒下時，有人拿扶起你；當你覺得手上的雪鞋很沉重時，有人拿幫你拿著，其實真的很感動！Really work as a team!

許文驄

沿路看到的地衣，北極狐的足印，沿岸的鯨魚骨頭，甚至山上 Inuits 的墳墓，都令我感受到格陵蘭大自然的魅力。

畢仟琳

It's amazing to stay on a snow mountain. I still can't believe this's real and feel like watching documentary or reading encyclopedia. I also feel great that our team is building up and our work is on track.

阮康穎

作為一個東北人，不是沒見過雪，也不是沒在雪地上走過，但爬雪山還真是第一次。北極的天氣變化多端，上山時還是大霧一片，爬到一半時霧已漸漸之漸漸清晰。在途中，我們發現了很多不同的植被，雖然不知道它們的名字，但看到它們不同的形態，足以讓我這個攝影愛好者興奮一陣。

王策

啟航

行程日誌

第三日 航程

2015.5.14

永恆峽灣（Evighedsfjorden）→ 鞍山冰川（Sermitsiaq Glacier）→ 森美蜀（Sammisoq）

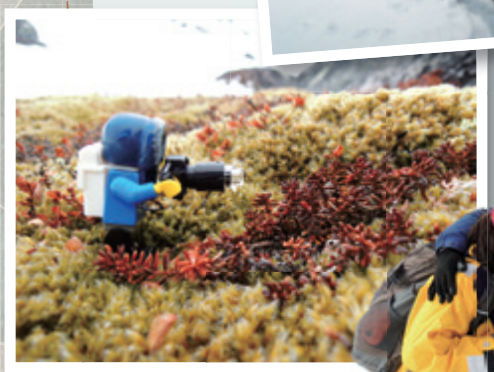
一早起來，天氣相當的晴朗。到甲板上一望，竟然發現座頭鯨的蹤影！而且那鯨還徘徊了好一會兒才離開，隊員都感到興奮不已！早餐過後，我們乘搭橡皮艇登陸，開展了第一次實地考察——石灘。這裏的海洋狀況非常良好，岸邊盡是青口和海藻。沿著海岸線走，有一個突起的大型石台，我們在上面發現麥類植物，還有一塊已有風化痕跡的鯨魚椎骨！而岸的另一邊，則有一所夾心塞滿了羽毛和棉花的小屋。原來早於十八世紀，已有人在格陵蘭開始捕鯨。這所小屋，很可能就是捕鯨人用作休息和取暖之用；而那些麥類，也很可能是人為移植過來作種植糧食。另一邊廂，我們的隊員在石灘找到不少有趣的生物，通通記錄在案。

吃過午飯，我們再次乘搭橡皮艇。不過這次不是登陸，而是到海中心去看海冰。極地有許多冰山，然而有時也會不勝負荷倒塌，那些海冰就是倒塌下來卻未完全溶化的部份。海冰在陽光的照耀下，反映出湖綠的光芒，讓人嘆為觀止。回到船上，突然身後傳來巨響，原來是冰川有一角塌陷了！塌陷的力量翻起了浪，使船才受到了海浪的衝擊。冰川崩塌的部份顯出深邃的寶藍，就像有種把人吸進去的魔力。

休息了一會，我們開始進行各項有關海水的研究。我們成功採集了海水和魚類的樣本，並嘗試辨識內裏的成份。這一天的晚上，由鄧蕙盈介紹她的中醫實驗，遊客和船員們均對此非常感興趣，更踴躍地請她為自己把脈！

旅程

感想



Day 3

今天第一次感覺到現實和理想中的分別，以及對現實無力的感覺。有時很希望做好每一件事，卻反而因為太混亂而全每件事都做得不好。很感激隊員一直互相支持，否則很多時候都無法繼續撐下去。

夏倩儀

今日遲了一點起床，錯過了看鯨魚縱影的機會，有點兒失望。的確，這種機會一轉即逝，一不把握就會錯過。準備不足夠，就會錯過很多東西，到最後失望的只有自己。

程為鈞

我覺得首要解決的問題是人力資源的運作，包括幫助大家清楚自己工作的內容，以及妥善地分配工作，尤其是在大部份同學都沒有理科背景的情況下。

林世傑

來到第三天，壓力、困難開始慢慢浮現，休息不足以及惡劣的環境都令到大家心煩，衝突都逐漸增多。大家目標出現差距，隊員之間欠缺溝通和信任，成為了前進的障礙。

蘇衍安

啟航

行程日誌

第四日 航程

2015.5.15

永恆峽灣（Evighedsfjorden）→ 替蕭錫（Tasiussaq）

是日我們登陸後，進行了有關石灘的第二部份考察。另一邊廂，編輯團隊的隊員往岸的更深處進發，沿路還找到些野獸吃剩的鳥獸皮毛。最後，我們終於找到插上中大和善衡旗的好地方！這裏的風光讓人猶如置身於畫中，兩側的雪谷美得如天上人間。但是這路並不好走，走兩步，雪就下陷三分。即使有雪爪的幫助，還是有跌倒的危險。我們在這裏做了個小實驗，嘗試把石頭拋到遠方雪原上，看看會不會令雪塊崩裂。結果證明，人類的力量還是太過渺小啊！

下午回來後，我們繼續了先前未完成的海水採樣工作。晚上的時候，由陳毓雋來介紹他的生態考察部份，使大家對是次所見的生態，又多了幾分認識。

旅程感想

小百科

浮冰、冰川顏色？

不要總以為冰就等於白色。原來，隨著壓力和密度不同，從冰雪反射出來的顏色也有所不同。我們平常看到的白冰，是壓力和密度最小的一種。壓力愈大、密度愈高，冰雪的顏色也顯得愈深。例如我們在旅程中看到的浮冰是近乎透明的青藍；而冰川崩塌一角後，內裏冰層是湖藍；然而從冰川狹縫中窺見的，又似乎是寶藍。船上的導賞員說，冰在受到最大壓力時，更可能達到深藍至灰黑時的程度。這是因為冰在受到壓力時，內裏的氣泡會因而釋出；氣泡愈少，冰所折射反映的顏色也愈深。因此，冰雪決不止於一種顏色——那種美，確是震撼得讓人無法相信。

Day 4

以前常在電視中看到一些科研的紀錄片，今天有幸親身參與體驗，也算是對科學家精神有了直接的感受。小時候曾經夢想成為一名科學家，卻並未如願。今天看到一位科學家的投入與執著，心中再次充滿崇敬。

王策

Today, we did a valuable interview with Dr. Chung. I'm glad to have heard what he felt deep inside his heart, and I agree that there are still loads of improvement for the team.

殷芷彤

今天在水中發現了一隻水母的近親，是這次探險的新發現，令我明白到當探險家找到新發現、新大陸的時候，當中的興奮是難以忘記的。用很長時間和心機去尋找「新發現」，享受可能的不是那種發現到底有何震撼，而是享受尋找的過程。

程雋鈞

有時我會想難得來到極地卻無法行山好像錯失了很多東西，但另一方面有機會研究石灘、冰湖都是另一個體驗。因為我相信很少人來到極地會花時間了解一個石灘。

林世傑

啟航
行程日誌

第五日 航程

2015.5.16

堅賈美活（Kangaamiut）→
培雅托 / 尼雅古雅他古拿（Puiartoq / Niaqoenaata Qulaa）

這一天，我們登上一個與曼尼蜀很相似，卻又截然不同的小鎮——堅賈美活。這條村只有三百多人，如果善衡全部同學同時上岸的話，這可能會滅村啊（開玩笑的）！這裏遠看就像曼尼蜀一樣，五彩繽紛的屋子坐落於雪上，就像是積木砌成的村落。但是，這裏一年幾乎只有兩天有旅客到訪，而旅客們都不會過夜，因此這裏可是連旅店也沒有！這裏的居民差不多每一個都互相認識，是一個人與人之間聯繫相當緊密的社區。由於鮮有客人到訪，這裏的居民相比曼尼蜀，顯得腼腆一些，但還是一樣的樂於助人。話說我們探訪了村裏的一位藝術家後，就想到村內的博物館參觀，卻吃了閉門羹。我們後來轉到超市逛逛，卻又因不懂格陵蘭語而一頭霧水。這時候有位和藹的女士走來，用簡單的英語來問我們是否需要幫助，我們簡直喜出望外！她不但幫助我們接受訪問，當她知道我們想去博物館卻碰釘，就表示可幫助我們。疑惑之際，博物館館長出現了！原來這位正是她的父親，正與家人聚天倫呢！他一知道我們的來由，馬上領我們到博物館，並逐一介紹展品。雖然他不諳英語，卻是盡力為我們介紹，令我們相當動容。這場奇妙的緣份，令我們十分窩心。在這村裏，我們還首次看到因紐特人的墓地和教堂，這些都令我們大開眼界。離開的時候，我們發現這裏的水非常清澈，離岸不到五米的地方更有大片的海膽群！可惜這只能遠觀，不可褻玩，因為生態保育很重要啊！

到了下午，我們來到一個海上孤島進行凍原考察。這島曾是海鳥的棲息地，因此我們發現了不少海鳥羽毛、碎骨和風化的海膽殼。經過一輪測量、記錄，我們終於完成考察，並在島上拉起我們是次考察團隊的橫額！

這天是五月十六日，除了是海上航行的第五日，也是我們王策同學生日的大日子！大廚 Khabir 得知後，為他準備了特別的蛋糕；我們也為他準備了美酒相伴。然而，少不了的，當然是中大同學傳統的慶祝儀式！王策這個生日，應該也是史上最難忘的生日吧！

晚飯過後，由蔡俊輝來講解他的工程習作和坡度研習，這個創新的概念使大家又有新的啟發。臨睡前，天空下起大雪，使整個甲板都白茫茫一片。我們就跑上甲板去，砌雪人扔雪球，好不快活啊！

旅程感想

Day 5

今天做了一個鐘博士的訪問，回想很多他的想法。雖然我不是個科學系的學生，但他對我的鼓勵及支持，令我有動力完成研究。鐘博士的努力和對科學的熱誠，亦令我十分感動。

謝昀臻

Dr. Chung was really brilliant! No matter how cold it was, how windy it was, he just continued to do his work. At this time, I was really astonished by his perseverance and his work attitude to his work. We are really proud of him. Thanks for having him in our team.

畢仟琳

在一個比書裏還古人的村落中，遠離塵世的生活，簡單而樸素。人們總會向你友好地問好，不是匆匆地低頭趕路。孩子們比曼尼蜀的着邋，但不會滿臉憂愁。純潔的笑臉如同此處的自然一樣。

蔡俊輝

今日真的很有驚喜，前幾天研究小鎮的氣氛是很差的，一來實地調查工作很艱苦，二來非理科的同學又不明白項目的意義，但是今天的轉變很大。除了因為大家開始找到自己的角色之外，最大原因應該是被鐘博士的熱誠感動了。

林世傑

今日大家工作的默契明顯地多了很多，每人都開始清楚自己適合的工作，可以自動自覺分工合作，令整件事更加高效。

夏倩儀

今天是最有士氣的一天，我們在孤島上努力探索，總算有一些成績。站在無人島的感覺很奇妙，然後整個島瞬間就被我們的腳印填滿了。

張曉瑩

我發覺最簡單、最真摯的溝通方法就是友善的身體接觸。很高興能替他們把脈，談天，認識他們的生活。

鄧蕙盈

今日在雪地做研究，雖然我只是在一旁拍攝，但感受到那種嚴寒之下的熱血和團隊精神，真是令人高興。

陳家明

今日比起 Day 3 真的團結和合作了很多，每個人都清楚自己的崗位，拿到工具就可以快速開始工作，效率高了很多。每個人都不怕辛苦，有需要時就會主動地去負責，感覺到我們真是一個團隊。

許文聰

小百科

到訪小鎮要預約

船長很早已告訴我們行程中會到訪兩至三個小鎮，每個小鎮的人口約一百五十至二百人左右，但要到訪這些小鎮必須事前預約，背後的原因很有趣。其實因努特人很和善，對外來者亦沒有太大的抗拒，所以一直以來到訪的外地人都可自由泊岸和在小鎮觀光，但三年前發生了一件事，改變了這些小鎮的參觀形式。三年前有一艘載著六百人的郵輪在穿越北冰洋時，因為天氣驟變所以在其中一個叫堅賈美活（Kangaamiut）的小鎮泊船避風，郵輪上的旅客對這個小鎮十分有興趣所以都紛紛上岸參觀。問題來了，在這個只得二百人的小鎮，突然遇到六百人到島上，可想而知對當地居民有多大的影響和衝擊！一夜間超級市場和商店被一掃而空，幾乎造成這個一個月才補給一次的小鎮斷糧。自此之後，這些小鎮便要求所有計劃到訪的船隻和遊客必需事前預約。

啟航 行程日誌

第六日航程

2015.5.17

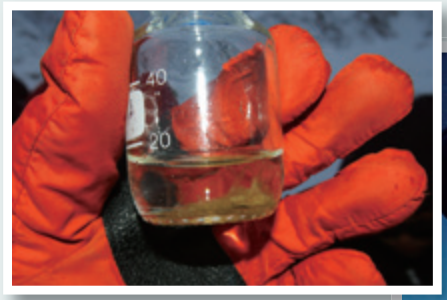
培雅托 / 尼雅古雅他古拿（Puiartoq / Niaqoenaata Qulaa）

下了一整晚的雪，今天比之前確實冷了一些。吃過早餐，我們就出發進行活水考察。然而我們的挑戰，是山峽中的大風大雨。由於這是活水的研究，隊員不得不下水去採集樣本或拍照，實在是冷得哆嗦。但鍾博士仍然面不改容，甚至連手套也不戴上，努力地為科學獻身，精神真是相當可敬。離開的時候，天上一大群飛鳥排列整齊的橫空而過，實是壯觀。

吃過午飯，我們再登陸作第二部份的凍原研究。在靠岸的時候，我們遠遠瞥見幾「粒」小人兒從山頂「Z」型地滑下，再極速地滑到我們跟前。原來他們是一群來自歐洲的滑雪好手，正歡度他們的假期呢！與他們聊天過後，我們來到了凍原之上開始考察。這次是一個連接著海岸的大斜坡，我們要爬上比較高的地方工作，望下去也真的有些發抖呢！可是適應過後，望向周邊的大山大川，又有一股傲然

於胸之氣，遺世獨立之感。工作進行得差不多了，我們恃著高度，大膽地一屁股滑下去——剛才的恐懼已全然拋諸腦後，哪只一個「爽」字了得！

這天的晚餐是歐洲盛行的告別烤肉聚餐。正當大家離別依依，突然想起我們還有一些活水的研究尚未完成，而明天的天氣可能再度轉壞，那就可能做不成了！正當苦惱之際，隊員建議不如趁天色未黑，再度上岸，直至做完工作再回來！起初大家感到十分驚訝，但後來卻很快同意了這提議。於是我們就進行了是次最瘋狂的考察，於晚上十時登岸！雖然極地夏天的晚上不太黑，但還是有些陰暗，而且風雪越發強勁，吹得儀器散開，人也站不穩了，研究的同學雙手卻要插進冷凍的水裏採樣。我們著實為他們心痛了，不知那來的衝動，我們有的唱起了熟悉的流行曲，然後似企鵝般緊緊摟成一圈，為其他同學擋風擋雪；有的代替他們取樣，好讓他們的手能夠暖和一陣子；有的幫忙打燈，好讓工作能更有效率地進行……如此惡劣的天氣之下，我們團結一致，上下一心，三小時後，工作終於告一段落。冒著刮得臉上發痛的冷風，蹣跚向小艇回去。這是個有關寒冷的挑戰，但我們心中卻是暖暖的。



旅程感想

Treading through the icy winds and chilling snow, unforgivable blizzard blew every drop of our blood cold. There is no forgiveness in nature, but motivation lies in man.

梁頌輝

This is the most tiring day of the trip. Highlight of the day was going out in 0°C to conduct our ecological research. The weather was almost unbearable but no one withdrew from the research. We managed to stay warm as we hugged one another and sang together.

麥傲冬

今天我們開了三更，深刻地感受到科學工作者的艱辛和堅持。在收集樣本的時候，有些同學以及鐘博士更是徒手在冰水中工作，一直浸在冰水中，還十分認真地工作，這是令我十分感嘆和敬佩的。

蔡俊輝

Day 6

琴日夜晚真喺傻架、喺傻架！把握時間係好，但喺都要顧及同學同船員晚需要，風雪交加，晚上凌晨十二點都要人出去做實地考察，鐘博士既人力分配同時間管理真喺可以再做好啲。不過我亦不得不佩服鐘博士既毅力同忍耐力，佢實在太厲害啦！

畢仟琳

這是一段既艱辛又漫長的旅程，我們一邊走一邊歌唱，冷的時候圍起來像企鵝般取暖。在嚴寒時的真情，實在是難能可貴。我們真可謂共度生死的兄弟姐妹了。這是最冷的季節，也是最暖的季節。

龍曉瑩

這次是我們第一次夜晚到上岸做研究，岸上又冷又黑，迎來了我們在極地一次最寒冷的天氣。雪和雨混合不分，寒風嘯嘯的吹過，幸好我們的裝備齊全，加上一腔的熱血，才能抵禦寒風，平安回來。

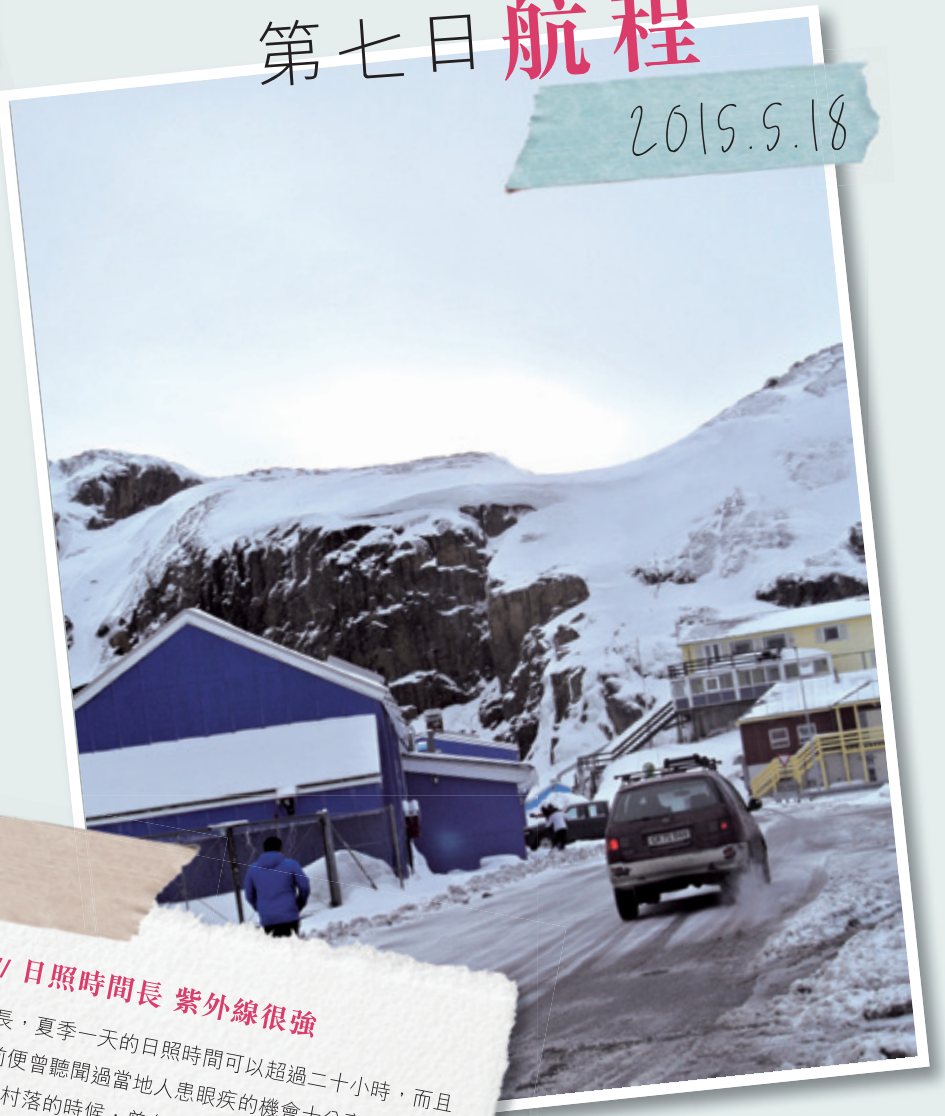
蘇衍安

啟航

行程日誌

第七日航程

2015.5.18



小百科

天黑仍然很光有 UV // 日照時間長 紫外線很強

極地的緯度高，日照時間十分長，夏季一天的日照時間可以超過二十小時，而且紫外線強度十分高。我們出發前便曾聽聞過當地人患眼疾的機會十分高，不少人十分年輕便失明。我們到訪極地村落的時候，曾在他們的體育用品店買過雪鏡。不過，我們走在街上甚少見到當地人戴上太陽眼鏡。究竟他們是如何忍受刺眼的日光呢？參觀過他們的博物館後，謎底便解開了。原來，他們很早便發明了太陽眼鏡。樣子及製作材料當然和現在的很有分別。在極地生活的人用海象的牙造成眼罩的樣子，再分別於左右的中間位置割一條十分幼的縫隙，以阻擋大部份光線之餘，讓雙眼可以看到外面的事物。這種原始的太陽眼鏡因缺少了濾光鏡片，始終未能有效減低失明的風險。可是，它也不是古老且不合時宜的產物。我們在網上發現，經過悉心設計，這款眼鏡竟曾登上過時尚的舞台，走在潮流的尖端呢！

Sermilinguaq Fjord → 曼尼蜀（Maniitsoq）

一覺醒來，這天的風雪更大了，登陸似乎已是不可能。於是我們轉為乘搭橡皮艇去看浮冰。這次海冰的覆蓋面更廣，但冰的體積卻比上次小了一點。如果把手伸進海裏，你會發現指尖瞬間麻木，然後漸漸的整段手指也會失去知覺，然後再蔓延至掌心。那是種冷得可怖的體驗。風雪狠狠地刮，但崖上的海鳥依然無懼。眼前整面崖壁、整片天空，都是鳥兒的，鳴叫聲，聲音響徹整遍海。我們已好久沒有聽過如此純粹、如此自然的聲音了。

旅程來到尾聲，我們是要真正的告別了。倫勃朗號慢慢駛近曼尼蜀的港口，來了個首尾呼應。我們吃過晚餐，踏上久違了的土地。這是一場不容易的歷險，我想，這裏每個人的生命，大概是有些不一樣了。

Day 7

旅程感想

Cruised on the zodiacs through the fjords today. Freezing winds propelled the unforgiving blizzard. Cold and shattered, but passion not weakened.

梁頌輝

愛尼蜀的人有一種獨特的人情味，當你迷路時，花駕車的人會停下來為你指路；當你在超級市場詢問時，他們會願意花時間招待你，真的很感動！

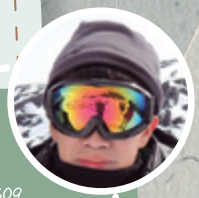
許文驄

無限感激！多謝書院，多謝同學，多謝船員，多謝 Ivan，多謝鍾博士！

陳毓鳳

再次回到曼尼蜀，已經變了暴風雪曼尼蜀，和第一天到埗時的風和日麗相差很大，大自然的力量真是很厲害。還試了同學買回來的海豹肉，味道真是一試難忘的「好吃」。

阮康穎



It's the very last day of our trip. We returned to Maniitsoq again. I went to the indoor football field and played football with local people for an hour and it was an amazing experience. Football is a universal language and nothing mixes people better than sports. It was my best experience in Mannitsoq so far.

麥傲冬

今天由於天氣原因，我們不需要出 field，於是我們便乘 zodiac 出海。雪很大，不止是橫著吹，甚至是向上斜著吹，終於明白了什麼是鵝毛大雪。也經過了一個有很多鳥的地方，萬鳥整天飛翔，甚是壯觀。

蔡俊輝

啟航
行程日誌

哥本哈根遊歷

五月十一日下午到達酒店後，我們先收拾一下行裝，再相約隊員們到市中心感受一下北歐風情。因為只有一個下午的時間，所以我們連地點也未確定便直奔在酒店旁的地鐵站，急不及待要到市區。不過，我們首先便要解決買車票的問題。當地的票機只收硬幣或信用卡。我們沒有硬幣，只能使用有 PIN 碼的信用卡買車票到市區。

去到哥本哈根市中心，編輯組的成員急不及待前往當地的樂高專門店。那裏擺滿琳琅滿目的樂高積木。然後，我們便到了新港、阿馬林堡宮及小美人魚像等著名景點。哥本哈根的大街寬闊，路人悠閒地在充滿北歐風情的建築中間散步，十分寫意。我們晚餐到了新港旁的一間餐廳嘗了各種的北歐鮮魚，包括大家熟悉的三文魚，每種都鮮味十足，可算是我們吃過最美味的魚。晚上十時，天色還是夕陽紅，我們收拾心情回酒店，為明天開始的旅程作最後準備。

再回到哥本哈根已是旅程的尾聲。七日不見，我們這次回來已是哥本哈根的凌晨。雖然如此，我們仍然活力十足出外大吃一頓。翌日早上，我們一大清早便起來爭取遊覽哥本哈根的最後時光，最後我們都依依不捨地離開了哥本哈根。

到了杜拜機場，我們發現我們停留的時數可以換到一頓機場內餐廳的免費餐，所以回到香港前我們一行人在機場快樂地吃了一頓自助餐，為旅程畫上了完美的句號。


S.H.K.O
College

發現

海洋生態研究小組

生態考察是今次極地探索的主要任務，工作是考察格蘭西部的生物多樣性。今次的考察團由鍾國昌博士帶領四位主修科學的同學，分別是程雋鈞、林世傑、陳毓雋和畢仟琳組成極地研究小組，而其餘的隊員則需要一邊支援他們，一邊進行自己的研究。

本次的考察研究四個生態系統，包括深海、石灘、凍原和淡水。每個的生態系統都要分別於兩個不同的地點作實驗，換句話，整個團隊要在短短七天的航程進行八次考察和實驗。每天晚上，海洋生態研究小組隊員會檢討一下當日的考察過程和結果，再與船員和鍾國昌博士準備下一日的考察。因為船隻的航線很容易受到天氣、海流、風向等的非人為因素影響，加上他們對於當地的地理環境不熟悉，因此很難去決定考察的實際位置，只能於前一天臨時決定。

一節實地的考察通常需要三到四個小時，隊員於每一個考察點都會先仔細收集及紀錄環境數據，如氣溫、濕度、風速及紫外線等，回到船上再作整理及比對。北極的生態環境與香港的完全不同，當地的動植物在香港並不常見甚至從來沒有出現過。因此，即使是隨團的科學主任鍾國昌博士和主修生命科學的隊員，也要研讀極地的生物圖鑑，以便協助同學辨認當地的生物和研究生態環境。

是次研究旨在探索西格陵蘭極地生物的多樣性、相對優勢及分佈模式。研究於五月進行，時值當地的初夏及極地植物的年度生長時間，所以開花及播種等生命階段剛剛開始、少生物多樣性及積雪都是意料之內。要了解極地的生態系統結構，可以由當地的季節變化入手。

北極的海洋狀況非常良好，水深平均達五十米，有利他們進行深海研究。樣本會在不同海深的地方收集及主要在晚上進行。他們準備了兩種儀器收集以分別收集浮游動物及浮游植物。收集浮游生物樣本的網分兩種，兩者的不同在於收集浮游動物的洞較大。

是次研究主要以浮游生物網分別在格陵蘭西部水域四米及四百五十米深採集浮游植物及浮游動物樣本，以了解格陵蘭水域所蘊含的浮游生物種類。

他們成功採集了海水、藻類和硝蝦的樣本，並以顯微鏡辨認及分析樣本內的成份。

石灘是一個由固體岩石組成的潮間帶區域，包括陡峭的岩石峭壁，平台，岩石池和巨石領域等。它往往是一個生物豐富的環境，由於位處鹹淡水交界，生物時刻都處於常變的環境中，基於這個原因，牠們必須能夠容忍溫度，鹽度，水分和波浪作用極端變化生存。

凍原跟地球其他的生態系統近似，基本能源來自太陽幅射。由於極地位處高緯度，陽光供應可以有大幅距離：由夏天時完全日照（一般稱為夏至）到冬天時漆黑一片（一般稱為冬至）。太陽能的季度供應令極地植物要在有日照的幾個月內完成由發芽到繁殖的生命週期。因此，只有細小、結構簡單、快速生長及成熟的植物，如草類、苔類及地衣等自養生物才可以在極地凍原生存，而灌木及木在那裏絕跡。

屬於淡水的河流是地球的重要生態系統，它除了將淡水從內陸帶到海洋，完成水循環；它通過侵蝕、搬運、堆積等作用改變地質，塑造地貌；它作為眾多生物的棲息地，更是地球生態系統中重要一環。儘管格陵蘭及南極蘊藏地球上超過百分之九十九的淡水資源，但液態水所佔比例卻不多。極地河流一般位處偏遠、氣候惡劣，科學家甚少有機會長期觀察、研究其生態系統。在全球暖化下，氣候模式推算極地升溫速度較全球平均更快，極地河流生態預期會受到急速融冰、凍土融化、季節改變等因素影響，在未來作出複雜改變。是次旅程一共考察了兩條當地河流。由於缺乏足夠的考察時間、儀器，他們只能簡單量度環境因素及進行質性生態調查。研究的結果發現兩條河流的生物多樣性都出奇地低，箇中原因仍有待進一步仔細分析。

發現

獨立研究

除了海洋生態研究之外，其他的隊員也趁著這個難得的旅程去研究格陵蘭的文化以及在當地人的身體狀況等。因為格陵蘭地理位置偏遠而且生活環境苛刻，與世隔絕之下，他們大都能夠保存自己獨特的生活文化。但在全球化之下，極地與世界接軌似乎是個無可避免的趨勢。究竟在科技的進步、文化的傳播和經濟的發展下，因紐特人（原住民）會如何去接受和適應轉變呢？我們的隊員希望可以由多個角度去探討和了解不同地方的文化變遷。

冰山辨認工具

極地的文化固然引人入勝，但最吸引人的仍然是漫天冰雪和巍峨雪山。主修電腦科學的蔡俊輝同學就是被形態萬千的崇山峻嶺所吸引，他的研究旨在製作一個能根據地勢把冰川歸類的辨識工具。他利用 Google 地球記錄航行路線以追蹤冰川的位置，船隻在永恆峽灣（Evighedsfjorden）就遇到六座冰川，包括鞍山冰川（Sermitsaq Glacier）和森美蜀冰川（Sammisoq Glacier）等。因旅程所限，隊伍遇到的冰川主要有兩種——流入海洋冰川以及陸上終止冰川。顧名思義，前者會直接連接海洋，而後者則會先經過陸地才會流入大海。森美蜀冰川（見圖一左）是一座典型的陸上終止冰川，鞍山冰川（見圖一右）則是一座流入海洋冰川。蔡同學利用尺度不變特徵轉換法（SIFT）偵測與描述這兩種冰川的特徵，SIFT 是一種電腦視覺演算法，用以辨識物體，而且鮮有誤認。不過六座冰川的數據仍不足以作模擬訓練，而到目前為止仍沒有特別的數據庫記錄冰川的特徵。因此蔡同學需要由基礎開始搜集更多格陵蘭冰川的衛星圖像，才可以建立一個可靠的系統。

嚴寒下的生理變化

極地變幻莫測的天氣是人類的天敵，究竟當地的人如何適應嚴寒的氣溫呢？他們的身體質素會否與我們不同呢？修讀醫科的麥傲冬和梁頌輝同學就是抱著疑問和求知的心態，設計了一系列的測量方式，用以研究在極地嚴寒的壓力下，來自香港的隊員、考察船的船員及其他外國旅客的生理反應。這項研究針對四個主要變數：上臂血壓、脈搏、毛細血管重滿時間，以及掌心對身體核心溫度率。此外，我們都有進行室外禦寒測試（OCTT）去研究在嚴寒壓力下自發的生理反應。

研究的結果顯示，旅客的收縮血壓的平均轉變及平均動脈壓明顯比船員高。旅客的收縮及擴張血壓平均都上升，但船員則兩者皆稍跌，可見船員的身體已適應寒冷的環境，因此身體的改變較少。另外，研究對象如果有經常運動的習慣，他們的收縮壓、脈壓、脈搏及毛細血管重滿時間會比其他研究對象上升得較少。我們估計這是因為經常運動的人擁有更強壯的心血管系統，可以以較快和較大的轉變去快速適應環境的變化。

發現

極地的天人合一

除了以西方醫術之外，作為華夏子孫的我們，當然少不了以中醫學的角度去觀察不同人於極地的身體變化。主修中醫的鄧蕙盈同學透過這個難得的機會，結合自身觀察及文獻研究兩方面，探討人與天地之間的關係和「天人合一」的思想。鄧同學安排了各隊員在接受旅程前、旅程中及旅程後三個階段的中醫健康評估，透過連續評估參加者的健康狀態，並結合不同因素作考慮，從而分析北極地區的環境對人的影響。研究發現極地與香港的環境不同會導致參加者出現不同的證候表現。這些表現大多隨著參加者到達北極地區後而生，並在旅程結束回港後而去。

雖然環境的影響於不同人的身體中會有獨立的發展路徑，但相合地域所持的特點後，亦可以看到發病的趨勢。首先，極地地區寒氣與燥氣俱盛，因此在航程中，大部分人都有口渴欲飲而飲不解、咽喉不利、皮膚乾澀、大便秘結等表現。醫書記載，寒氣會使脈象變急，但這次眾隊員的脈象卻不急，反而脈細帶數。可見寒氣傷人，脈急只是其中一種狀態，若陽氣不足，但仍奮起抗邪，亦可見脈數。是故病無定脈，必須從疾病的過程，思考脈象的變化，正本清源，才能作出準確的判斷。

中醫的優勢在於對天地與人之間的關係上有非常精密的觀察及思考，其中時間及空間乃掌握整體變化的關鍵。只有以天人相應的角度，思考生命在自然狀態下的變化，醫者才能完整地把握疾病的發生、發展及變化，掌握治療的時機。醫者的高下正正取決於把握整體的能力。因此，若醫者能夠在治病必求於本的基礎上，結合多方面的變化作整體的考慮，便能對求診者的狀態作出更全面及精確的判斷，從而提高其臨床療效。

格陵蘭的飲食文化

夏倩儀主修食物及營養學，希望由因紐特人的飲食文化作切入點，去認識這個神祕而傳奇的種族。因紐特人現正面對一個飲食的轉捩點，面對日益增多的外資企業，他們的飲食習慣現正受到西方文化的影響，漸漸由本地農耕所得的傳統食物變為入口的工業食品。為了解因紐特人的飲食文化，夏同學首先到當地的超級市場觀察食物種類。超級市場是當地居民主要的食物來源，從中可以大概了解他們的飲食習慣，如食品的種類和價格等資料。曼尼蜀的超市規模很大，提供來自全球各地的產品，包括丹麥、中國及美國的工業食品。雞肉、羊肉、豬肉及牛肉的比例原來遠較傳統肉類，如三文魚、海豹肉等多。原來那些傳統肉類主要在街市出售，超市的肉類都是經過急凍及加工處理。除了肉之外，有不少人都以為因紐特人很少吃蔬果，其實不然。現今的運輸及農業技術改善，當地的蔬果供應與香港的分別已不大了。而在價格方面，當地的工業食品跟香港差不多，以七隻香蕉為例，當地的售價為二十丹麥克朗，折合約港幣二十三元。當地的居民也表示傳統食物較貴，因而轉為選擇工業食品。

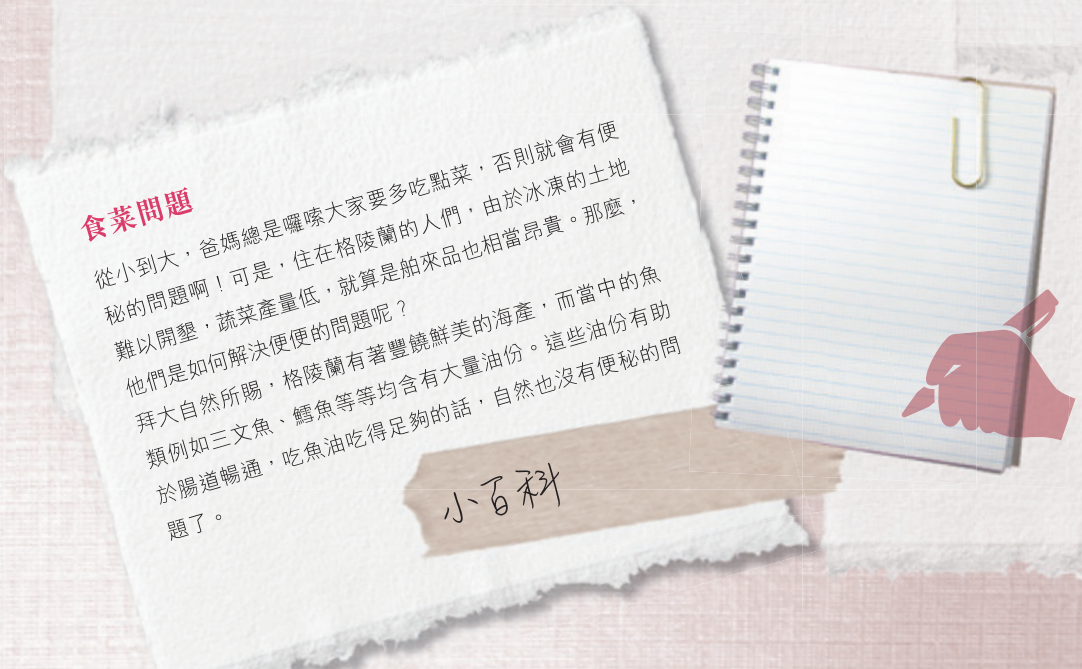
除了考察超市外，夏同學也透過訪問及問卷調查進行資料搜集，了解當地居民對工業食品的評價以及對傳統飲食的影響。調查結果顯示，工業食品最大的優勢是供應穩定。而傳統食物的供應則是取決於當地獵人的收穫，經濟發展以及政府政策令當地的獵人和可獵殺動物的數量越來越少，導致傳統肉類的價格提高至一個難以承擔的水平。工業食品則可以彌補這方面的缺憾，引入工業食品對格陵蘭的飲食文化是好是壞，仍然是難以判斷。可幸的是，部分因紐特人仍然推崇傳統，例如於生日及婚慶時仍然會食用醃海雀——將海雀放於掏空的海豹中醃製而成。小孩又會因為要學習打獵而曠課甚至不去考試，可見當地人在努力追上全球化的步伐的同時，又盡力保留他們獨有的傳統，這種態度是值得我們尊重和學習的。

發現

短途的野外之旅會否為學生帶來正面發展

不少研究文獻指出，外展訓練（Outward Bound Activities）及極地探索團可有效改善參與者的能力及性格。修讀心理學系的許文聰同學希望藉是次旅程，探討短途的野外之旅會否為學生帶來正面發展。在這七天的極地考察之旅，他會主要研究參加者的性格、應對策略、自我效能和自我評估。十二名大學本科生參與者已在旅程前後完成及跟進所有問卷。

然而，雙樣本中位數差異檢定（Wilcoxon Signed Rank Test）反映旅程後只有部份自我評估的性格及生物多樣性測驗中有顯著改善；性格、應對及自我效能分析均無明顯改善。然而，因為樣本量太少及旅程中有不足，北察考察團參加者均沒有顯著的正面轉變。



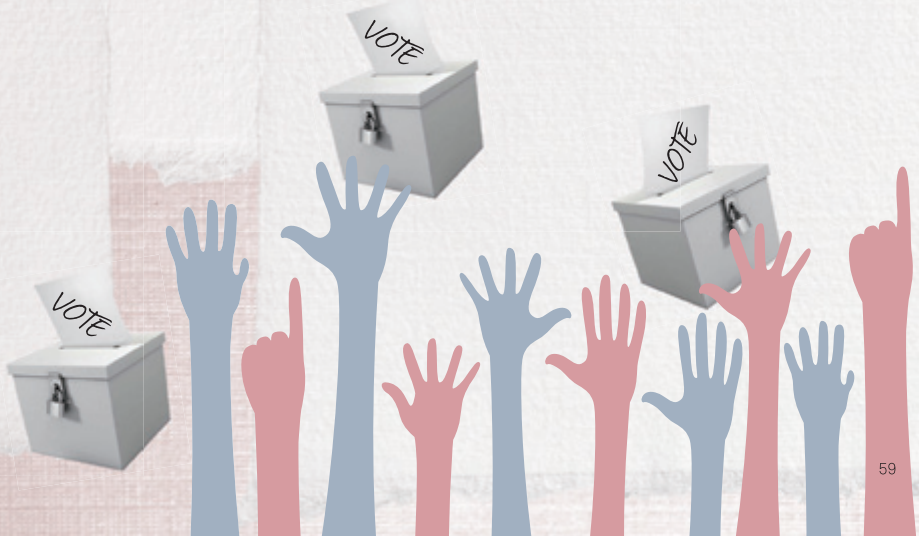
獨立候選國之格陵蘭

在北方極寒之地的格陵蘭與位於亞熱帶的香港，在地域上看似毫不相干，但在歷史和政治的背景上卻有著種種的相同。

格陵蘭和香港一樣，曾為大國的殖民地。後來格陵蘭以自治區的身分加入丹麥，對地區擁有「高度自治權」。在自治條例的保障下，當地民眾更積極參與地區發展及管治，並逐漸出現「完全自治」、謀求獨立的聲音。

然而獨立也需要本錢，否則只是鏡中花、水中月。對於這個只有約五萬人口的漁業國家，獨立之路是否如想像般容易？在民族獨立和經濟發展之間，人民到底會如何取捨呢？主修法律的謝昀臻同學決定，以訪談及觀察的形式，記錄當地人對於國家、民族及獨立思潮的看法；她以法律學生的角度評論格陵蘭在自治、獨立之路上的困難和機遇，並預測格陵蘭的未來發展路向。

同樣曾為殖民地的香港，卻又與格陵蘭的命運不盡相同。基於歷史及政治的因素，香港不能以自決的原則決定未來的政治路向。縱然格陵蘭民眾現處於民族自決與國土撕裂的紛擾中，能夠在瑰麗的極光前一次又一次以公投的形式參與城市的發展，也著實叫人感動和羨慕。



發現

善衡人看北極——
生態篇

北極動物種類繁多。陸地上的哺乳動物中，食草動物有北極兔、旅鼠、麝牛、北極馴鹿；食肉動物有北極熊、北極狼、北極狐；其中北極熊是北極最大的陸生動物。水域中有海豹、海獺、海象、海狗，以及角鯨和白鯨等六種鯨類；還有茴魚、北方狗魚、灰鱒魚、鮭魚、胡瓜魚、長身鱈魚、白魚及北極鮭魚等各種魚類。由於人類大量捕殺極地生物，北極的海象、海豹、北極熊和角鯨都曾瀕臨絕種的邊緣，而斯特勒海牛則已經在一七六八年因人類過度獵殺而滅絕。但因為當地的居民仍有捕獵的習慣，導致該處的動物變得害怕人類，因此我們都沒有看到過任何陸上的動物，只有在探索雪山時發現過牠們在雪地上殘留的蹤跡，按大小和深度判斷，應該是北極狐的腳印。不過，我們在一個早上竟然有幸一睹抹香鯨的身影，那時牠剛好要到水面換氣，能夠觀察到牠噴出來的水柱，真是「早起的鳥兒有蟲吃」了。

北極地區的鳥類有一百二十多種，大多數為候鳥。北半球的鳥類有六分之一在北極繁衍後代，有至少十二種鳥類在北極越冬。在湖泊及水澤中有各類涉禽，如長尾鳧、赤頸鳧、短頸小野鴨、斑背潛鴨、鵲鴨、秋沙鴨、黑鳧、雪鵝等；飛禽則有北極雷鳥、雪鴞、刀嘴海雀、渡鴉、海雀、北極燕鷗和黑冠蒼鷺等等。雀鳥算

是我們在北極最常看到的動物了，除了每朝能在甲板看到一兩隻正在翱翔的海鳥以外，在乘坐小船登岸的途中，也會常常看到被群鳥佔領的雪山。放眼所及，在千里無人的冰洋上，萬鳥遨遊在冰川之間，自由自在，好不震撼。

如果你逐漸走向北極，會發現樹木愈來愈小，愈來愈稀疏，但北極絕非寸草不生的不毛之地。我們探索北極之時，矮小的灌木、多年生禾草、地衣、苔蘚等佔據了優勢，北極地區的這種植物群落，被稱之為苔原。隨著緯度升高，可供植物生長的熱量（主要是太陽能）會愈來愈少。在北極地區，植物的新陳代謝周期大幅放緩，達到了極限，因為最微小的節約對都有利於維持生長和繁衍。全年寒涼的環境會限制北極地區的植物的大小、種類和繁衍能力。在最溫暖的區域，灌木可以生長到兩米高，莎草、苔蘚和地衣可以形成厚厚的覆蓋層；而在最寒冷的區域，絕大部分的地表是裸露的，植被基本上是地衣和苔蘚，草本植物只佔極少數。

發現

善衡人看北極——地理篇

地球兩極位於南北（緯度六十六點五度以上），而北極和南極為其中心地帶；正極的北冰洋和南極的南極大陸皆被大量的冰層包圍。狹義上，北極指地球表面上最北的點，但我們平時提到的「北極」大多是指環繞在地球北極點周圍的地區。北極地區的定義有幾種，通常會以北極圈（北緯六十六點三四度）為界，圈內的地區就被稱就北極。北極包括整個北冰洋以及格陵蘭島（丹麥領土）、加拿大、美國阿拉斯加州、俄羅斯、挪威、瑞典、芬蘭和冰島八個國家的部分地區，總面積為二千一百萬平方公里，其中陸地佔二千八百萬平方公里。北極圈更是永晝和永夜現象開始出現的界線，圈內的地區會連續六個月是白晝（永晝），連續六個月是黑夜（永夜）。北極點每年更只有一次日出和一次日落，這更令北極點不適用於現時的時區劃分規則。要到北極點的探險，探險員使用任何方便的時區，例如出發地點的時區。

「北極樹木線」也可以用於定義北極地區。北極附近只有近地表的一米左右的土壤已解凍，一米之下則是季節性或永久性凍土，因此樹木的根部無法伸展。加上近地面常年有強風，樹木已難以成長。從南往北，連續成片的森林開始消失，取而代之的是稀疏的喬木和灌木的混雜植被，最後只剩苔蘚和地衣。而且由於土壤的垂直排水能力很差，所以植物的根幾乎是淹在水中，缺乏足夠的氧氣和營養，致使北極植物生長極其緩慢。因此在我們欽佩北極植物生命頑強之餘，也應知道一旦人類破壞了北極的生態環境，環境的恢復將是多麼的困難和漫長。

提起北極，有不少人都會第一時間想起北極光。究竟什麼是極光呢？極光是地球兩極特有的自然景象，永夜時，北極的極光一般在北緯七十至八十度就可看到，一般出現在一百五十至四百千米的上空，分擴散極光和分立極光兩種。來自太陽的高能電子被地球磁場捕獲，牽引到兩極地區上空。地球大氣層外層的氣體分子或原子與其碰撞後，短暫地被激發至高能態甚至電離態。在回到基態時，原子會放出特定波長的光波，形成極光。可惜我們到北極時正好是永晝的季節，太陽的光線太強烈，我們很難有機會看見極光。

北極地區的氣候十分嚴寒，而且暴風雪多。即使是在夏季最「熱」的時候，氣溫也只是在攝氏十度左右。如果在冬季，氣溫可以下降到攝氏零下五十多度。但是，北極點（在北冰洋上）和北極中央地帶都不是最冷的地方。位於蘇聯西伯利亞的佛賀揚斯克市，是世界上有人住的地方中最冷的城市，它的最低氣溫曾經達到攝氏零下七十度。在這座城市，冰雪封凍的日子長達六至八個月，河流結成厚厚的冰塊。這樣寒冷的天氣，連水銀都會結冰，人們只能用酒精溫度計。因此，人們把佛賀揚斯克市稱為「世界冷極」——地球上最冷的城市。然而，北極地區最可怕的還不是寒冷，而是猛烈異常的風暴。那兒，經常刮起十級以上的大風。每當風暴來臨時，大雪紛飛，天昏地暗。這時，人們如不趕快躲避就會被風吹倒，就會窒息，以致有被風雪埋葬的危險。

發現

善衡人看北極——歷史篇

人類很早已經開始探索北極地區，早於公元前三二五年，一位叫做皮西亞斯的古希臘商人便勇敢地登上帆船，開始了人類歷史上第一次的北極探險。不過他此行的目的並不是要到北極去探險，亦不是為了天文觀測或者蒐集科學數據，而是希望尋找到錫和琥珀的原產地才駕船北上。這兩種東西在當時的歐洲市場上價格非常昂貴，因而有利可圖。他大約用了六年的時間完成了這次航行，據他自己的記載，現今的推測是他到達了現在的不列顛群島（記載中稱為「普樂塔尼群島」），然後繼續北上，來到了傳說中的圖勒大地，可能即是現今的冰島或者挪威北部。他的記載中提到，圖勒旁邊的地方「由既不是水也不是空氣的物質組成，或者說是前兩者的混合」，「太陽落下兩三個小時後又會升起來」。憑藉以上的資料，現今的研究者認為皮西亞斯當時應該已經很接近北極圈了。

歷史的齒輪總是不斷推進。十九世紀時期的文藝復興文化運動解放了人們的思想、發現新大陸開闊了人們的眼界、工業革命則為人們帶來技術，英國人開始了新一輪的北極探險。為了鼓勵各個探險家，英國政府決定設立兩項獎金：第一艘到達北緯八十九度的船隻可以獲得五千英鎊的獎勵，而第一個打通西北航線的人更可獲得兩萬英鎊。這個本是個探索北極的巨大機遇，可是卻間接導致了北極探險史上嚴重的意外——富蘭克林的悲劇。當時，富蘭克林率領兩艘最先進的輪船及一百二十九名船員向北極進發，所有人都認為他必然會成功，可惜事與願違，他們自此一去不返。從一八四八年起往後的十多年，共四十多個救援隊湧進了北極地區，展開大面積搜索。雖然無法拯救富蘭克林一行人，但一連串的搜救行動並非毫無意義。搜救行動不僅查明了富蘭克林船隊遇難的原因，也大大地豐富了關於美洲北極地區的地理知識，對北極地區的洋流和冰蓋漂流現象有了更多的認識。探險家們認識到，只有向北極地區的本地居民學習，才有可能更好地適應當地的環境。

世界的探險家並沒有因為富蘭克林的悲劇而停滯不前，於十九世紀後期，美國也開始加入到北極探險的隊伍中，爭先到達北極點的競賽達到高潮。為了獲得第一個到達北極點的榮譽，許多探險家都把目光朝向北方。最後這項榮譽由美國的探險皮爾里獲得，他三度向北極進發，才能征服北極點。在成功的背後，付出的代價也相當昂貴。據非正式統計，光是在正式探險中獻身的人數就達到五百零八人。至此，人類才算正式踏足北極。

但各種挑戰北極的壯舉卻並未停止，一九七八年，日本探險家植村直己隻身乘狗拉雪橇向北極進發，完成了人類歷史上第一次隻身到達北極點的壯舉。而在一九八六年，法國醫生愛提厄更只靠人的體力孤身滑雪到達北極點。及後，大量科學觀測站在北極地區建立，人類對北極的認識推至到一個前所未有的高度。

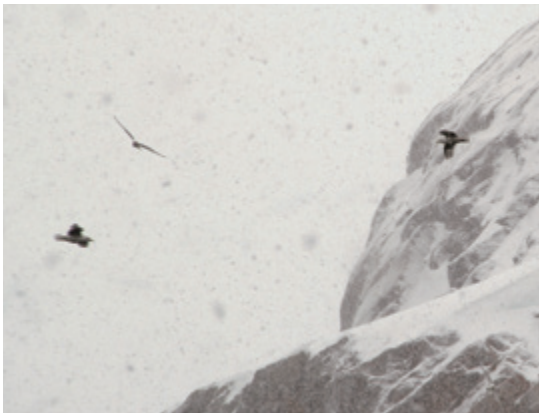
小百科

船上食物

正所謂「民以食為天」——很多同學在出發前都很關心在極地的膳食安排。格陵蘭作為一個沿海的國家，海產相當豐富，格陵蘭鱈魚、三文魚、海膽等等，均是唾手可得的鮮食。但是，在受保護的海域裏，我們當然不能隨捕隨食；就算是釣捕，也僅供學術用途作記錄，必須馬上放生。因此，我們在船上吃的，絕大部份均是船員從曼尼蜀的超市採購回來。早餐的時候，我們多數有乳酪、生果、煙肉、炒蛋、麥皮等等，但最教人難忘的，還是每天早上船員親製、熱騰騰出爐的牛角包——酥、香、脆。在冷颼颼的早上，呻一口熱朱古力，來一口牛角包，幸福得要命。午餐通常比較簡單，每天一種餐湯，再加上一個主菜。有一天大廚熬了以豌豆煮成的湯，我們乍眼一看還以為是綠豆沙，但喝下去卻是鹹的餐湯。後來我們打趣跟 Khabir 說，下次可以試一下用糖來煮嘛，那就成就一道具遠東風味的糖水了。所謂的文化交流，還是在吃的方面最能體現。

晚餐的環節總是讓人期待。行了整天的山路，又或是做了這麼多的考察功夫，得要一頓豐富的晚飯來補充體力！












從心

今次的旅程真的很特別，我們在不同的時間感受到不同的天氣。有炎熱的時候，也有寒風刺骨的時候，總算是一個特別的體驗。今次連海獅肉都能吃到，我想大家都已經無憾了！領隊菲爾給我們看了關於一個因紐特人生活的紀錄片Vision Man。男主角曾是一個獵人，但是後來因為孩子的反對只好結束獵人生涯。他不無遺憾的想，隨著格陵蘭島愈加現代化，捕獵文化也逐漸消逝，難以傳承。 我很喜歡影片裏的一句話："The television gives them everything, and nothing."（意譯：電視給了他們所有，也讓他們一無所有）。確實，現代科技給了我們所需要的一切，但也奪走了我們傳承傳統文化的機會。人們只是專注在他們的平板電腦，手機上，卻拒絕去瞭解或體驗他們自己文化的精髓。希望傳統的格陵蘭文化不會消失，而是繼續發展。現代化並不一定是社會前進的最好方式！

畢仟霖

這次的旅程讓我深刻地感受到科學工作者的艱辛和堅持。時常聽到朋友說，在實驗室一挨就是一天，特別是在沒有窩的實驗室裏，實驗員經常廢寢忘食。而且工作經常要不斷重重複複。今天的我終於感受到這種艱辛。我的工作主要是測量地面水平高度，動作十分簡單，但是要不斷重複，要頂著凜冽的寒風，保持尺的水平，從而保證測量的精準。另外，科學工作者還要十分之吃苦耐勞。每次實地考察，我們都要經過一段「跋涉」才能到達做研究的地點，更要拖著不少的裝備。最後一晚，還得冒著大雨考察，天氣情況十分惡劣，再加上已開兩更，又是飯後的疲倦時刻，實在教人疲乏。現在回想起來，倒覺得這真是一段很難忘的回憶。我相信這些辛勞和汗水（還有雨水和雪水）一定是這一次極地之旅最令我難忘的，也希望自己能保持（學習）這種對科學的熱誠和認真。

蔡俊輝

借來的時間，借來的空間，幾天的時間一聲就過去了，所以說「時間過得真係快，又係時間講再見」。由互不認識到最後彼此間有說有笑，真的要感激這個難得的機會，尤其是書院對我這個「摺友」的信任。還要多謝每一位隊友以及在旅程中遇到的每一個人。海豹肉有鮮味又有腥味，吃過之後大家就是好兄弟。還有與大家一同面對暴風雪，回想起都覺得十分熱血，倘若將來遇上任何困難，我都會想起今次的經歷，那麼我就不再害怕甚至會心微笑。其實一個攝影師的角色就好像一個旁觀者，這個旁觀者可以說是參與其中，但又同時是用另一個視角看正在發生的事情。而因為一直躲在鏡頭背後，你好像消失在活動的紀錄之中，但你會知道自己一直都在，這些感覺和記憶是不會消失的。其實我不介意做攝影師，每個攝影師其實都是一個浪子，在相片、影片和大家的心中不留痕跡。其實我也有感到捨不得，不過我覺得我早已看透聚散離合。總之，有緣再見吧。

陳家明

我們為追求更快更高更強的未來，放棄了現在，但偏偏我們的結局只有死亡；沒有盡頭的進步也是環境的災難，文明愈發展，地上建築愈多，消耗的資源就愈龐大，地球的健康就愈差。沒有盡頭地追求欲望是所有人痛苦的來源，永恆的追求，永恆的不滿足，永恆的地獄。每次旅行都提醒了我人生的另一可能性。每逢收拾行李，我都發現人需要的是如此的少——幾件衣物、一張地圖、一個起點就足夠我在異地生存。我們一定要工作嗎？工作一定需要回報嗎？旅途必須有目的地？生活必須有同伴嗎？旅行把所有人生多餘的需要都減去，留下的正是我們生命的真諦。這，就是我旅行的意義。

陳頴雋

從心

「會當凌絕頂，一覽眾山小」，這次旅程即將結束了，雖然很多事情都未能盡善盡美，但過程中我真的學習到很多很多。很多的第一次，很多的難忘經歷。這些都會伴我一生，成為我人生的一部份。很感恩有這趟難得的旅程，感激在這裏遇上的每一位。例如船上來自印度的廚師，Khabir，他真是一個很有趣的人。他為我寫下了印度秘傳咖喱的做法，待我回港後必定要一試！極地的大雪紛飛，與香港的炎夏，是一個強烈的對比，也是一段難忘的見證。

魏曉瑩

時間過得很快，不經不覺過了七天。這七天中，經歷的事情很多，希望經歷的是與別不同，為自己帶來美好回憶。其實有想，每個人有自己不同的背景，船上的其他乘客、船員、當地人，每個人都有各自的價值觀、標準、故事。不能滿足於任何人，要使自己懂得欣賞自己，做回自己，不因他人而改變自己的態度，要明白最需要好好對待的是自己。對待別人，希望抱有一期一會的心態，每次相處都是一次減數，不能要求太多。不可能每樣東西都是完美的，只期望每次相處都是快樂便足夠。希望每人都有快樂充實的人生。今次的航海旅程暫時完結。

程雋豹

在曼尼蜀的超級市場行了一圈之後，發現因紐特的食物比我想像中更加多。除了很多不知名的肉類以外，還有很多我沒有想過的蔬果。另外食物的種類比自己想的更加多，好像曲奇、茶、果汁、牛奶，甚至有日本的壽司。這些真是完全超出了自己的預期，亦證明了其實因紐特的生活和飲食文化已經受到西方文化很深的影響。在機場的訪問時我們得知，其實因紐特人並不反對西方文化改變自己的飲食習慣，最主要的原因都是方便，而他們亦不認為這些西方的飲食習慣會影響當地的傳統文化。這部份都算是這次旅程最大的收穫。另外我也很享受在超級市場內閒逛和拍照的時間，因為我相信要了解當地的飲食習慣，超級市場會是最好的地方。

夏倩儀

今次的旅程真是很累很驚險，不過真是一人生一次（人生絕無僅有的體驗）！有很多我原本想像不到的事情：原來一個很冷很多冰的地方都有很多很頑強的生物。極多藻類和青苔在石頭上面生長，還有很多有莖的植物，原來極地並不一定會寸草不生。還有，原來在雪上面行走是很難並要講求技巧的，我經常會倒下，畢竟保持平衡很需要腰力。有些斜坡真的很陡峭，行走的時候有隨時會死的感覺。每一步都要非常小心，因為隨時會因為一步錯而死，第一次覺得自己的生命好沉重，好怕下一步踏到的雪會塌下去。其實做任何事都要考慮得很清楚，尤其是在這次極地之旅！

許文驄

從心

"Keep going, the view is great up there." Hiking up the snow hill wasn't easy at all. Even with the help of your snowshoes, every small step in the thick snow feels like a meter's leap. Indeed, the view on the hill top was magnificently stunning. When seeing the greatness of nature, one realizes the tininess of man, spontaneously. Hearing the strong winds blowing, and snowflakes showering, I realized whenever we encounter obstacles or difficulties in life, we must remember to keep going—because the view shall be great up there. I will never forget this feeling, this place, this moment.

梁頌輝

我上一次看到雪應該是二十年前剛剛學會走路的時候，我這樣的「熱帶動物」對雪有很大的幻想。（對我這樣的熱帶動物而言，雪意味著無盡美好的幻想。）不過當中午溶雪的時候就明白，雪其實一點都不浪漫。曼尼蜀是一個原始的小鎮，遊客在這裏是一種很稀有的生物。當我們在超級市場買東西的時候，當地的小學生會圍著我們拍照；在街上行走時，每個人都會跟我們打招呼（不過很害羞），甚至到上船前也有一群小孩跟住我們直到最後。最特別的是當地人的思維方式，當我們買藝術品的時候，他們其實不太在意賣多少錢。他們不像香港人那樣無時無刻不在想著成本，想著怎樣講價，而是著重和你分享有什麼新發現和該件藝術品背後的故事。

林世傑

Nothing makes me happier than the smile on Greenlandic children's faces. Visiting Mannisoq in Greenland was undoubtedly an unforgettable experience for me. People in Greenland are even more amazing than the weather and the scenery. In addition, for a 20-year-old boy who has never touched snow before, climbing up the hill in Greenland with a group of experienced, welcoming hikers was definitely unforgettable. There was difficult time during the hike like deep slopes and fluffy snow. We managed to get through this as a team. We all corporated together which made this difficult trip exciting and memorable.

麥傲冬

極地之旅終於進入尾聲了，今次的旅程最與別不同的地方是要帶著工作、完成任務的心態而來。今次的旅程緊接在考試之後，大家都未能付出最多的時間做最好的準備，但我相信大家都盡了最大的努力，為這次難得的機會奮鬥。最初作為一個心理學學生，希望能在極地作有關心理學的研究，最後則被委派了作出版的工作。新的崗位帶來全新的挑戰，亦能圓我小時的夢想——出一本自己的書。我十分樂意接受這個考驗，也感到十分興奮。這趟旅程可說是一個課堂，我學到的知識肯定是獨一無二，而且會終生受用。

蘇紡安

極地之旅讓我經歷了許多畢生難忘的事，征途中的甜酸苦辣都催化了我的成長。從開始到完結，我學會了更多科學的知識，也加深了對自己本科的認識，但當中令我印象最深刻的是人與人之間的互動。作為一名中醫學生，這次旅程賦予我另一個角度去認識世界，讓我更加明白人與自然之間的關係。這次旅程讓我有機會接觸來自世界各地的人士，讓我能夠向他們分享我對中醫的看法。從中他們亦令我明白到只要全面掌握認識生命的方法，不論是何種人、從哪裏來，該如何繼續走也是同一套道理。人與人之間的關係，並不是靠精密的儀器運算得出結果這麼簡單。

鄧蕙盈

從心

在書本上閱讀到，很多的獵人為了捕獵鯨魚或其他大型海上生物，都不免要到雪山住三兩個月，然後再到附近的小鎮賣掉漁穫後才能回家。離鄉別井的行動是否是他們自願；或是都為著家中生計著想？又如船員每次出海都是以月計算，與家人分別又是否是心中所願？到極地探險，在不同雪山中探索可能是很多人的夢想，但當夢想變成工作，每天必須要重複著一樣的生活，並與家人離別，這又是否探險者的心願？我不知道。但我清楚自己不欲把旅遊、探險的志趣變成職業，被逼地重複進行同一動作的感覺始終不太好。到極地探索本有的「自由、奔放」感覺都沒有了，還是把它留作志趣吧，我肯定自己是不適合當船員或嚮導了。

謝昀臻

雖然在來到這裏之前曾想像過這裏的景象，但我仍然被親眼所見的冰川、海洋所震撼。鏡頭無法捕捉自然的鬼斧神工，清勁的寒風中，我站在甲板上，愈發感到自己的渺小。其實生命的意義在於什麼呢？我應該因生命而感恩，但如果為了生存而追求安安穩穩、平平淡淡的生活，又是否是對生命的褻瀆與浪費呢？其實最容易處理的挑戰便是身體上的挑戰。如果連自己的身體都管理不好，又怎能很好地應對其他挑戰呢？這是我認同的觀點，也將是我踐行的指引。希望自己能用有限的生命接受更多的挑戰，讓生命與眾不同。

王策

即使我的高中並不在香港但我亦有出國旅遊，不過也從沒有嘗試過在兩日內搭了四程飛機，由香港到杜拜轉飛哥本哈根，再飛到格陵蘭島的堅賈路蜀，最後到曼尼蜀乘船。這海陸空的曲折轉乘，是我人生中絕對難忘的經歷。在我看來，假期是開拓眼界的好機會。除了追尋夢想之外，我在假期中可以放鬆並記錄真實的自我。如果我可以在哥本哈根和曼尼蜀逗留更久的話，我會騎自行車，做個深呼吸，用心去感受這裡的生活。

殷芷彤

今次極地之旅同以往的旅行十分不同，因為它並不是玩樂性質。除了要收拾自己的物資之外，還要顧及和預留公用裝備的位置，所以都比較緊張。到極地後發覺原來氣溫沒想像的冷，但冰天雪地的景色是我人生第一次看見，十分難忘。沿途的當地人都十分友善，更主動帶我們到當地的博物館參觀。他們的生活也十分享受和快樂，這是一個十分有趣的文化接觸。另外，非常感謝我的隊友，爬坡的時候我的鞋子總是跑偏，而他們一直幫助我走過滑坡。觀察來自不同背景的人很有趣，因為他們都有不同的行為模式和文化差異，這種觀察亦幫助我學會在與人合作期間更好的與人溝通交流。跟出版小組的隊員一起遊玩和工作真的十分快樂，當中充滿了歡樂和笑聲。出版小組真的很幸福。

阮康穎

Phil showed us a documentary *Vision Man* about the life of an Inuit. The protagonist used to be a hunter, but he was upset when his grandchildren no longer allowed him to hunt. He thought that this hunting culture was deteriorating gradually when Greenland was getting modernized. I love a quote in the documentary, “The television gives them everything, and nothing”. Really, technology gives us everything, but it also takes away our chances of preserving our cluture. People just stick to their iPads, mobiles but refuse to know more/ practise their own culture. Hope the traditional Greenlandic culture won't disappear one day, but continue to prospect in the future. Modernization may not be the best way forward!

畢仟霖

這次的旅程讓我深刻地感受到科學工作者的艱辛和堅持，時常聽到朋友說，在實驗室一挨就是一天，特別是在沒有窩的實驗室裏，經常會廢寢忘食。而且工作經常要不斷重複重複重重複複重複又重複。在今天我也終於感受到了。我的工作主要是測量地面水平高度，動作十分之簡單，需且要不斷重複，要頂著凜冽的寒風，保持尺的水平，從而保證測量的精準。另外，科學工作者還要十分之挨得苦。在每次的研究，我們都要經過一段「跋涉」後才能到達做研究的地點，而且要拖著不少的裝備。在最後一晚，還要落著大雨，天氣情況十分惡劣，再加上已開兩更，也是飯後的疲倦時刻。現在想起來，覺得這真是一段很難忘的回憶。我相信這些辛勞和汗水（雨水、雪水）一定是這一次北極之旅最令我難忘的，也希望自己能保持（學習）這種對科學的熱誠和認真。

蔡俊輝

後記——從心深處

- 借來的時間，借來的空間，幾天的時間一聲就過去了
- 所以說「時間過得真係快，又係時間講ByeBye」
- 海豹肉有鮮味又有腥味，吃過之後大家就是好兄弟。
- 由和整團人都不認識到最後和大家有說有笑，真的要感激這個難得的機會
- 尤其是書院對我這個「摺友」的信任
- 暴風雪下的大家真的好熱血
- 相信將來有任何困難時我都會想起今次的經歷，從而不再害怕甚至會心微笑。
- 還要多謝每個拍檔以及在旅程中遇到的每一個人。
- 其實擔任camera man的角色就好像一個旁觀者，這個旁觀者可以說是參與其中，但又同時是用另一個視角看正在發生的事情
- 而因為一直躲在鏡頭背後，你好像消失在活動的紀錄之中
- 但你會知道自己一直都在，這些感覺和記憶是不會消失的
- 其實我不介意做攝影師，每個攝影師其實都是一個浪子，在相片、影片和大家的心中不留痕跡
- 其實我也有感到捨不得，不過我覺得我早已看透聚散離合
- 有緣再見吧

陳家明

加數是人生常態：出生以來歲數不斷增加，認識的面孔愈來愈多，負擔的責任漸漸增重。加數也是人類的常態，文明在進步，大廈在增高，科技在發展。加數更是思考的常態：入大學是為了增加資歷，辦交流團是為了書院的知名度，拍新照片是為了更換一張更受歡迎的profile pic。但是——沒有盡頭的加數盡是折磨。我們為追求更快更高更強的未來，放棄了現在，但偏偏我們的結局只有死亡；沒有盡頭的進步也是環境的災難，文明愈發展，地上建築愈多，消耗的資源就愈龐大，地球的健康就愈差。沒有盡頭地追求欲望是所有人痛苦的來源，永恆的追求，永恆的不滿足，永恆的地獄。

每次旅都提醒了我人生的另一可能性。每逢收拾行李，我都發現人需要的是如此的少——幾件衣物、一張地圖、一個起點就足夠我在異地生存。我們一定要工作嗎？工作一定需要回報嗎？旅途必須有目的地？生活必須有同伴嗎？旅行把所有人生多餘的需要都減去，留下的正是我們生命的真諦。這，就是我旅行的意義。

陳毓雁

「會當凌絕頂，一覽眾山小」，這個旅程即將結束了，雖然很多事情都未盡善盡美，但過程中真的學習到很多很多。很多的第一次，很多的難忘經歷。下雪、滑雪（還是原始的那種方法）、釣魚、座頭鯨、暴風雪、堆雪人、帆船出海。這些都會隨我一生，成為我人生的一部份。這次考察不免有很多艱難的挑戰，卻令我們更加團結，更有默契。很感恩有這趟難得的旅程，感激在這裏遇上的每一位。例如是船上來自印度的廚師，Khabir，他真是一個很有趣的人。他為我寫下了印度秘傳咖喱的做法，待我回港後必定要一試！還有在小鎮中遇上的Elisabeth和Signe，這裡的人總是熱情得讓人意想不到——縱然你知道她們能以語言表達的不多，她們還是窮盡腦海中的每一枚詞彙去拼湊，竭力去為我們介紹格陵蘭的一分一寸。極地大雪紛飛，冷颼颼的。忽爾讓我想起香港的炎夏。我想，那是一個強烈的對比，也算是一段難忘的見證罷。

——龔曉瑩

時間不合理般，過得很快，不經不覺過了七天。這七天中，經歷的事情很多，希望經歷的是與別不同，為自己帶來美好回憶。其實有想，每個人有自己不同的背景，船上的其他乘客、船員、當地人，每個人都有各自的價值觀、標準、故事。不能滿足於任何人，要使自己懂得欣賞自己，做回自己，不因他人而改變自己的態度，要明白最需要對好的是自己。對待別人，希望抱有一期一會的心態，每次相處都是一次減數，不能要求太多。不可能每樣東西都是完美的，只期望每次相處都是快樂便足夠。希望每人都有快樂充實的人生。今次的航海旅程暫時完結。

——程雋鈞

後記——從心深處

在曼尼蜀（Maniitsoq）的超級市場行了一圈之後，發現Inuit的食物比我想像中更加多。除了很多不知名的同類以外，還有很多我沒有想過的蔬果。另外食物的種類比自己想的更加多，好像曲奇、茶、果汁、牛奶，甚至有日本的壽司。這些真是完全超出了自己的預期，亦證明了其實Inuit的生活和飲食文化已經受到西方文化很深的影響。在機場的訪問得知，其實Inuit並不反對西方文化改變自己的飲食習慣，最主要的原因都是因為方便。而這些Industrial food的價錢其實偏貴，因此會令當地人卻步，而他們亦不認為它們會影響當地的傳統文化。這部份都算是這次旅程最大的收穫。另外我也很享受在超級市場內閒逛和拍照的時間，因為我相信要了解當地的飲食習慣，超級市場會是最好的地方。

另外，當地人的熱情亦令我感受至深。他們的單純、對人與人之後的信任，正正是香港所缺乏的。當地小朋友最天真的笑容，是在香港所找不到的。與小朋友的互動是自己最享受最開心的時刻。

夏倩儀

今次的旅程真是很累很驚險，不過真是一人生一次！有很多想像不到的事情：

- 原來Eternity Fjord，一個很冷很多冰的地方都有很多很頑強的生物。極多mosses和lichens在石頭上面生長，還看到很多有stem的植物，原來並不是真的寸草不生。
- 原來在雪上面行走是很難和講求技巧的，經常也會倒下，保持平衡很需要腰力。有些斜坡真的很斜，行走的時候真的有隨時要死的感覺。每一步都要非常小心，因為隨時會因為一步錯而死，第一次覺得自己的生命好沉重，好怕下一步踏到的雪會塌下去。其實做任何事都要考慮得很清楚，尤其是在這次北極之旅！
- 想不到大家會這樣團結，會互相合作，當你快要倒下的時候，有人會扶起你；當你覺得拿著雪鞋很重，Dr. Chung會幫忙。其實真心很感動！Really work as a team!

許文驄

“Keep going, the view is great up there”.

Hiking up the snowhill wasn't easy at all. Even with the help of your snowshoes, every small step in the thick snow feels like a meter's leap.

Indeed, the view on the hill top was magnificently stunning. When seeing the greatness of nature, one realises the tininess of man, spontaneously. Hearing the strong winds blowing, and snowflakes showering, I realised whenever we encounter obstacles or dfficulties in life, we must rememeber to keep going—because the view shall be great up there. I will never forget this feeling, this place, this moment.

梁頌輝

Nothing makes me happier than the smile on Greenlandic children's faces. Visiting Mannisoq in Greenland was undoubtedly an unforgettable experience for me. People in Greenland is even more amazing than the weather and the scenery. In addition, for a 20-year-old boy who has never touched snow before, climbing up the hill in Greenland with a group of experienced, welcoming hikers was defibitely unforgettable. There have been difficult a.alskdf the hike like deep slopes and fuffy snow, we managed to get through this as a team. We all corperate together which makes this difficult trip exciting and memorable.

麥傲冬

其實我已經分不清現在是幾點鐘，亦分不清今日是幾號了。唯一知道的是，現在的我睏得立刻可以倒頭就睡。

我們坐了四程機才來到曼尼蜀（Maniitsoq），今次是我第一次來歐洲。在哥本哈根的時間雖然不長，但也令我留下了深刻印象。他們沒有高樓，不需要如我們的生活般緊促，卻依然可以過得富足快樂。走過公園我看到連小狗也比香港活的快樂。還有，新港真的很漂亮。

我上一次看到雪應該是二十年前剛剛學會走路的時候，對於我這些「熱帶動物」而言，我對雪有很大的幻想。不過當去到中午溶雪的時候就明白，雪其實一點都不浪漫。

曼尼蜀（Maniitsoq）是一個原始的小鎮，遊客在這裏是一種很稀有的生物。當我們在超級市場買東西的時候，當地的小學生會圍著我們拍照；在街上行走時，每個人都會跟我們打招呼（不過很害羞），甚至到上船前也有一群小孩跟住我們直到最後。

最特別的是當地人的思想，當我們買藝術品的時候，他們其實不太在意賣多少錢。他們不像香港人，無時無刻在想著cost，想著怎樣講價，而是著重和你share有什麼新發現和該件藝術品背後的故事。（店主更會跟我分享在哪裡可以採到鑽石和紅寶石！）

林世傑

北極之旅終於進入尾聲了，今次的旅程最與別不同的地方是要帶著工作、完成任務的心態而來。旅行其實是一次很特別的經歷，一開始你會認識不少人，有些志同道合的，會陪你多走幾段路；有南轅北轍的，最初已經大吵一場；有更多的，只會點頭微笑，轉頭已在回憶中消失得半點不剩。旅行中途，大多事都早已被決定，天氣、路線、航道，你可以做的只是揹緊你的背包，牽著你的旅伴，見繁華滄桑，感悲喜樂憂。不管沿途風光有多絺麗，人事有多感動，來自異地的我們，從不屬於某處地方，我們能留下的，叫做眼淚，能帶走的，叫作回憶。旅途中，你身邊的人都會因各樣事情而有所更替，聚散離位只是平凡瑣事。回頭一看，原來剩下的只有自己。每個人都只是你生命中的過客，有人會帶來一些東西，有人又會從你身上帶走一點。沖刷之後，你可能變得面目全非，但只有你自己知道你仍然是你，從未改變。

這不很像人生嗎？人生的旅程更長更複雜，而對未知，我們只需緊記挺起胸膛，昂首，闊少。

今次的旅程緊接在考試之後，大家都未能付出最多的時間，做最好的準備，但我相信大家都盡了最大的努力，為這次難得的機會奮鬥。最初作為一個心理學學生，希望能在北極作有關心理學的研究，最後則被委派了作出版的工作。新的崗位帶來全新的挑戰，亦能圓我小時的夢想——出一本自己的書。我十分樂意接受這個考驗，也感到十分興奮。這趟旅程可說是一個課堂，我學到的知識肯定是獨一無二，而且會終生受用。

北極之旅完，人生路途未完，共勉之。

蘇紓安

後記——從心深處

北極之旅讓我經歷了許多畢生難忘的事，途中艱苦的、快樂的各種體驗都令我成長了不少。從開始到完結，我除了學會更多科學的知識，還有加深對自己本科的認識，但當中令我最深刻的是人與人之間的互動。作為一名中醫，賦予我另一個認識世界的眼光，讓我更加明白人與自然之間的關係。這次旅程讓我有機會接觸來自世界各地的人士，讓我能夠向他們分享我對中醫的看法。從中他們亦令我明白到只要對認識生命的方法有全面的掌握，不論是何種人、從那裏來，該如何走繼續走也是同一套道理。人與人之間的關係，並不是靠精密的儀器去進行運算而得出的結果。

鄧蕙盈

在雪山上，有一個小木屋獨自站立在山邊，內裏佈置精細，牆壁都用毛絨包裹，亦用一張木床及少量傢具，看來是以前的獵人居所。長年生活在正山中，而沒有朋友親人，只有白雪相伴，究竟是什麼心態才能過著這樣如隱士般的生活？

在書本上閱讀到，很多的獵人為了捕獵鯨魚或其他大型海上生物，都不免要到雪山住三兩個月，然後再到附近的小鎮賣掉漁穫後才能回家。離鄉別井的行動是否他們自願；或是都為著家中生計著想？又就如船員每次出海都是以月計算，與家人分別又是否心中所願？到北極探險，在不同雪山中探索可能是很多人的夢想，但當夢想變成工作，每天必須要重複著一樣的生活，並與家人離別，這又是否探險者的心願？

到北極探險，在不同雪山中探索可能是很多人的夢想，但當夢想變成工作，每天必須要重覆著一樣的生活，並與家人離別，這又是否探險者的心願？我不知道。但我清楚自己不欲把旅遊、探險的志趣變成職業，被逼地重複進行同一動作的感覺始終不太好。到極地探索本有的「自由、奔放」感覺都沒有了，還是把它留作志趣吧，我肯定是不適合當船員或嚮導的了。

謝昀臻

經過長途跋涉，終要開始海上更長時間的旅程。我們以一個叫做曼尼蜀（Maniitsoq）的小鎮出發，所乘坐的船是一百多年前為海上探險而建造。經過了現代技術的改造，這艘船將帶領我們一路北上，開啟探險之旅。

雖然在來到這裏之前曾想像過這裏的景象，但我仍然被親眼所見的冰川、海洋所震撼。鏡頭無法捕捉自然的鬼斧神工，清勁的寒風中，我站在甲板上，愈發感到自己的渺小。

其實生命的意義在於什麼呢？我應該因生命而感恩，但如果為了生命而追求安安穩穩、平平淡淡的生活，又是否是對生命的褻瀆與浪費呢？其實最容易處的挑戰便是身體上的挑戰。如果連自己的身體都管理不好，又怎能很好地應對其他挑戰呢？這是我認同的觀點，也將是我踐行的指引。希望自己能用有限的生命接受更多的挑戰，讓生命與眾不同。

王策

進入社會大學將近十一個月的生活，在不斷為事業打基礎的同時，好像已忘記為自己留下喘息的時光……在一家工程顧問公司上班，每天與同事和電腦相處的時間比家人還要多。不過我選擇用這一年的假期去逐夢，環遊世界的夢。即使我的高中並不在香港但我亦有出國旅遊，不過也從沒有嘗試過在兩日內搭了四程飛機，由香港到杜拜轉飛哥本哈根。Then to Kangerlussuaq in Greenland, and finally Maniitsoq for boarding on boat. 這海陸空的transit, gave me an unforgettable milestone in my life. Vacation refreshes my mind. Instead of only pursuing dreams, it allows me to relax and record the true me. If I could stay in Copenhagen and Maniitsoq longer, I would ride a bike and take deep breathes to feel 'life'.

殷芷彤

當最依依不捨之時，船又回到了曼尼蜀（Maniitsoq）的碼頭。由被雪山冰塊包圍的大自然環境之中，回到了曼尼蜀（Maniitsoq）的城市之中。

沿路走上，發覺因為大風雪的關係，曼尼蜀（Maniitsoq）的面貌全都改變了。由悠閒寫意的漁港，變成白雪雪的漁港。風雪大到寸步難行，又凍又濕，格陵蘭的夏天真是……（不過平時這裏的夏天不會這樣冷的，可能又要全球暖化引起的問題？）

無論如何，今次的旅程真的很特別，在不同的時間感受到不同的天氣。有炎熱的時候，也有寒風刺骨的時候，都算是一個特別的體驗。今次連海獅肉都能吃到，我想大家都已經無憾了！

今次北極之旅同以的旅行十分不同，因為它並不是玩樂性質。除了要收拾自己的物資之外，還要顧及和預留公用裝備的位置，所以都比較緊張。

這次先到杜拜轉機再到哥本哈根，本以為旅程頭尾都有時間四處走走，可以先在機場附近未到過的地方走動看看，但原來時間並不足夠。所以都是先與朋友們到市區走動。雖然主要景點一樣，但同伴不同路線不同都有一番新景象 亦很感謝朋友們信任我的帶領=D

原來我們還想看日出，不過最後還是想去先作休息。

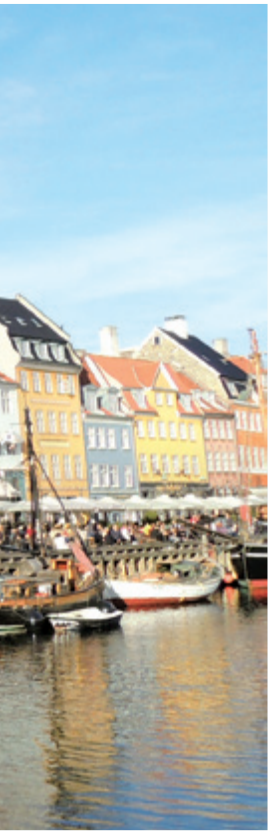
在機上我認識了一位和藹可親的老太太。我們雖然語言不通，但總算知道對方的名字和來處，更留下了聯絡方法。她更送我一條手繩，我亦在無準備之下找到一張塑膠10元港幣作為回禮。

到北極後發覺原來氣溫沒想像的冷，但冰天雪地的景是我人生第一次看見，十分難忘。沿途的當地人都十分友善，他們更主動帶我們到當地的博物館參觀。他們的生活也十分享受和快樂，是一個十分有趣的文化接觸。I'm so grateful to my teammates who always helped me when walking through slippery slopes and when the shoes lost their place. In addition, it's nice to observe the difference in the behaviours and culture of people from different backgrounds and origins. (helpful, learn a lot in how to communicate better.) P.S.與editorial team一起玩、遊覽、工作真的十分快樂，充滿歡樂和笑聲。Editorial team其實真的很幸福。

阮康穎


HONG-KONG


Your success is your answer




34-16

A Multifocal Cross Sectional Study on Physiological Responses to Acute Cold Stress in the Arctic

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Introduction

Low temperature is a known stimulant of autonomic sympathetic responses (Young, 1996a) and it may increase a person's basal sympathetic tone and impairs peripheral perfusion. When exposed to a cold environment, norepinephrine released from sympathetic nerve fibers constricts skin blood vessels and epinephrine secretion from the adrenal medulla increases thermogenesis. All human beings had physiological adaption to cold but the response varies with different parameters such as age and physical fitness (Young et al, 1996).

We had initiated a cross-sectional study aiming to further investigate whether people adapted to warm and cold areas, or have different physiological characteristics (e.g. gender, ethnicity, weight, BMI, age, exercise habits) will respond differently to the same environment in the Arctic vessel, s/v Rembrandt van Rijn (RVR).

Exposure to cold climate may cause peripheral perfusion which will cause an impact on many body functions, and may result in subnormal sensory functions, edema, increased healing time of lesions and increased risk of thrombosis. Cold-induced physiological changes

such as rise in blood pressure and pulse rate, and vasoconstriction may impose risks to people with cardiovascular and pulmonary diseases, in particular from myocardial infarction and stroke (Schneider et al, 2008).

The purpose of this study is to provide better health indications and health precautions for people living in different climates or with different physiological characteristics and health statuses traveling to cold regions.

Methods

Subjects

A total of 46 healthy subjects were recruited into our study, including our expedition team of 22 members, 7 other travellers onboard the s/v Rembrandt van Rijn, 5 crew members of the vessel, and 12 indigenous Inuit inhabitants from two towns in Greenland (Maniitsoq and Kangaamiut). In our statistical analysis, we have only included the 22 Hong Kong members and 4 crew members of the vessel who have participated twice in both Outdoor Cold Tolerance Tests.

Study Design

In this study, four variables were measured from our subjects: (1) *brachial blood pressure*, (2) *pulse rate*, (3) *capillary refill time*, and (4) *palm-to-core body temperature gradient (palm temperature and tympanic temperature were measured)*. The variables were measured for most of our targeted subjects once before the trip, once per day during the trip and once after the trip. In addition to the daily measurements, the *Outdoor Cold Tolerance Test* (OCTT) was also performed twice for our subjects on both 13th and 18th May 2015. The general structure of the test was similar to those previously done in studies on human physiological responses to cold (Purkayastha et al, 1992). In the OCTT, the subject was asked to move to an outdoor environment (e.g. deck of ship) and sit stationary with no more than 3 layers of light clothing for 3 minutes. The four variables were then measured from the subject immediately afterwards with the same clothing.

Measured Variables

Brachial Blood Pressure and Pulse Rate

Brachial Blood Pressure and Pulse Rate were measured simultaneously by an electronic oscillometric measuring device (Omron HEM-711AC Automatic Blood Pressure Monitor) with an adequate cuff size (Pickering et al, 2005). Subjects were reminded to avoid caffeine and alcohol several hours prior to the blood pressure measurement, and were required to rest for at least 8 to 10 minutes before the blood pressure reading was taken. The subject was seated with uncrossed leg, back and arm supported and the upper arm is at heart level during the measurement.

Capillary Refill Time

Capillary refill time was measured by holding the subject's hand higher than heart-level, then the distal phalanx of the index finger of the subject was squeezed between the thumb and index finger of the observer for fifteen seconds (Schriger & Baraff, 1988). The finger was then released and the time for the finger pulp to return to its baseline colour was monitored by using a mechanical watch. If there was any technical error, the measurement would be repeated at least 1 minute after the previous measurement to rule out influences from pressure and temperature changes.

Peripheral-to-core Body Temperature Gradient (palm temperature; tympanic temperature).

The palm temperature was measured by holding an alcohol-in-glass thermometer within subject's palm until the thermometer reading stabilised. The bulb of the thermometer must be held in position at the centre of the palm and was held in an upright position. The core temperature was measured by an infra-red tympanic thermometer (Braun ThermoScan 5 IRT 4520 Ear thermometer). The infra-red thermometer was inserted into the external auditory meatus by pulling the pinna backward. It was held in the same position until the beep sound was heard (Gasim et al, 2013).

Results

Differences in response to acute cold stress between the Hong Kong travellers and the acclimatised crew

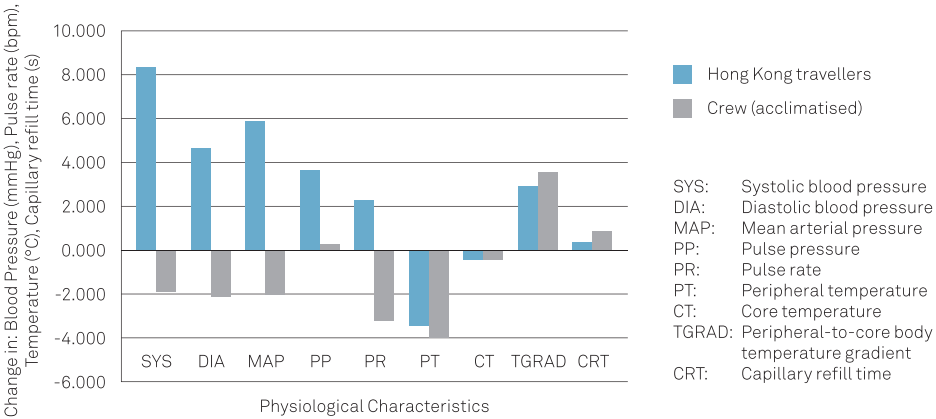

Figure 1. Bar chart comparing the average changes of physiological values in response to acute cold stress between the Hong Kong travellers and the crew onboard the RVR

From our 26 subjects who participated both the OCTTs, we found that the average change in *systolic blood pressure* (8.4±9 vs -1.9±9; p = 0.042) and *mean arterial pressure* (5.9±7 vs -2.0±7; p = 0.046) after an exposure to acute cold stress is significantly higher in the RVR passengers compared with the crew. The systolic and diastolic blood pressures had risen (positive values) on average after exposure to acute cold for the passengers, but both blood pressure had slightly decreased (negative values) on average for the acclimatised crew members. Although statistically insignificant, we spot major differences between the average increments of *diastolic blood pressure, pulse pressure* and *pulse rate* among the two groups shown in Figure 1. Changes in *peripheral temperature, core temperature, Peripheral-to-core body temperature gradient* and *capillary refill time* were generally similar among both groups.

Gender

Among the 22 Hong Kong subjects who have completed the OCTT tests, we found that male subjects had higher increments in their *mean arterial pressure* and *pulse rate* after exposure to acute cold stress. In addition, although statistically insignificant, we spot major differences between the average increments in *pulse rate, systolic pressure*, *diastolic pressure* and *pulse pressure* after an exposure to acute cold stress in our male subjects. Whereas there are no major differences for their changes in temperature values and capillary refill time among both genders.

Changes in resting physiological values in Hong Kong subjects before and after the expedition to the Arctic

Generally, the temperature values among the 20 Hong Kong subjects who had their temperature values measured 5 days before; and up to 10 days after the expedition showed only minor differences. The average core temperature of the subjects were almost the same, however, we detected the *peripheral temperature* has dropped by more than 2°C, and therefore, the *peripheral-to-core body temperature gradient* has increased (Figure 2).

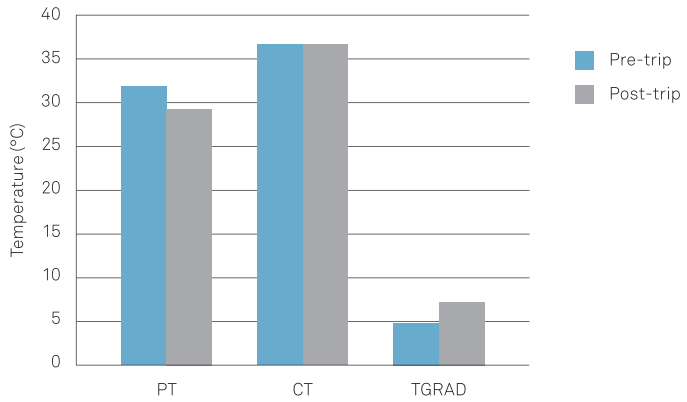

Figure 2. Bar chart comparing the resting temperature values of the Hong Kong subjects before and after the expedition.

Discussion

The findings from this study provide insights into human physiological and hemodynamic responses to acute cold stress. Specifically, we identified significant differences in the changes of physiological response to acute cold stress among the travelers and acclimatised crew, and people of different gender.

Concordant to previous studies (Young, 1996a), the acclimatised individuals have significantly dampened responses to acute cold stress compared to the Hong Kong travellers as unacclimatised counterparts. The difference in increments were statistically significant for *systolic blood pressure* ($p = 0.042$) and *mean arterial pressure* ($p = 0.046$). In unacclimatised individuals, the increase of blood pressure and pulse rate are important cardiovascular responses to cold exposure, because they provide an enhanced circulatory function and allow the increase of non-shivering thermogenesis and metabolic rate for maintaining an adequate body temperature (Sun, 2010). The four crew members took part in our study had been working in the polar regions for an average of 8.4 (3.5-16) years, and we can assume that they each experienced acclimatisation to coldness to a certain extent.

Different patterns of human cold acclimatisation have been repeatedly observed and reported (Castellani et al, 2006). The most common pattern is habituation, in which physiological responses to cold stress become less pronounced than unacclimatised individuals. The dampening of cardiovascular responses including blood pressure and pulse rate changes are signs of habituation. In addition, we also noted a small but coherent reduction in blood pressure and pulse rate values for the acclimatised crew in response to cold stress in our present study. Instead of increasing the blood pressure and pulse rate like the unacclimatised travellers, the reduction in these values indicate the crew may be experiencing a form of hypothermic habituation. This phenomenon had been reported before (Young, 1996b), which the acclimatised subjects may exhibit a more pronounced body heat than the unacclimatised. It was hypothesised that this leads to better distribution of heat in the body and decreased discomfort.

The data from our present study appears to indicate that within the Hong Kong travelers, male subjects have higher increments in blood pressure values in response to acute cold. These results presented are similar to those previously obtained (Kilgour & Carvalho, 1994).

Among several physiological variables studied in our cohort, acclimatisation and gender showed a significant independent association with acute cold stress responses. This is in agreement with findings of other studies suggesting differences in cardiovascular responses in the subjects exposed to the same degree of acute coldness.

In the present data, our Hong Kong subjects with a BMI lower than 25 tended to have a more pronounced response to acute cold stress, but not at a statistically significant level.

Conclusion

In summary, the non-acclimatised and the male travelers had larger differences in physiological variables in response to acute cold stress, compared to the acclimatised ship crew and female travelers, respectively. These results are concordant to previous studies done on Caucasian and indigenous Arctic populations.

Acknowledgments

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Conflict of interest

The authors of the study have no conflicts of interest to be declared.

Reference

Castellani J.W., Young A.J., Ducharme M.B., Giesbrecht G.G., Glickman E., & Sallis R.E. (2006) American College of Sports Medicine: American College of Sports Medicine position stand: prevention of cold injuries during exercise. *Medicine and Science in Sports and Exercise*. 8:2012–29.

Gasim, G.I., Musa, I.R., Abdien, M.T. & Adam, I. (2013) Accuracy of tympanic temperature measurement using an infrared tympanic membrane thermometer. *BMC Research Notes* 6: 194.

Kilgour R.D. & Carvalho J. (1994) Gender differences in cardiovascular responses to the cold hand pressor test and facial cooling. *Canadian Journal of Physiology and Pharmacology*. 72 (10): 1193-1199, doi:10.1139/y94-169.

Pickering, T.G., Hall, J.E., Appel, L.J., Falkner, B.E., Graves, J., Hill M.N., Jones, D.W., Kurtz, T., Sheps, S.G. & Roccella, E.J. (2005) Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Circulation* 111: 697–716.

Purkayastha S.S., Selvamurthy, W. & Ilavazhagan, G. (1992) Peripheral vascular response to local cold stress of tropical men during sojourn in the Arctic cold region. *Japanese Journal of Physiology*. 42: 877–889. doi: 10.2170/jjphysiol.42.877.

Schneider, A., Panagiotakos, D., Picciotto, S., Katsouyanni, K., Lowel, H., Jacquemin, B., Lanki, T., Stafoggia, M., Bellander, T., Koenig, W., Peters, A. & AIRGENE Study Group. (2008) Air temperature and inflammatory responses in myocardial infarction survivors. *Epidemiology* 19: 391-400.

Schriger D.L. & Baraff L. (1988). Defining normal capillary refill: variation with age, sex, and temperature. *Annals of Emergency Medicine* 17: 932-935.

Sun, Z. (2010). Cardiovascular responses to cold exposure. *Frontiers in Bioscience (Elite Edition)*, 2: 495–503.

Young, A.J., Sawka, M.N. & Kent B.P. (1996) Physiology of Cold Exposure. *Nutritional Needs in Cold and in High-Altitude Environments*. Washington, D.C. Pp. 127-147.

Young, A.J. (1996a). *Human adaptations to cold stress*. In: Shiraki, K. (Ed.), Physiological Basis of Occupational Health. SBP Academic Publishing, Amsterdam, pp. 53—67.

Young, A.J. (1996b). *Homeostatic Responses to Prolonged Cold Exposure: Human Cold Acclimatization*. In: Handbook of Physiology: Environmental Physiology, M. J. Fregly and C. M. Blatteis (Eds.). Bethesda, MD: American Physiological Society, pp. 419-438. doi: 10.1002/cphy.cp040119.

An Investigation of the Pelagic Ecology of West Greenland

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Introduction

With extreme weather condition and remote location, Greenland is known as one of the hardest region for conducting biodiversity investigations. Due to climate change, the global average temperature has increased in recent years, which caused the loss of habitats and affected the livelihood of many organisms. Especially in Greenland, the massive melting of ice sheet may deprive many polar organisms of habitats and food, although this also results massive production of plankton under sea ice (Kevin et al., 2012). Therefore, the effects of climate change on the ecology and biodiversity of Greenland is worth investigating.

Fig.1 Glacier in West Greenland

Fig.2 Research Team working on board

Fig.3 Humpback Whale observed in West Greenland

Fig.4 Mountains at Evighedsfjord

In May 2015, our research team was formed and different ecological surveys were conducted to study the ecology and biodiversity in West Greenland. Our project aims at exploring the landscape of Greenland, observing the animals' behaviours and conducting ecological surveys in different ecosystems, including tundra, rocky shore, freshwater stream and pelagic environment, to investigate the environmental parameters, habitats of organisms and species richness in West Greenland.

With respect to the pelagic studies, water samples from different depths of the sea were collected to study the presence of different types of plankton, including phytoplankton and zooplankton.

Although a humpback whale was observed and various fish samples, mainly Arctic Cod, were also collected, they are not the major concern of this survey and will not be discussed in this report. From the water samples, lots of plankton were collected. However, due to the lack of resources, accurate measurement on the biodiversity indices could not be done on board, so the findings could only be discussed qualitatively. In the followings, the pelagic ecology and the sample collected from West Greenland will be discussed.

Site Description

General Description

The pelagic study was conducted in Evighedsfjord, which is also known as Eternity Fjord, at 05:28p.m. on 15/5/2015. Evighedsfjord is a long, meandering fjord surrounded by some of the highest mountains in West Greenland. The weather was snowy and chilly and the water was freezing cold. However, arctic waters is in fact teaming with life despite the physical conditions are really extreme. Different types of phytoplankton and zooplankton were being collected and several types of arctic cod were also found in Evighedfjord.

Environmental Parameters

The GPS coordinates of the location where the sampling was started and terminated were 65°57.620N/52°11697W and 65°57.630N/52°11.669W respectively. The air temperature, humidity and Secchi depth was 2.42°C, 53.60% and 5.5m respectively. For light intensity, it started from 430.8µmol photons m-2S-1 and ended with 239.4µmol photons m-2S-1, and UV254nm, UV300nm and UV365nm were recorded as 0 µWcm-2, 30 µWcm-2 and 40 µWcm-2 respectively. From the data provided by vessel crew, the water depth of that region of sea was about 520m, and white horse waves were observed at the sea surface. The prevailing wind direction was from south to north with wind speed of 3.9ms-1 and the current was quite strong on the day of sample collection.

Methodology

In order to study the pelagic system of West Greenland, water samples at different depths were collected by using two types of plankton nets, which are phytoplankton net and zooplankton net. Both types of plankton nets share the same mechanism of plankton sampling. The plankton nets are composed of a nylon mesh net on top with a sample collection bottle at the bottom. When the net is lowered to a designated depth, plankton will be collected by hauling the net slowly through the column, and then be collected into the sample collection bottle.

The structure of a simple plankton net is given in Fig. 7. With different mesh sizes, plankton with different sizes will be collected.

(Olympic Region Harmful Algal Bloom [ORHAB] Partnership, 2002)

Fig.5 Arctic Cod caught from Evighedsfjord

Fig.6 Release of zooplankton net into the sea

Fig.7 Structure of a plankton net

Fig.8 Zooplankton net connected with the modified fishing rod

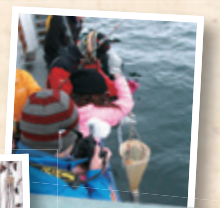

Fig.9 Collection of the zooplankton net

For phytoplankton sampling, a phytoplankton net with a mesh size of 80μm was used. It was hauled from 4m deep to the water surface, and 800mL of plankton sample was collected. While for zooplankton sampling, a zooplankton net with a mesh size of 125μm was used. It was hauled from 450m deep to the water surface, and 940mL of plankton sample was collected. In order to release the zooplankton net to 450m deep, a fishing reel (Penn International II 50 SW) was modified and coupled with a strengthened fishing line so as to reduce the weight of the gear while allow easy manipulation of the zooplankton net.

When the plankton nets were taken out from the sea, sea water was poured from outside the net to wash the plankton that attached on the net into the collection bottle at the bottom. The water samples collected were then poured into a large washbowl for the measurement of various environmental parameters and the collection of plankton sample.

As this is an only qualitative study of the presence of different types of plankton in the Arctic Ocean, rather than preserving the whole sample for the calculation of biodiversity indices, plankton samples were carefully selected and persevered with formalin for identification later.

Fig.10 Washing of the zooplankton net

Fig.11 Pouring of the plankton sample collected

Fig.12 Plankton sample collected

Fig.13 Water and plankton samples collected at different sea depths

Apart from sample collection from plankton nets, water samples at different depths (0m, 10m, 20m, 30m, 40m, 50m deep respectively) were also collected with a water sampler for the measurement of various environmental parameters, including temperature, dissolved oxygen, pH and salinity. These measurements help draft and analyse the condition of the living environment of the plankton, so that we could predict the types of plankton that can be found in the selected region. It also helps the identification of plankton samples collected at later stage.

Results and Discussion

Plankton Identification

For sample collected from the phytoplankton net, two groups of organisms, diatom and crustaceans, were observed, and diatoms were found to be the dominant organisms in the sample. Photomicrographs of diatoms are given in Figure 14a and 14b below.

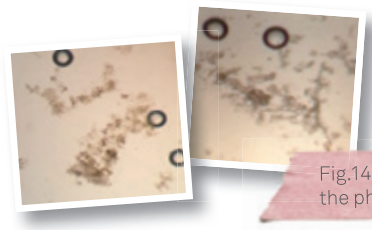

Fig.14 Diatoms collected in the phytoplankton net

While for sample collected from the zooplankton net, four groups of organisms, including diatoms, dinoflagellates, copepods and crustaceans, were observed. Sample photomicrographs of the various groups of organisms are given in Figure 15 to 18 below.

Fig.15 Diatoms collected by zooplankton net

Fig.16 Dinoflagellate collected by zooplankton net

Fig.17 Copepod collected by zooplankton net

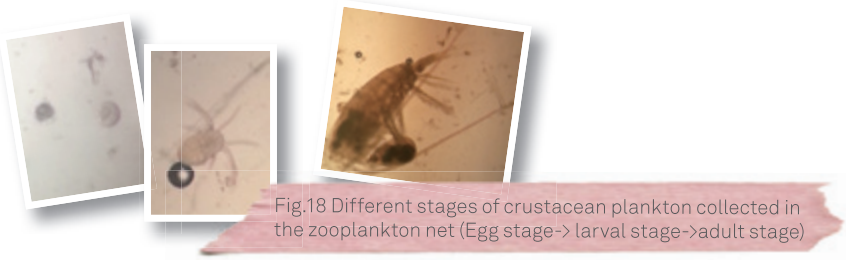

Fig.18 Different stages of crustacean plankton collected in the zooplankton net (Egg stage-> larval stage->adult stage)

Although the zooplankton net is designed for collecting zooplankton with size bigger than 125μm, which is the mesh size of the net, some phytoplankton, in particular the colonial forms, can still be collected as they are large enough to be retained by the zooplankton net. Interestingly, many fragments of faecal pellets were also found from the sample collected. They are believed to be the waste products of the zooplankton and some small marine organisms, which can be largely found at the depth where the zooplankton net was hauled from. Samples of faecal pellets collected were given in Figure 19 below.

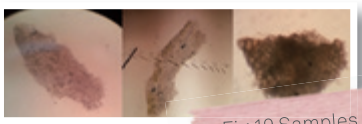

Fig.19 Samples of faecal pellets collected in the zooplankton net

Since some of the samples had already been decayed or broken into fragments during the time of transportation and storage, most of the plankton collected are not able to be identified and classified to species level, but only to the major types of plankton concerned. Besides, as the current was very strong on that day, although the zooplankton net was released for 450m, due to the inclination of the fishing line linking to the plankton net, it may not be the actual depth from which the net was hauled. Thus, some of the desired types of zooplankton was not found, but only plankton that lives in the shallower level of the sea.

As observed, the plankton samples collected could all be found in Hong Kong's pelagic environment. Although Arctic water is cooler and the condition is more extreme than Hong Kong sub-tropical environment, life forms living there could actually be really diversified. Groups of zooplankton and phytoplankton that are found in sub-tropical regions can also survive and were being found in the Arctic. Therefore, Arctic water is, in fact, teaming with live. However, this study is conducted in early summer of the Arctic region, not much organisms could be observed, as the biodiversity of the Arctic had not reach the fullest yet. Further study is required to thoroughly investigate the biodiversity in the pelagic environment in Greenland.

Analysis of Environmental Parameters

Apart from identifying the plankton samples collected, various environmental parameters, including temperature, dissolved oxygen, salinity and pH value were also analysed. The physical and chemical parameters recorded from water samples collected at different depths are given in Table1 and Figure 20 below.

Table 1 Environmental parameters of water samples collected at different depths

Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Salinity (‰)
0	2.00	8.80	8.14	42.50
10	1.20	9.02	8.05	43.80
20	0.75	8.90	8.2	44.00
30	1.00	8.35	7.88	44.00
40	0.50	9.57	7.75	44.00
50	0.10	9.37	7.84	44.00

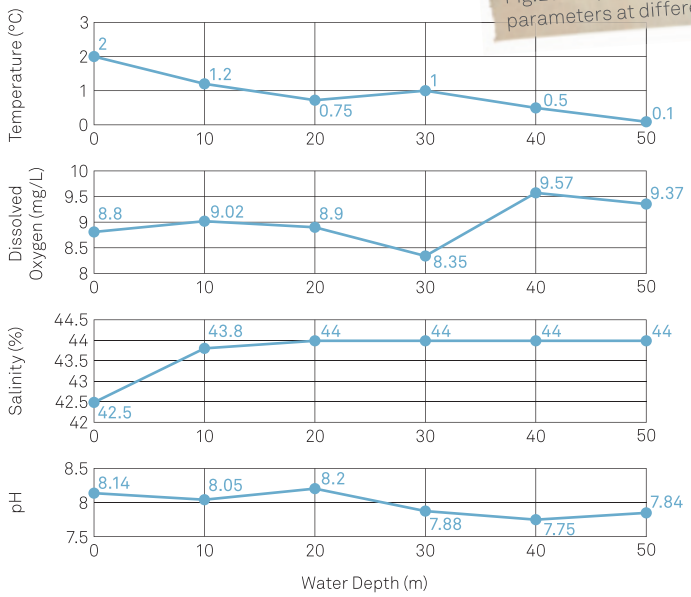

Fig.20 Graphs of environmental parameters at different water depth

1. Temperature

   For temperature, it is observed that the water temperature decreased with increasing water depth. According to Fig. 20, the water temperature continuously dropped from 2°C at 0m to 0.1°C at 50m. It is due to the reduced heat energy input with increasing distance from the Sun, which is the main heat source of the sea water.

2. Dissolved Oxygen

For dissolved oxygen, it was observed that the dissolved oxygen keeps fluctuating with increasing water depth. Although its trend was slightly different from expected, it is still acceptable. Overall, the dissolved oxygen increased from 8.8mg/L at 0m to 9.37mg/L at 50m (Fig. 20). In general, the dissolved oxygen in upper pelagic region will fluctuate with a tendency of decreasing due to consumption of dissolved oxygen by living organisms and oxidation of organic matter, an oxygen minimum layer exists in ~1 km below the surface (Grippo, 2010).

However, as the dissolved oxygen meter used is found to be out of order on the day of measurement, the data recorded may be not accurate enough to draw a valid conclusion.

3. Salinity

For salinity, it was observed that the salinity increased with water depth. According to Fig. 20, with increasing depth, the salinity increased from 42.5‰ at 0m to 44.0‰ at 20m, and remain constant at 44.0‰ from 20m to 50m. The salinity increased with depth because saltier water is denser, and it will sink at the deeper region of the sea (Ocean Water Properties. University of Rhode Island), so that the salinity of deep water will be higher than that of surface water.

4. pH Value

For the pH value, it was observed that the pH value remains steady at about pH 8.0 with increasing water depth. Theoretically, sea water is slightly alkaline with a pH value of about 8.2 (Feely et al., 2004). However, due to the significant increase of anthropogenic activities, carbon dioxide released from these activities had also increased substantially, so as those absorbed by the oceans. Thus, the pH value of sea water is found to be decreasing in recent years. This phenomenon is also known as ocean acidification (Feely et al., 2004).

As shown in Fig.20, although, generally, the pH value decreased 8.14 at 0m to 7.84 at 50m, its average remains at pH 8.0, which is still a normal pH. The decrease in pH value with increasing depth could be due to the progressive oxidation of organic materials with increasing depth. From

the oxidation of organic matters, carbon dioxide (CO_2), water and heat are produced as the major products. Carbon dioxide formed will then be dissolved into the sea water and form carbonic acid (H_2CO_3), which will make the sea more acidic and decrease the pH value of sea water.

Although there is a decrease of pH with increasing depth, the difference is really slight and the pH value obtained is still within the normal range of pH 7.5-pH 8.4. Thus, no significant effect of ocean acidification on the Arctic Ocean is observed.

As we have conducted limited sampling trials and only sampled water at a maximum of 50m, there was insufficient data on the environmental parameters to illustrate the impacts of climate change on the pelagic system of the Arctic Ocean comprehensively. Besides, due to the environmental restrictions and the lack of equipment, many of the measurements could not be done on board. This made it hard to conduct a quantitative study on the biodiversity indices of the pelagic system. Therefore, organismic samples collected were only identified and recorded, but not for calculating the biodiversity indices. While for the environmental parameters, as the data is insufficient, they could only be used for describing the condition of habits of the plankton samples collected preliminarily. More measurements have to be done in order to thoroughly understand the pelagic ecology of West Greenland.

Conclusion

In this investigation, different ecological surveys, like measurement of environmental parameters and collection of different organismic samples, were conducted to study the ecology and biodiversity of the pelagic environment in West Greenland.

Water samples from different depth were collected to study the environmental parameters and the effects of the changes of these parameters on the organisms and the production of the Arctic Water. It was observed that with increasing depth, both temperature and pH value of the water had decreased, while the dissolved oxygen and salinity had increased. These changes on the environmental parameters can all benefit to the increase of the production of the Arctic water.

Besides, different plankton samples were also collected to study the types of plankton that could be found in West Greenland. On the whole, many types of plankton were found, including diatoms, dinoflagellates, copepods and crustaceans. Most of these groups of plankton could also be found in Hong Kong's pelagic environment. Although the condition of Arctic water is more extreme than those of sub-tropical regions, like Hong Kong, lots of organisms, like different group of plankton and whales were still being found in the pelagic environment. Thus, the pelagic environment of West Greenland is, in fact, very biodiverse and teaming with live.

With the ever-increasing anthropogenic activities, inevitably, incalculable damages had already been done on our invaluable mother nature. From this pelagic study, fortunately, no significant effect of climate change on the Arctic Ocean is identified. However, as this is only a preliminary study on the Arctic pelagic system, a more extensive research has to be conducted to investigate the impacts thoroughly.

Climate change might have brought numerous remarkable impacts on the environment of Greenland already, which may not be realized by us who are lived half globe apart. There is every reason why we have to join hands and work for the benefits of our nature and those irreplaceable creatures. With the contributions from all sectors in reducing human impacts on the environment, a ray of light has come and our harmonious and sustainable relationship with the nature can be built.

References

Feely, R.A., Sabine, C.L., Lee, K., Berelson, W., Kleypas, J., Fabry, V. J., Millero, F. J. (2004). Impact of Anthropogenic CO_2 on the $CaCO_2$ System in the Oceans. Science, 305(5682), 362-366. doi: 10.1126/science.1097329.

Grippo, A. (2010) Elements of Oceanography, part 1: Oxygen and Nutrients. Retrieved 24 September, 2015 from http://homepage.smc.edu/grippo_alessandro/oce1.html

Kevin, R. A., Perovich, D.K., Pickart, R.S., Brown, Z.W., van Dijken, G.L., Lowry, K.E., Mills, M.M., Palmer, M.A., Balch, W.M., Bahr, F., Bates, N.R., Benitez-Nelson, C., Bowler, B., Brownlee, E., Ehn, J.K., Frey, K.E., Garley, R., Laney, S.R., Lubelczyk, L., Mathis, J., Matsuoka, A., Mitche, B.G., Moore, G.W.K., Ortega-Retuerta, E., Pal, S., Polashenski, C.M., Reynolds, R.A., Schieber, B., Sosik, H.M., Stephens, M. and Swift, J.H. (2012). Massive Phytoplankton Blooms under Arctic Sea Ice. Science, 336(6087), 1408. doi: 10.1126/science.1215065.

The Olympic Region Harmful Algal Bloom (ORHAB) Partnership. (2002). Education. Retrieved 28 July, 2015, from http://www.orhab.org/education.html

Ocean Water Properties. (n.d.). University of Rhode Island. Retrieved 24 September, 2015, from http://www.hurricanescience.org/science/basic/water/

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I love you all~

Veronica

Appendix

Arctic Pelagic Plankton Study Data sheet

Recorder: Regina
Date: 15/5/2015
Time: 05:28p.m.

General Information
Location: Evighedsfjord (Eternity Fjord)
GPS: (Start) 65°57.620N / 52°11.697W (End) 65°57.630N / 52°11.669W
Air Temperature: 2.42°C **Humidity:** 53.60% **Visibility:** 5.5m
Light Intensity: (Start) 430.8μmol photons $m^{-2}S^{-1}$ (End) 239.4μmol photons $m^{-2}S^{-1}$
UV: (254nm) 0μW cm^{-2} **(300nm)** 30μW cm^{-2} **(365nm)** 40μW cm^{-2}
Total Water Depth: 520m
Water Waves: Medium (Observation: White Horse)
Wind Direction: From South to North
Wind Speed: 3.9m/s

Environmental Parameters

Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Salinity (‰)
0	2.00	8.80	8.14	42.50
10	1.20	9.02	8.05	43.80
20	0.75	8.90	8.2	44.00
30	1.00	8.35	7.88	44.00
40	0.50	9.57	7.75	44.00
50	0.10	9.37	7.84	44.00

Sampling of Zooplankton
Sampling Depth: 450m
Sample Volume: 940mL
Subsample Volume: 25mL

Sampling of Phytoplankton
Sampling Depth: 4m
Sample Volume: 800mL

Changes in personality, coping strategies, self-efficacy and self-reported skills after a One-week Arctic Expedition Trip

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Abstract

Previous study has found that outward bound activities and arctic expedition trips could bring participants positive improvements in different skills and personality dimensions. The purpose of the current study is to investigate whether short-term trips in wilderness could also bring positive effects in students' development. Personality, coping, self-efficacy and specific skills were assessed in a 7-day-long arctic expedition trip. Twelve undergraduate participants participated in this study and finished all pre-expedition, post-expedition and follow-up questionnaires. Wilcoxon Signed Rank Test results revealed significant improvements only in several self-reported personal and biodiversity skills. Analysis in personality, coping and self-efficacy measures indicated no significant improvement. Lack of significant positive change could be explained by small sample size and the insufficiencies of the current trip.

Introduction

There is a common belief that stressful challenges and outdoor activities could bring positive psychological and developmental changes on students. There is also an increasing number of literature providing evidence for the benefits of Outdoor Bound and Adventure Education activities. High school Outward Bound activities were found to foster the development of students' stress coping repertoire (Neil & Heubeck, 1998), help students to gain a more realistic view of own strengths and weaknesses (Kaplan, 1974) and enhance self-esteem of the participants over time (Kafka et al., 2012). In a meta-analysis of 96 studies of adventure programs, Hattie et al. (1997) concluded that the major benefits of adventure programs include: independence, confidence, self-efficacy, self-understanding, assertiveness, internal locus of control and decision making. These benefits were long-lasting and correlated positively with the length of the adventure program. These studies provided a foundation for the development of adventure programs and outward bound activities in education.

Some adventure programs or expeditions incorporated elements of wilderness and aimed to elevate possible benefits on personal development. Thirty years ago, Hendee and Roggenbuck (1984) reported 417 colleges and universities that offered wilderness-related courses. In a literature review of 186 research studies about the use of wilderness element, Moore and Russell (2002) concluded that wilderness elements in programs could enhance participants' self-esteem and sense of control. A study revealed that school-aged students became more ascendant, emotionally stable, sociable and responsible after a six-week expedition trip that required students to climb and trek in high altitude (Watts et al., 1992).

The Arctic region has become a popular destination for adventure learning because of its novelty, extremity and challenges. Studies with adult subjects revealed that polar expedition brought long-term improvements in individual functioning and interpersonal

relationships by enhancing coping strategies and self-esteem (Palinkas & Suedfeld, 2008). In a 6-week expedition trip to East Greenland in the Arctic Region, 70 young adults (aged 16 to 20) were found to have improved personal, social and technical skills after the Arctic expedition trip (Stott & Hall, 2003).

Most adventure or expedition programs investigated are long trips that last for weeks. In many cases, long trips are not feasible for many education institutions. Resources used in organizing a long trip could be divided for making several short trips; however, there are only few attempts in this research field showing the benefits of short-term expedition trips on students. The aim of the current research is to provide more empirical evidence on possible psychological changes (benefits and drawbacks) in short-term expedition trips (one-week long). The study is more exploratory in nature, so several psychological measurements were tested at the same time: personality, stress coping, self-efficacy and self-reported skills. Although the sample size of this study was inevitably small, this study is still valuable for its uniqueness.

Method

Subjects

The arctic expedition team consisted of 3 expedition leaders, 1 college professor, 1 college staff and 17 expedition participants (16 undergraduates and 1 college graduate, aged 18-24). The participants volunteered to join the expedition trip and were selected by written application and a college interview. The college graduate and the experimenter were excluded from this research. The remaining 15 subjects are Chinese; 9 are male and 6 are female. The ages range from 19 to 23 (Md = 21). Their majors include: English Language, Chinese Language and Literature, Biology, Environmental Science, Earth System Science, Computer Science, Medicine (Global), Chinese Medicine, Law, Journalism and Communication, Psychology and Integrated Business Administration. The subjects were divided into

the research team (n = 10) and the editorial team (n = 5). The research team members need to complete an individual research related to the expedition and take part in a biodiversity research organized by the college professor; the editorial team need to record and take photographs during the expedition. Before the expedition, all of them were given briefings about the Arctic environment, safety measures, biodiversity research skills and expedition equipment they need for the trip. Only one of the subjects had prior expedition experience.

All of the subjects consented to participate in the study. Twelve out of 15 subjects finished all questionnaires including the 30-days follow-up questionnaire. Only the twelve subjects who finished all questionnaires were analyzed in this study. Basic information of the experiment subjects were presented in Table 1.

Table 1 Basic Information of Experiment Subjects

	Research Team	Editorial Team
Number of subjects	8	4
Number of males	5	2
Number of females	3	2
Age	M = 20.13, SD = 1.13	M = 21.50, SD = 1.29

Expedition

The arctic expedition trip lasted for 7 days (excluding days travelling to Greenland). Subjects were living on a ship for the whole trip. The ship set sail in Maniitsoq (Day 1); then sailed to different places in Greenland: Narssaq (Day 2), Sermitsiaq Glacier (Day 3), Sammisoq (Day 4), Kangaarmiut (Day 5), Niaqoenaata Qulaa (Day 6) and Sermilinguaq Fjord (Day 7). All subjects joined the ice-trekking activity on day 2. Subjects in the research team had been doing biodiversity research from day 2 to day 6. Research team members measured parameters and counted species numbers either on board (from water sample) or on land. Subjects in the editorial team took photos and recorded videos for the whole trip.

Measures

The personality measure administered was the *Revised NEO Personality Inventory* (NEO PI-R; Costa & McCrae, 1992). The NEO PI-R consists of 240 items in a 5-point Likert scale format, ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The questionnaire can assess 5 high-order personality domains: Neuroticism (tendency to experience negative affects), Extraversion (sociability, dispositional optimism, excitement-seeking and preference of gatherings), Openness (imagination, aesthetic sensitivity, curiosity, and unconventionality), Agreeableness (altruism, sympathy, trust and cooperativeness) and conscientiousness (control of impulses, self-control, and determination). Each domain could be further divided into 6 facets. According to Costa and McCrae (1992), the alpha coefficients of the personality domains range from 0.86 to 0.92.

The *Coping Strategies Inventory* (CSI; Tobin et al., 1989) is a 72-item questionnaire assessing coping thoughts and behaviors in stressful events. Subjects are required to describe a specific stressful event. Subjects then need to indicate in what extent the statements happened in the described event: from 0 (never) to 4 (very much). There are eight primary subscales: Problem Solving (eliminating stressor by behaviorally changing the stressful event), Cognitive Restructuring (changing the meaning of the stressful event; viewing from a new positive perspective; positive reappraisal), Social Support, Express Emotions, Problem Avoidance (denial of stressor), Wishful Thinking (wishing things to get better), Self Criticism and Social Withdrawal. According to Tobin et al. (1989), the internal consistencies of the primary scale factors range from 0.71 to 0.94 (m = 0.83).

The *General Self-efficacy scale (GSES) - Chinese version* (Schwarzer et al., 1997) is a 10-item scale measuring self-efficacy as a general personality disposition. Responses follow a 1-to-4 Likert scale format. The alpha coefficient of the Chinese version is 0.91. Construct validity is supported by correlations with other constructs including depression, anxiety and optimism.

The *Skill Evaluation Questionnaire* was a 29-item self-report questionnaire designed after interviewing the expedition leaders and the college professor about the important skills needed for the expedition trip. The skills mentioned were grouped into four categories: Personal skills (12 items); Social skills (7 items); Expedition skills (4 items) and Biodiversity Research skills (6 items). Subjects evaluate whether the statements correctly describe themselves. Each statement is rated on a 5-point Likert scale. The items included in the questionnaire are presented in the *Appendix*.

Procedures

Subjects (n = 12) first completed a set of *pre-expedition questionnaire* before the expedition, while waiting for flight in the airport. The pre-expedition questionnaire consists of NEO-PI-R, CSI, GSES and the Skill Evaluation Questionnaire. In the CSI questionnaire, subjects were instructed to describe a stressful event in the past month. Data collected in pre-expedition stage represent personality, coping strategies, self-efficacy and skills of the subjects before intervention.

Subjects completed a set of *post-expedition questionnaire* after the expedition, while waiting for flight in the airport back to Hong Kong. The post-expedition questionnaire is the same as the pre-expedition questionnaire, except that the subjects were required to describe a stressful event during the expedition trip for the CSI part. Data collected in this stage could be used to compare with pre-expedition data to reveal possible short-term changes in different constructs.

Thirty days after the expedition, subjects completed an online *follow-up questionnaire* which is identical to the pre-expedition questionnaire. An online version was used because some subjects had gone aboard and could not be reached. Data collected could be used to compare with pre-expedition data for the analysis of long-term changes in constructs.

Results

To examine changes in personality, coping, self-efficacy and skills after the expedition, paired sample T test and repeated measures ANOVA could be used; however, the sample size of this study is too small (n = 12) for running parametric analyses. Pre-expedition, post-expedition and follow-up datasets may not appear to be normal distributions. More conservative nonparametric tests should be used to compensate the problem of small n. Wilcoxon Signed Rank Test is a nonparametric test which can be used to compare two dependent samples. The test was used to compare results between pre-expedition questionnaire and post-expedition questionnaire (short-term effect; ST effect), and between pre-expedition questionnaire and the follow-up questionnaire (long-term effect; LT effect).

As research team (n = 8) and editorial team (n = 4) have different aims and works during expedition, the data set of both teams should also be analyzed separately. Due to extremely small n, editorial team results yield no significance in all constructs and measurements. Only general (research and editorial combined) and research team results are presented in this study. Research team results are presented to provide more possible significant results without data of editorial team which is the minority group in this expedition. There is no intention to compare changes in research team against changes in the editorial team.

Personality characteristics (NEO-PI-R)

NEO-PI-R results of the subjects were transformed into T scores before analysis.

Pre-expedition NEO-PI-R results indicated that the subjects in this study were not in general well-adjusted in terms of NEO-PI-R domains before expedition. Subjects score relatively high in neuroticism (Md = 59.5), relatively low in agreeableness (Md = 41.5) and conscientiousness (Md = 39.5), and average in extraversion (Md = 52) and openness (Md = 52). Some individuals even scored 77 (very high) in neuroticism or 25 (very low) in agreeableness. Pre-expedition NEO-PI-R results are presented in Table 2.

NEO-PI-R general comparison results are presented in Table 3. Results showed no significant short-term and long-term paired difference in all NEO-PI-R personality domains; the personality domains are quite stable across the expedition.

Table 4 presents comparison results specific to the research team. Results show that there is a significant long-term decrease in openness ($Z = -2.38$, $p < .05$, $r = 0.69$) by comparing pre-expedition (Md = 52) and follow-up questionnaire (Md = 51) results; however, according to Table 3, decrease in openness only approaches significance in the general sample. Research team results also reveal a short-term increase in neuroticism that approach 5% significance.

Table 2 Central Tendency Measures of Pre-Expedition NEO-PI-R Domain scores

	NEO-PI-R Questionnaire Domains				
	N	E	O	A	C
M^	61.17	52.75	53.58	38.42	41.58
SD	8.10	9.39	5.38	9.67	11.27
Md^	59.5	52	52	41.5	39.5
Min.^	48	37	46	25	20
Max.^	77	59	62	48	61

Note: N = neuroticism; E = extraversion; O = openness;
A = agreeableness; C = conscientiousness.
^ Scale scores are T scores.

Table 3 Short-term and Long-term Changes in Domains of NEO-PI-R (General)

NEO-PI R Domains	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
N	61.17[#] (8.10)	63.17 (9.87)	60.25 (6.68)	-1.26[b]	.21	-.45[a]	.66
E	52.75 (9.39)	52.67 (6.54)	52.33 (6.81)	.00[c]	1.00	-.36[a]	.72
O	53.58 (5.38)	53.92 (6.97)	51.33 (6.20)	-.67[b]	.51	-1.83[a]	.07
A	38.42 (9.67)	37.92 (8.35)	37.75 (8.71)	-.46[a]	.65	-.27[a]	.79
C	41.58 (11.27)	40.08 (9.18)	42.08 (9.34)	-.62[a]	.53	-.12[b]	.91

Note: N = neuroticism; E = extraversion; O = openness; A = agreeableness; C = conscientiousness.
ST = short-term difference (After-Before comparison); LT = long-term difference (Follow-up-Before comparison)

[a] Based on positive ranks [b] Based on negative ranks [c] Sum of negative ranks equals to the sum of positive ranks
[#] Scale scores are T scores.

Table 4 Short-term and Long-term Changes in Domains of NEO-PI-R (Research)

NEO-PI R Domains	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
N	61.75[#] (9.91)	65.13 (11.66)	58.63 (7.39)	-1.75[b]	.08	-.1.27[a]	.20
E	50.62 (7.41)	52.25 (5.37)	51.13 (6.06)	-1.27[b]	.20	-.11[b]	.92
O	53.13 (6.24)	52.50 (8.16)	50.13 (7.02)	-.21[a]	.83	-2.38[a]	.017*
A	40.00 (8.38)	39.12 (6.77)	38.88 (7.20)	-.49[a]	.62	-.59[a]	.55
C	40.75 (13.75)	37.25 (10.12)	41.38 (11.27)	-1.35[a]	.18	-.28[b]	.78

Note: N = neuroticism; E = extraversion; O = openness; A = agreeableness; C = conscientiousness.
ST = short-term difference (After-Before comparison); LT = long-term difference (Follow-up-Before comparison)

[a] Based on positive ranks [b] Based on negative ranks [c] Sum of negative ranks equals to the sum of positive ranks
[#] Scale scores are T scores.
* $p < .05$

Coping Strategies (CSI)

Before the expedition, coping strategies that were most frequently used include: Problem Solving (Md = 22.5), Social Support (Md = 22.5), Cognitive Restructuring (Md = 22.0) and Wishful Thinking (Md = 22.0). Results indicate that subjects tend to cope with stress by solving the problem directly, seeking for emotional support, positively reappraising the situation and sometimes by making wish. Pre-expedition CSI primary factor scores are presented in Table 5.

Table 5 Central Tendency Measures of Pre-Expedition CSI Primary Factor scores

	Coping Strategies Inventory (CSI) Factors							
	PS	CR	EE	SS	PA	WT	SC	SW
M^	23.50	23.63	17.88	17.88	17.63	22.25	22.00	21.13
SD	5.18	3.42	5.64	7.88	7.61	7.54	9.64	5.25
Md^	22.5	22.0	18.0	22.5	16.5	22.5	17.0	17.5
Min.^	18	20	11	6	4	12	10	14
Max.^	33	29	25	26	27	32	35	30

Note: PS = problem solving; CR = cognitive restructuring; EE = express emotions; SS = social support; PA = problem avoidance; WT: wishful thinking; SC = self-criticism; SW = social withdrawal.

^ Scale scores are raw scores (sum of nine 0-to-4 Likert scale responses), not T scores. Scale scores could range from 0 (strategy not used) to 36 (strategy used in a greatest extent).

The CSI comparison results of all subjects is given in Table 6; while the results specific to the research team is given in Table 7. There is no significant difference in using the CSI coping strategies in different time. The increase in the use of Express Emotions and Social Support approached significance in the research team sample. These increases can possibly reach significance if a larger sample was used.

In the post-expedition questionnaire, subjects were asked to describe a stressful event during the expedition. Seven out of 12 subjects (58.33%) described a stressful event related to the biodiversity fieldtrip: 4 out of 12 subjects (33.33%) mentioned the night fieldtrip at freshwater river in day 6; 3 out of 12 subjects (25%) mentioned about difficulties in cooperating with the college professor during biodiversity fieldtrips. Some of the descriptions are presented below:

Subject F01 (Editorial)	*Demand on Editorial work* ...Taking photos for professor's research is really stressful... we need to take very clear pictures in order to identify them... we need to do it quick with quality under cold weather...If we finish fast, we could get rid of the cold weather...
Subject F02 (Research)	*Night Fieldtrip in Day 6* ...The research study at night! It was 9:30 and a stormy, windy night. I couldn't even stand straight. There was no light and heat. We were asked to put bare hands into iced water and count the worms and plants. I even caught a cold. Well, but we finally really experienced "Arctic" weather in this trip. It was memorable...
Subject M01 (Research)	*Night Fieldtrip in Day 6* ...The midnight fieldtrip at freshwater river. Storm and strong wind...chill while working... We just have to do as fast as possible so that we can leave earlier... Just cooperate better with others...
Subject M08 (Research)	*Communication with Teammates* Sometimes it is hard to communicate with our leader... We worked with low efficiency during fieldtrips. We didn't have enough communication... lack of team spirit.... Just talk to others about what I concerned of. They understood me, especially for the communication problems with the leaders...

The coping strategies that subjects frequently used before expedition could also be identified in these descriptions; they used Problem Solving, Cognitive Restructuring and Social Support as coping strategies in a stressful event during expedition. Subject F01 and subject M01 tried to accomplish the work fast in order to get rid of the cold stressor (Problem Solving). Subject F02 reappraised the stressful night fieldtrip as an experience of Arctic weather which is "memorable" (Cognitive Restructuring). Subject M08 expressed his own emotions to his teammates when he found the team poor-functioning (Social Support; Express Emotions).

Table 6 Short-term and Long-term Changes in CSI Coping Strategies (General)

CSI Strategies	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	p (2-tailed)	LT (Z)	p (2-tailed)
Problem Solving	23.92[#] (5.14)	22.25 (4.67)	20.33 (8.22)	-.71[a]	.48	-.62[a]	.53
Cognitive Restructuring	22.08 (4.76)	24.25 (7.23)	20.58 (7.79)	-1.22[b]	.22	-.98[a]	.33
Express Emotions	18.42 (5.45)	21.50 (6.35)	20.17 (7.36)	-1.38[b]	.17	-1.34[b]	.18
Social Support	20.00 (7.73)	24.92 (6.73)	19.50 (7.62)	-1.37[b]	.17	-.28[a]	.78
Problem Avoidance	15.75 (7.01)	18.83 (6.53)	14.67 (9.33)	-1.03[b]	.30	-.10[a]	.92
Wishful Thinking	22.83 (6.44)	22.83 (5.59)	21.83 (6.04)	.00[c]	1.00	-.51[a]	.61
Self Criticism	21.67 (9.34)	15.08 (9.82)	20.08 (10.75)	-1.69[a]	.09	-.36[a]	.72
Social Withdrawal	18.33 (5.97)	15.33 (6.89)	16.58 (8.21)	-1.02[a]	.31	-.12[a]	.91

Note: Strategies listed are primary subscales of CSI.
ST = short-term difference (After-Before comparison); LT = long-term difference (Follow-up-Before comparison)
[a] Based on positive ranks [b] Based on negative ranks [c] Sum of negative ranks equals to the sum of positive ranks
[#] Scale scores are raw scores (sum of nine 0-to-4 Likert scale responses), not T scores. Scale scores could range from 0 (strategy not used) to 36 (strategy used in a great extent).

Table 7 Short-term and Long-term Changes in CSI Coping Strategies (Research)

CSI Strategies	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
Problem Solving	23.50[#] (5.18)	23.13 (3.94)	23.63 (4.03)	-.17[a]	.87	-.08[b]	.93
Cognitive Restructuring	23.63 (3.42)	25.88 (4.91)	22.63 (5.68)	-1.19[b]	.23	-.42[a]	.67
Express Emotions	17.88 (5.64)	23.75 (1.98)	19.88 (6.73)	-1.95[b]	.05	-1.41[b]	.16
Social Support	17.88 (7.88)	26.00 (6.41)	19.00 (8.82)	-1.82[b]	.07	-.81[b]	.42
Problem Avoidance	17.63 (7.61)	21.38 (5.58)	16.38 (9.81)	-.85[b]	.40	-.17[b]	.86
Wishful Thinking	22.25 (7.54)	24.50 (5.68)	22.25 (5.01)	-.84[b]	.40	-.14[b]	.89
Self Criticism	22.00 (9.64)	16.63 (11.62)	21.25 (8.41)	-1.13[a]	.26	.00[c]	1.00
Social Withdrawal	21.12 (5.25)	16.88 (6.90)	19.00 (7.84)	-1.12[a]	.26	.00[c]	1.00

Note: Strategies listed are primary subscales of CSI.
ST = short-term difference (After-Before comparison); LT = long-term difference (Follow-up-Before comparison)
[a] Based on positive ranks [b] Based on negative ranks [c] Sum of negative ranks equals to the sum of positive ranks
[#] Scale scores are raw scores (sum of nine 0-to-4 Likert scale responses), not T scores. Scale scores could range from 0 (strategy not used) to 36 (strategy used in a great extent).

General Self-efficacy (GSES)

Self-efficacy was assessed by the Chinese version of General Self-efficacy Scale. The comparison results based on the general and the research sample are given in Table 8. There is no significant change.

Table 8 Short-term and Long-term Changes in General Self-efficacy

	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
GSE							
General	28.83[#] (4.41)	27.75 (5.41)	29.92 (3.42)	-1.07[a]	.29	-1.10[b]	.27
Research	27.88 (2.03)	26.88 (5.41)	29.25 (2.49)	-.51[a]	.61	-.94[b]	.35

Note: GSE = general self-efficacy. ST = short-term difference (After-Before comparison); LT = long-term difference (Follow-up-Before comparison)
[a] Based on positive ranks [b] Based on negative ranks
[#] Scale scores are raw scores (sum of ten 1-to-4 Likert scale responses), not T scores. Scale scores could range from 10 (lowest self-efficacy) to 40 (greatest self-efficacy).

Skill Evaluation

There are 4 sections in the skill evaluation questionnaire: personal skills, social skills, expedition skills and biodiversity research skills. Test results regarding changes in self-reported skills are presented in Table 9. In terms of personal skills, results reveal significant short-term improvements in Independence ($Z = 2.00$, $p < .05$, $r = .58$) and Time Management ($Z = 2.24$, $p < .05$, $r = .65$). There was no significant change regarding social skills. In terms of expedition skills, short-term improvement in snow-walking skill was significant ($Z = 2.12$, $p < .05$, $r = .61$). In terms of biodiversity research skills, both short-term ($Z = 3.04$, $p < .01$, $r = .88$) and long-term ($Z = 2.06$, $p < .05$, $r = .59$) improvements in Water Sampling skills were significant. Lower Z score in long-term comparison implies that the magnitude of improvement in Water Sampling skills deteriorated with time.

When research team data is analyzed: there are significant short-term improvements in Time Management ($Z = 2.24$, $p < .05$, $r = .65$), Body Temperature Control ($Z = 2.33$, $p < .05$, $r = .67$) and Water Sampling skills ($Z = 2.64$, $p < .01$, $r = .76$), but no significance in all long-term changes. Results of research team-specific analysis of changes in self-reported skills are given in Table 10.

Summary

Subjects in this study were in general more neurotic, less agreeable and less conscientious. There is a long-term decrease in openness specific to the research team (NEO-PI-R). Problem Solving, Cognitive Restructuring and Social Support were the coping strategies used most frequently before expedition. These skills were also used during the expedition. There was no significant change in the use of coping strategies except for the short-term increase in Express Emotions and Social Support specific to research team (approached significance) (CSI). Self-efficacy measures showed no significant change in all time periods (GSES). In terms of self-reported skills, there are short-term improvements in independence, time management, body temperature control (research team), snow-walking and water sampling. For long-term changes, only change in water sampling skill showed significance. In general, self-reported improvements were more robust in short-term comparisons than in long-term (Skill Evaluation).

Discussion

The aim of this study is to investigate the effectiveness of a short-term expedition trip on personality, coping, self-efficacy and skill measures. Although many constructs showed improvements across time, most of them failed to reach 5% significance level in both short-term and long-term levels. Significant improvements were only observed in self-reported skills. There is insufficient evidence to conclude that a short-period expedition could yield changes in the subjects.

Table 9 Changes in personal, social, expedition and biodiversity research skills (General)

Skills	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
Personal Skills							
Adaptability to new environment	3.08# (.67)	3.25(.45)	2.83(.58)	-1.41[b]	.16	-1.34[a]	.18
Awareness of own strengths	2.58(1.08)	2.42(.79)	2.67(1.07)	-1.00[a]	.32	-.18[b]	.85
Awareness of own weaknesses	2.83(.39)	2.75(.75)	3.00(.43)	-.38[a]	.71	-1.00[b]	.32
Emotional regulation	2.00(.85)	2.17(1.03)	1.67(.98)	-.55[b]	.58	-1.19[a]	.23
Goal-Achieving	3.25(.45)	3.33(.49)	3.17(.39)	-.45[b]	.66	-.45[a]	.66
Goal-Setting	2.92(.67)	2.67(1.30)	2.92(.79)	-.59[a]	.56	.00[c]	1.00
Independence	3.00(.43)	3.33(.49)	3.00(.43)	-2.00[b]	.046*	.00[c]	1.00
Loneliness Avoidance	2.42(1.00)	1.83(1.27)	2.08(1.00)	-1.20[a]	.23	-.56[a]	.58
Punctuality	1.25(1.14)	1.33(1.15)	.92(.67)	-.17[b]	.86	-.76[a]	.45
Responsibility	2.58(.67)	2.00(.95)	2.00(.95)	-1.82[a]	.07	-1.62[a]	.11
Self-Motivation	2.92(.67)	2.75(1.06)	2.92(.67)	-.71[a]	.48	-.11[a]	.91
Time Management	2.42(1.08)	2.83(.83)	2.75(.97)	-2.24[b]	.025*	-.74[b]	.46

Skills	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
Social Skills							
Assertiveness in groups	3.00(.85)	2.92(.90)	3.08(.51)	-.45[a]	.66	-.38[b]	.71
Co-operation with strangers	2.83(.83)	2.83(.72)	3.00(.43)	.00[c]	1.00	-.63[b]	.53
Friend-Making	2.58(.90)	2.75(.62)	3.08(.67)	-.71[b]	.48	-1.61[b]	.11
Leadership	2.58(.90)	2.33(.98)	2.75(.45)	-1.13[a]	.26	-.37[b]	.71
Mediation in Arguments	2.33(.78)	2.50(.90)	2.42(.67)	-.71[b]	.48	-.28[b]	.78
Sensitivity to others' needs	2.00(.85)	2.33(1.07)	2.50(.90)	-1.27[b]	.21	-1.26[b]	.21
Sensitivity to others' personality	3.00(.85)	2.75(.62)	2.42(.90)	-1.13[a]	.26	-1.61[a]	.11
Expedition Skills							
Body Temperature Control	2.92 (.67)	3.42 (.51)	3.00 (.43)	-1.73[b]	.08	-.38[b]	.71
First-aid	2.33 (.78)	2.50 (1.00)	2.17 (.94)	-1.00[b]	.32	-.63[a]	.53
Fish	1.58 (1.08)	1.42 (1.16)	1.50 (.90)	-.52[a]	.60	-.33[a]	.74
Snow-Walking	2.75 (.87)	3.25 (.45)	3.00 (.60)	-2.12[b]	.034*	-.37[b]	.37
Biodiversity Research Skills							
Mammal Identification	2.08 (1.00)	1.42 (.79)	1.75 (1.14)	-1.81[a]	.07	-.88[a]	.38
Plankton Identification	.83 (1.19)	1.00 (.85)	.67 (.65)	-.63[b]	.53	-.14[a]	.89
Plant Identification	1.42 (1.00)	1.50 (1.17)	1.33 (.65)	-.29[b]	.77	-.07[a]	.94
Quadrat Sampling	2.42 (1.08)	2.83 (.83)	2.67 (.78)	-1.67[b]	.10	-.83[b]	.41
Seabird Identification	1.17 (1.11)	1.08 (.67)	1.17 (.83)	-.28[a]	.78	-.07[b]	.94
Water Sampling	1.25 (1.06)	2.75 (1.22)	2.25 (1.06)	-3.04[b]	.002**	-2.06[b]	.039*

[a] Based on positive ranks [b] Based on negative ranks
[c] Sum of negative ranks equals to the sum of positive ranks
* $p < .05$ ** $p < .01$
[#] Scores range from 0 (strongly disagree) to 4 (strongly agree).

Table 10 Changes of personal, social, expedition and biodiversity research skills (Research)

Skills	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
Personal Skills							
Adaptability to new environment	3.00# (.53)	3.13 (.35)	3.00 (.53)	-1.00[b]	.32	.00[c]	1.00
Awareness of own strengths	2.50 (1.07)	2.50 (.76)	2.75 (1.16)	-.38[a]	.71	-.54[b]	.59
Awareness of own weaknesses	2.75 (.46)	2.75 (.89)	3.13 (.35)	.00[c]	1.00	-1.73[b]	.08
Emotional regulation	2.38 (.74)	2.50 (.76)	1.75 (1.16)	-.27[b]	.79	-1.52[a]	.13
Goal-Achieving	3.13 (.35)	3.50 (.53)	3.25 (.46)	-1.73[b]	.08	-.58[b]	.56
Goal-Setting	2.75 (.46)	2.38 (1.41)	2.88 (.99)	-.71[a]	.48	-.38[b]	.71
Independence	2.88 (.35)	3.25 (.46)	3.00 (.53)	-1.73[b]	.08	-.58[b]	.56
Loneliness Avoidance	2.50 (1.07)	1.88 (1.46)	1.75 (.89)	-1.19[a]	.24	-1.12[a]	.26
Punctuality	1.38 (1.06)	1.13 (.99)	.88 (.64)	-.55[a]	.58	-.92[a]	.36
Responsibility	2.38 (.74)	2.13 (.99)	2.13 (.99)	-.82[a]	.41	-.69[a]	.49
Self-Motivation	2.75 (.71)	2.63 (1.19)	3.00 (.53)	-.45[a]	.66	-.71[b]	.48
Time Management	2.00 (1.07)	2.62 (.92)	2.75 (.89)	-2.24[b]	.025*	-1.29[b]	.20
Social Skills							
Assertiveness in groups	2.75 (.89)	2.75 (1.04)	3.13 (.64)	.00[c]	1.00	-1.34[b]	.18
Co-operation with strangers	2.75 (1.04)	2.75 (.89)	3.00 (.53)	.00[c]	1.00	-.63[b]	.53
Friend-Making	2.38 (.92)	2.75 (.71)	3.13 (.83)	-1.34[b]	.18	-1.73[b]	.08
Leadership	2.25 (.71)	2.25 (1.16)	2.88 (.35)	.00[c]	1.00	-1.67[b]	.10
Mediation in Arguments	2.13 (.64)	2.25 (1.04)	2.38 (.74)	-.45[a]	.66	-.82[b]	.41
Sensitivity to others' needs	1.88 (.64)	2.38 (1.06)	2.50 (1.07)	-1.41[b]	.16	-1.16[b]	.25
Sensitivity to others' personality	2.88 (.99)	2.75 (.46)	2.50 (.93)	-.45[a]	.66	-.71[a]	.48

Skills	Mean (S.D.)			Wilcoxon Signed-rank Test			
	Before	After	Follow-up	ST (Z)	*p* (2-tailed)	LT (Z)	*p* (2-tailed)
Expedition Skills							
Body Temperature Control	2.62 (.52)	3.50 (.53)	3.00 (.53)	-2.33[b]	.020*	-1.34[b]	.18
First-aid	2.38 (.74)	2.50 (1.07)	2.25 (.89)	-.58[b]	.56	-.45[a]	.66
Fish	1.88 (1.13)	1.38 (1.19)	1.50 (.93)	-1.19[a]	.23	-1.34[a]	.18
Snow-Walking	2.50 (.93)	3.13 (.35)	3.13 (.35)	-1.89[b]	.06	-1.67[b]	.10
Biodiversity Research Skills							
Mammal Identification	2.00 (1.20)	1.63 (.74)	1.63 (1.19)	-1.00[a]	.32	-.74[a]	.46
Plankton Identification	1.25 (1.28)	1.13 (.83)	.63 (.74)	-.45[a]	.66	-.86[a]	.39
Plant Identification	1.63 (1.19)	1.50 (1.20)	1.38 (.74)	-.28[a]	.78	-.35[a]	.73
Quadrat Sampling	2.88 (.64)	3.13 (.64)	2.75 (.71)	-1.00[b]	.32	.00[c]	1.00
Seabird Identification	1.50 (1.20)	1.13 (.64)	1.13 (.99)	-1.00[a]	.32	-.53[a]	.60
Water Sampling	1.75 (.89)	3.50 (.53)	2.25 (1.16)	-2.64[b]	.008**	-1.34[b]	.18

[a] Based on positive ranks [b] Based on negative ranks
[c] Sum of negative ranks equals to the sum of positive ranks
* $p < .05$ ** $p < .01$
[#] Scores range from 0 (strongly disagree) to 4 (strongly agree).

The lack of significant results could be due to small sample size and statistical method used (Wilcoxon Signed-Rank Test). Student arctic expedition trips are scarce because of the demand in resources. Sample size was restricted because of financial and safety concerns. There is a need for future research to evaluate a short-term student arctic expedition trip with larger sample size.

Changes in short adventure trips were found to have smaller effect size than changes in long adventure trips (Hattie et al., 1997). This study aims to investigate whether the Arctic environment and purpose-focused activities done in the Arctic (for example, biodiversity data collection) could compensate on the shortened length of trip. Insignificant results could also be resulted from the lack of preparation and poor design of the expedition trip. This could be explained by the Hendee/Brown Model which was proposed to explain factors that determine in what extent wilderness experiences could affect personal growth (Hendee & Brown, 1987).

According to the Hendee/Brown Model (1987), the effect of wilderness on personal growth would be higher if the participant was receptive (motivated to self-improve), the trip offered optimum stress according to participants' capability (trip created enough stress for participants), the trip provided opportunity for attunement (liberated external forces in daily life) and if the experience is metaphorical (could be linked to daily life). The first three determinants could be used to explain insufficiencies of the current trip.

According to pre-expedition NEO-PI-R results, subjects in the trip scored relatively low in conscientiousness. Results imply that subjects in general were less motivated to achieve goals (less achievement-striving) and were difficult in completing tasks with distractions (low self-discipline). In the pre-expedition questionnaire, subjects listed their expectations on the trip. Three out of 12 (25.0%) subjects left blank; only three (25.0%) mentioned specific self-improvement goals. It is suspected that subjects might not have sufficient determination to self-improve. They were less receptive to new experiences.

Personal growth could be hindered by poor-planning of the current trip. Referring to the Hendee/Brown Model, wilderness adventure trips should

be designed with a right degree of stress level in order to bring benefits to students' personal growth. Expedition leaders should test participants for their stress reactivity and adjust the stress intensity of the activities; however, due to lack of preparation time before expedition, the trip was planned without considering subjects' stress threshold, previous outdoor experiences, stress reactivity and maturity. Some subjects were disappointed by the "hiking and trekking" routine and felt bored. It is also suspected that the short length of the trip restricted possible challenging activities to be organized. More importantly, subjects of this study scored relatively high in NEO-PI-R neuroticism (tendency of having unstable negative affects like anxiety) before expedition. Previous studies revealed that successful Arctic expedition members consistently had low stress reactivity, anxiety and depression characteristics (Leon, 1991; Leon, McNally & Ben-Porath, 1989). Moreover, polar expedition participants with highest score in emotional stability, showed more benefits in this construct (Watts et al., 1992). If future expedition trips aimed to enhance personal traits, subjects low in neuroticism score should be selected.

In the arctic expedition trip, the major mission was to collect data for the biodiversity research project. Subjects were focused on complicated and repeated steps of environmental measurements during the trip. The biodiversity research might be too purposeful so that subjects could not quietly observe own abilities and the environment in a slow pace. According to the Hendee/Brown Model, wilderness experience with purposeful research activities might not liberate subjects from a willful life. This could explain the significant long-term decrease in NEO-PI-R openness for the research team members.

Conclusion

The current study aimed to evaluate the effectiveness of a short-term expedition trip. There was insufficient evidence to show that the current short trip was beneficial to students' development. This could be attributed to participants' lack of self-improvement motive, poor-planning of expedition activities, insufficient screening of participants, and over-purposeful nature of the expedition; however, we could not rule out the possibility that the insignificance was due to small sample size. Further research is needed to investigate short-term expedition trips with larger sample size. Short-term trips could also be compared against long-term trips in future studies.

References

Costa, P. T., Jr., & McCrae, R. R. (1992). Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual. Odessa, FL: Psychological Assessment Resources.

Hattie, J., Marsh, H. W., Neill, J. T., & Richards, G. E. (1997). Adventure education and Outward Bound: Out-of-class experiences that make a lasting difference. *Review of Educational Research*, 67(1), 43-87.

Hendee, J. C., & Brown, M. (1987). How wilderness experience programs work for personal growth, therapy, and education: An explanatory model. (pp. 5-21). In J.C. Hendee (Ed.),The highest use of wilderness: using wilderness experience programs to develop human potential. Proceedings of the special plenary session at the 4th world wilderness congress Estes Park, CO. September 16, 1987.

Hendee, J., & Roggenbuck, J. (1984). Wilderness-related education as a factor increasing demand for wilderness. Paper presented at the International Forest Congress Convention, 5 August, Quebec City.

Kafka, S., Hunter, J. A., Hayhurst, J., Boyes, M., Thomson, R. L., Clarke, H., Grocott, A. M., Stringer, M. & O'Brien, K. S. (2012). A 10-day developmental voyage: converging evidence from three studies showing that self-esteem may be elevated and maintained without negative outcomes. *Social Psychology of Education*, 15(4), 571-601.

Kaplan, R. (1974). Some psychological benefits of an outdoor challenge program. *Environment and Behavior*, 6, 101-116.

Leon, G. R. (1991). Individual and group process characteristics of polar expedition teams. *Environment and Behavior*, 23(6), 723-748.

Leon, G. R., McNally, C., & Ben-Porath, Y. S. (1989). Personality characteristics, mood, and coping patterns in a successful North Pole expedition team. *Journal of Research in Personality*, 23(2), 162-179.

Moore, T., & Russell, K. C. (2002). Studies of the use of wilderness for personal growth, therapy, education, and leadership development: An annotation and evaluation. Moscow, ID: University of Idaho-Wilderness Research Center.

Neill, J. T., & Heubeck, B. (1998). Adolescent Coping Styles and Outdoor Education: Searching for the Mechanisms of Change. In Proceedings: *First International Adventure Therapy Conference: Exploring the Boundaries*, 1-5 July, Perth, Western Australia (pp. 227-243). Camping and Outdoor Education Association of Western Australia.

Palinkas, L. A., & Suedfeld, P. (2008). Psychological effects of polar expeditions. *The Lancet*, 371 (9607), 153-163.

Schwarzer, R., Bassler, J., Kwiatek, P., Schroder, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-Efficacy Scale. *Applied Psychology*, 46(1), 69-88.

Stott, T., & Hall, N. (2003). Changes in aspects of students' self-reported personal, social and technical skills during a six-week wilderness expedition in Arctic Greenland. *Journal of Adventure Education & Outdoor Learning*, 3(2), 159-169.

Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the Coping Strategies Inventory. *Cognitive Therapy and Research*, 13(4), 343-361.

Watts, F. N., Webster, S. M., Morley, C. J., & Cohen, J. (1992). Expedition stress and personality change. *British Journal of Psychology*, 83(3), 337-341.

Appendix – Skill Evaluation Questionnaire

Aspects	Chinese Statements	English Translation
	Personal Skills	
Adaptability to new environment	當我去到一個全新而陌生的環境，我很快便能適應。	When I face a new and unfamiliar environment, I can adapt to it shortly.
Awareness of own strengths	我不太清楚自己有甚麼長處。(R)	I am not quite sure what my strengths are. (R)
Awareness of own Weaknesses	我清楚知道自己有甚麼短處。	I clearly know what my weaknesses are.
Emotional Regulation	我有時會發脾氣，令身邊的人感到有壓力。(R)	Sometimes I lose temper and make people around me stressed. (R)
Goal-Achieving	我會努力達成自己的目標。	I make efforts to achieve my goals.
Goal-Setting	我會定期訂立個人目標。	I set personal goals regularly.
Independence	我能靠自己處理生活上的問題。	I can deal with my life problems on my own.
Loneliness Avoidance	當身邊沒有其他人，我會感到孤獨。(R)	When there is no one beside me, I feel lonely. (R)
Punctuality	我有時會遲到。(R)	Sometimes I arrive late. (R)
Responsibility	我需要別人提醒，才能知道我在一件事上應盡的責任。(R)	I am aware of my responsibility on an issue, only when others reminded me beforehand. (R)
Self-Motivation	我能夠自己推動自己完成工作。	I can motivate myself to finish my work.
Time Management	我能有效管理自己的時間。	I can manage my time efficiently.
	Social Skills	
Assertiveness in groups	我能在團體中清楚表達自己的意見。	In a team, I can express my opinions clearly.
Co-operation with strangers	我懂得如何與不相熟的人合作。	I can work and cooperate with somebody I am not familiar with.
Friend-Making	我能輕易與別人建立友好關係。	I can easily build friendly relationships with others.
Leadership	我知道如何領導其他人工作。	I know how to lead others.
Mediation in Arguments	我懂得如何調解兩個人之間的紛爭。	I know how to mediate arguments between two people.
Sensitivity to others' needs	當我看到一個人，我很清楚他需要甚麼。	When I look at someone, I clearly know what one needs.
Sensitivity to others' personality	與別人相處一陣子，我便能準確知道他的性格。	When I get along with someone, I know one's personality accurately.
	Expedition Skills	
Body Temperature Control	我懂得如何在嚴寒中保持身體溫暖。	I know how to keep myself warm in an extremely cold weather.
First-aid	當身邊有人受傷，我不知道應該如何應對。(R)	When somebody is injured, I don't know what I can do. (R)
Fish	我懂得如何釣魚。	I know how to fish.
Snow-Walking	我能在雪上安全地行走。	I can walk on snow safely.
	Biodiversity Skills	
Mammal Identification	我能夠辨認不同類型的海洋哺乳類動物。	I can identify different kinds of marine mammals.
Plankton Identification	我能夠辨認不同類型的浮游生物。	I can identify different kinds of plankton.
Plant Identification	我能夠辨認不同類型的陸上植物。	I can identify different kinds of terrestrial plants.
Quadrat Sampling	我懂得如何用樣方（Quadrat）量度生物多樣性。	I know how to use quadrat as a means to measure biodiversity.
Seabird Identification	我能夠辨認不同類型的海鳥。	I can identify different kinds of sea birds.
Water Sampling	我懂得如何抽取海水樣本。	I know how to sample sea water.

R: Reversed Items

Ecological Study on Arctic Tundra in West Greenland

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Introduction

The tundra is a typical form of terrestrial habitat in high latitude region especially near the poles. Different from those in tropical and subtropical regions of which habitats like woodlands and forests which demonstrated rich biodiversity and vertical stratification, tundra is dominated mainly by grasses, mosses and lichens with absence of shrubs and trees.

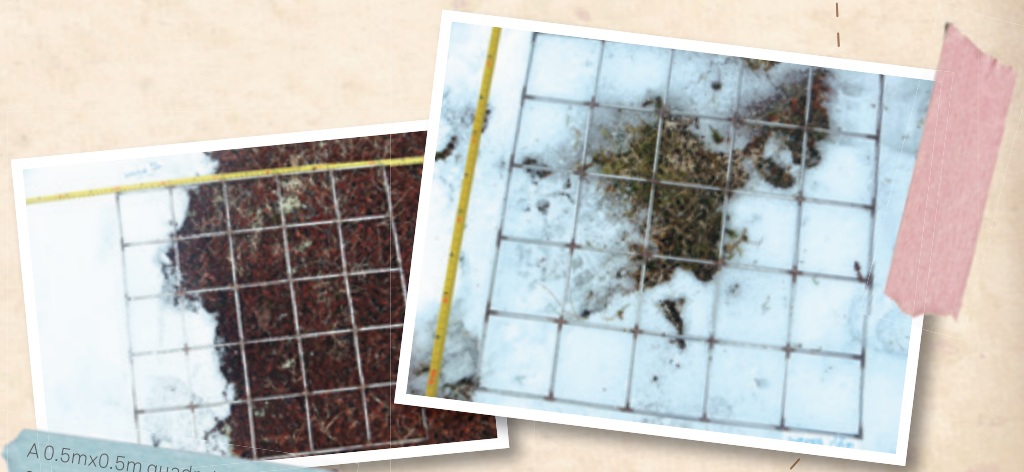
The ecosystem structure in the Arctic could be understood from the perspective of its seasonal variations. Same as most of the other ecosystems on the planet, solar radiation is the fundamental source of energy. In the Arctic, the availability of sunlight could be changed dramatically by its high latitude, from complete illumination in summer, which termed summer solstice, to complete darkness in winter called winter solstice vice versa. This seasonal variation of solar energy supply has forced arctic plant species to complete their life cycle, from germination to reproduction, within only a few months when sunlight is available. Therefore only small, simple structured, fast growing and maturing plants such as grasses and other primary producers such as mosses and lichens can be found in arctic tundra environment.

Objectives

The objectives of this project was to study the biodiversity of arctic tundra in West Greenland, including the species diversity, relative dominance and zonation patterns. As the time of our visit was in May, which was the beginning of summer and the annual growing period of arctic plants, low biodiversity and snow coverage were expected. Life stages such as flowering and seed dispersal were expected to be absent.

Methodology

The Line Transect Method was employed to study two separate tundra communities. Along transects, 5x5 quadrats were placed at fixed intervals. Plants, lichens and mosses at ground surface within the quadrats were counted, identified, photographed and recorded. Environmental parameters such as wind speed, ground surface temperature and light intensity were measured. The change in slope of the landscape was measured by an Auto-level set (Leica Geosystems). The biodiversity of habitats were compared by using Shannon-Wiener Index and Evenness Index.



A 0.5mx0.5m quadrat covering on tundra under snow

Results

Site 1

Site description

The first study was carried out on 16 May 2015 afternoon on an island at the centre of a gulf located 65°38.415N 53°06.063W. The light intensity started at 505.7 µmol photons $m^{-2}S^{-1}$ and ended with 367.0 µmol photons $m^{-2}S^{-1}$. The average air temperature was 1.30°C. The average wind speed was 4.2m/s and the relative humidity was 51.24%.

Table 1 Record of type of species along the first transect at site 1.

Quadrat	Sq No.	Species
1	Nil	Nil
2	1	Moss
3	1	Moss
	2	Grass
	3	Dead grass
4	1	Grass
	2	Moss
5	Nil	Nil
6	Nil	Nil
7	1	Moss
	2	Dead grass
8	1	Dead grass
9	Nil	Nil
10	Nil	Nil
11	1	Grass
	2	Moss
	3	Moss
	4	Fruit
12	1	Moss
	2	Grass
	3	Moss
	4	Grass
	5	Moss
	6	Moss

Table 2 Shannon-Wiener Index of each quadrat along the first transect at site 1.

Quadrat Number	Shannon-Wiener Index
1	0
2	0
3	0.693
4	0.887
5	0
6	0
7	0
8	0
9	0
10	0
11	0.139
12	0.110
Average	0.152

Table 3 Record of type of species along the second transect at site 1.

Quadrat	Sq No.	Species
1	Nil	Nil
2	Nil	Nil
3	1	Moss
4	Nil	Nil
5	Nil	Nil
6	Nil	Nil
7	Nil	Nil
8	Nil	Nil
9	Nil	Nil
10	1	Moss
	2	Moss
	3	Moss
11	1	Moss
12	Nil	Nil
13	Nil	Nil
14	Nil	Nil
15	Nil	Nil
16	Nil	Nil
17	Nil	Nil

Table 4 Shannon-Wiener Index of each quadrat along the second transect at site 1.

Quadrat Number	Shannon-Wiener Index
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0.800
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
Average	0.044

At this site 12 quadrats were set. 8 of 12 quadrats were free of living tundra organisms. Arctic lichens and mosses were found on the ground or under shallow cover of snow.

Photo of *Viola palustris*, an arctic herb.

The overall environment of the study site.

Photo of *Hedwigia ciliata*, an arctic moss.

The second study was carried out on 17 May 2015 afternoon on the foot of a mountain located 65° 42.537N 52o38.754W. The light intensity started at 635.8 µmol photons $m^{-2}S^{-1}$ and ended with 150.9 µmol photons $m^{-2}S^{-1}$. The average air temperature was 6.83°C. The average wind speed was 4.2m/s and the relative humidity was 46.25%. Both sites were covered by heavy snow with only limited exposed lichen growth. No living grass or flowering plant was found. Along transects only a few quadrats were able to cover lichen colonies.

Table 5 Record of type of species along the transect at site 2.

Quadrat	Sq No.	Species
1	Nil	Nil
2	1	Moss
	2	Lichen
	3	Moss
	4	Dead grass
3	Nil	Nil
4	1	Moss
5	1	Moss
	2	Moss
	3	Dead grass
	4	Lichen
	5	Moss
6	1	Lichen
	2	Moss
	3	Moss
	4	Lichen
	5	Dead grass
7	Nil	Nil
8	Nil	Nil
9	Nil	Nil
10	Nil	Nil
11	Nil	Nil
12	Nil	Nil
13	Nil	Nil
14	1	Moss
	2	Lichen
	3	Moss
	4	Moss
	5	Moss
	6	Lichen
15	1	Moss
	2	Moss
	3	Moss
	4	Lichen
	5	Moss
	6	Lichen
16	1	Moss
	2	Moss
	3	Moss
	4	Moss
	5	Lichen
	6	Moss
17	Nil	Nil

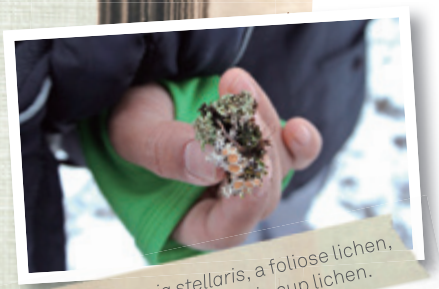


Photo of *Physcia stellaris*, a foliose lichen, with some moss and a pixie cup lichen.

Photo of pixie cup lichen (Genus Cladonia).

Table 6 Shannon-Wiener Index of each quadrat along the transact at site 2.

Quadrat Number	Shannon-Wiener Index
1	0
2	0.627
3	0
4	0
5	0.537
6	0.705
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	1.261
15	0.785
16	0.816
17	0
Average	0.278

Discussion

Species richness

The value of Shannon index of the individual quadrats obtained ranged from 0.044 to 0.887 in site 1, and from 0.278 to 1.261 in site 2. The values are quite low when compared with the corresponding Shannon index recorded for ground cover species in woodlands in Hong Kong, which could be well above 2.0. From this limited data available on the Shannon index, the species richness in arctic tundra should be much lower than that of related ecosystems in sub-tropic regions such as Hong Kong.

The adaptation of tundra species

The condition of arctic tundra can only support the growth of relatively simple organisms, like mosses and lichens. The major constrain arises from the seasonal change of solar energy supply, which in the arctic ecosystem may experience the two extremes. In order to complete the reproduction process, tundra species have developed adaptation for fast maturation and reproduction, and their offspring can withstand harsh environments before the next germination season arrived. Therefore, it is reasonable to expect simple structure and small size of tundra plant species. Tundra plant species also need to tackle with other harsh conditions of the environment, including strong wind, snow coverage and even low atmospheric oxygen for those tundra located at high altitudes.

The importance of tundra to global warming

The tundra is the major terrestrial biome at high latitudes and the poles. It is not only the feeding and nursery ground of tundra mammals, but also the major sink of carbon.

The high carbon content of tundra is the result of slow carbon cycling due to the low temperature. Carbon in tundra is mainly stored in form of methane hydrate in the permafrost, which in fact is a greenhouse gas about 20 times more potent than carbon dioxide, with even longer lifespan in atmosphere. The rise in global temperature might cause a net melting of arctic ice sheets, releasing the methane hydrate and turning tundra from net carbon sink to carbon source.

Conclusion

This study was conducted under extreme environment with severe limitation on resources. As the sampling size was small and the environmental factors measured along transects were inadequate, no relative dominance and distribution pattern could be concluded. The photos of lichen found and the demonstration of our practices were shown. Some lichen and mosses were found as expected but only a few vascular plants were found due to seasonal factors.

Ecological Surveys in Streams of Greenland

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1. Introduction

In May 2015, the S. H. Ho college has organised the Arctic Expedition programme, in which student joined the first team of undergraduates in Hong Kong to venture Greenland. Advised by Dr Rebecca Lee Lok Sze, founder of the China Polar Museum Foundation, and led by Dr Chung Kwok Cheong (hereafter Dr. K.C. Chung), lecturer in School of Life Sciences, the visit took students to the west coast of Greenland to do researches on various topics in biology, climate, geography, Paleo-Eskimo cultures and society there. Conducting ecological surveys is one of the core tasks of this expedition.

Greenland is one the remotest region in the world and the ecology there is relatively less studied. Under global climate change, it is highly confident that Greenland ice sheet has lost ice during the last two decades (Hartmann et al. ,2013) and the melting is accelerating (Vaughan et al. ,2013). Climate projections have also predicted that polar regions will have larger warming than global averaged in the future (Kirtman et al., 2013). It is reported that the biological dynamics in polar biome has responded to the significant changes in temperature, snow cover, growing season and nutrient variability (Post et al. , 2009) and it is believed that the alteration will continue in future. Wrona et al. (2006) also concluded that the biodiversity of most of the Arctic is very likely to be affected by climate change. Therefore, it is both scientifically interesting and environmentally important to conduct ecological surveys in the Arctic.

We have surveyed four types of ecosystems during the seven days in Greenland. This report will focus on the surveys in freshwater systems. Rivers are essential components of the Earth's ecosystems. It completed the hydrological cycle by bringing inland freshwater to the lake or ocean. At the same time, weathering by rivers facilitates the release of nutrients from rock and soils and shaped the landscape in geological time scale. Rivers also provide important habitats for numerous organisms and determine their biological characteristics.

Rivers are critical to polar ecology. Although Greenland and Antarctic Ice Sheets contain more than 99 percent of the freshwater on Earth (NSIDC, n.d.), water in liquid form, which is required by most of the life forms in the Earth, is rare in polar regions. Freshwater in river supports many ecosystems, especially those located inland.

Lengthening of ice-free seasons and increase in river discharge, which are crucial to life in the Arctic's rivers, are examples of obvious consequences of global warming. Furthermore, the change in the precipitation pattern, the melting of permafrost, which may release extra nutrients or pollutants and change the chemistry in river, and the potential shift in vegetation increase the complexity for understanding the response of river ecosystem to climate change. Wrona et al. (2006) summarized that the reduced ice thickness, ice duration, change in timings and compositions very likely result in the increase in winter or open-water productivity, but the detailed changes in biodiversity highly depend on the specific site.

The surveys of freshwater systems took place on the 17th May at local time, which is the 6th day of the expedition. We visited two streams in the morning and at night respectively. Due to the limited time staying at the sites and the lack of advanced instruments, only simple measurements of the abiotic factors and qualitative surveys of the community could be conducted. The report will start with the description of sites and methodology. Then the result of measurements will be presented and discussions on the results will follow.

2. Site and Method Descriptions

2.1 Site Description

The ship was sailing near Puiartoq and Ikamiut Kangerluarssuat on Day 6. The team landed three times on that day. The surveys of streams conducted during the morning's and night's landing. We landed by zodiac and walked for about 40 minutes to reach the sites. The weather conditions at the morning's site (hereafter S1) and the night's site (hereafter S2) are both quite bad during the visits. The details of two sites will be reported in below:

2.1.1 Stream Site One (S1)

The GPS reading in S1 is 65°38.455 N , 53°05.650 W. The site is located near the end of a valley and the river is flowing to a large muddy shore next to the site. It was snowy during the survey. The riparian was covered by snow and ice, where no vegetation was found, while the running liquid water was exposed. The overall environment of S1 are shown in Figures 1a (360 °panorama), and 2 respectively.

The survey started at 11.30 am. The air temperature was 3.2 °C and the relative humidity was 60.8%. The UV meter measured the intensities of UV-A (345nm), UV-B (300nm) and UV-C (265nm) as 0, 20 and 30 μW cm^{-2} respectively. The cloudy and rainy weather can explain the relatively high RH and low UV level found, compared to the other surveys conducted. The wind speed was 2.0 ms^{-1} and the wind direction was North, measured by a hand-held anemometer. The measurements of the light meter showed that the light intensity at the start was 349.0 μmol photons $m^{-2}S^{-1}$ and the reading at the end was 298.0 μmol photons $m^{-2}S^{-1}$. The texture of the river bed was generally fine and silty. The survey ended at 1.30 pm. The readings for the general physical conditions in S1 was summarised in Table 1.

2.1.2 Stream Site Two (S2)

The GPS reading in S2 is 65 °42.260 N , 52°28.116 W. The site is located in a plain with some mountains at the back. The river was not completely exposed until we had removed a thick layer of ice by ice axes. The overall environment of S2 are shown in Figures 1b (360 °panorama), and 3 respectively.

The survey started at 10.20 pm. The same set of instruments employed in S1 was used to measure the physical conditions in S2. The air temperature was 6.6 °C and the relative humidity was 51.5%. The intensities of UV-A, UV-B, UV-C were all 0 μW cm^{-2} because the sun has set. Wind speed was 4.4 ms^{-1} and the wind direction was south east. Despite the low average wind speed, strong gusts frequently blew during the survey. The texture in the river bed was mainly rocky. The light intensity was 117.1 μmol photons $m^{-2}S^{-1}$ at the beginning of the survey and 52.9 μmol photons $m^{-2}S^{-1}$ at the end. The details of physical conditions in S2 is given in Table 1.

2.2 Methodology

2.2.1 Sampling Methods

In each site, two transects were laid across the stream. They started and ended in riparian zones, which were covered by snow and ice. The positions of transects were specifically chosen by Dr. K.C Chung, attempted to show some distinct features across the vertical profile of the stream. Two transects were separated by 20 meters. The physical parameters of stream were measured at intervals of 1 m.

2.2.2 Measurements of abiotic factors along transects

The geometry of the streams was measured by an auto-level set (Leica Geosystems). All the left-right direction in this report is defined as the left and right of an observer facing in the direction of flow or downstream. Water depth was measured by a ruler. The temperature was estimated by immersing the alcohol thermometer into the water or ice on land. The pH of water sample was determined by pH meter, which was pre-calibrated on ship and the salinity was measured by a refractometer.

2.2.3 Qualitative surveys of organisms

We did not have enough time to survey all the quadrats at intervals of 1 meter. In addition, nearly no organism could be observed along the transact, either on the river bank or underwater. Therefore, we assume the isotropy across the river (will be explained more in the discussion) and just conducted the surveys of organism in the middle of the stream. 5 cm of sediment was sampled from the river bank and sieved for living organisms. Furthermore, a kick-net was used to collect the macroinvertebrates in the stream, which is a standard method in the field (Culp et al., 2012).

3. Results

3.1 Survey in Site 1

3.1.1 Details of Sampling and the measured abiotic Factors

The length of Transect 1 (hereafter S1T1) was 16 m and that of transect 2 (hereafter S1T2) was 22 m. The 0 m marks were placed on the left river bank. S1T2 was placed 20m downstream of S1T1.

Figure 4 shows the cross sections of the stream along S1T1 and S2T2. The landscape is flat and the water is shallow. Stream becomes narrower in the lower reach. Figure 5 shows the physical parameters along the transects. Salinity of water in S1T1 stayed at about 1‰ while the pH there varied from 7.3 to 7.8. A drop of 1 °C was observed in the right hand side of temperature profile of S1T1. Meanwhile, S1T2 had a similar temperature profile: the temperature stayed at about 1°C on land and 0°C inside the water. Lower pH and salinity were measured in S2T2. The pH in two sides of stream was around 6.8 and it reached the maximum of 7.1 in the middle. The salinity profile showed a shape reverse to that of the pH profile. It was around 1‰ in two sides and dropped to about 0.7‰ in the middle of stream.

3.1.2 Inspection of Organisms

No macro-organism swimming or suspending in water could be found during the whole survey. However, some foam and holes were observed on the surface of bare mud in the river bank. The production of gases may indicate the presence of some micro-organism, which is out of the scope of this survey. Remains of kelp (see figure 6) could also be found in the river bank and their abundance increased towards the direction of muddy shore.

Soil and rocks, with a total volume of about 1m x 1m x 0.05m, was dug from river bed in the middle of S1T1. The kick-net was also used to sample the soil and suspension in river. All the sampled soil and rocks were filtered and we searched for macro-organisms by bare eye. An individual belonging to the order of Gammaridea, which is likely to be *Gammarus setosus* was found. It has a bigger size compared to the other individuals found in other ecosystems.

3.2 Survey in Site 2

3.2.1 Details of Sampling and the measured abiotic Factors

The length of Transect 1 (hereafter S2T1) is 10 m and that of transect 2 (hereafter S2T2) is 8 m. S2T2 was placed in lower reaches of the stream and two of them were separated by 20m, which is the same as S1.

Figure 7 shows the cross sections of the stream along S2T1 and S2T2. Apart from being narrower, the geometry of the stream has no significant difference from that in site. Figure 8 shows the profiles of temperature, pH and salinity in S2T1 and S2T2. The pH and salinity of water are about 7.5 and 0.8‰ respectively and only had a small variation along S1T1. The temperature ranged from -0.5°C on land surface to 0.5 inside water, which is opposite to the day time measurements in S1. Except the slightly lower pH value at around 7.2 and a constant temperature at 0 °C, the profiles along S2T2 were generally similar to those along S2T1.

3.2.2 Inspection of Organisms

After the removal of ice cover over the stream, the pebbles were found to be covered with periphyton. We examined the filamentous algae and found various forms in algae (Figure 9). No obvious gradient in the abundance of algae was observed in the stream.

In S2T1, we collected all the algae in 4m mark and they was washed and panned. Many tiny animals were found in algae (Figure 10). Brief counting estimated there were 108 individuals in algae. We found more individuals in the substratum by applying a kick-net. The total number of individuals found in 4m quadrat was estimated to be 404. We repeated the procedures in 3m quadrat of S2T2. About 255 individuals in algae and 420 individuals in river bed soil were found. Post-trip analysis of the photos taken shown that they are likely to belong family Chironomidae.

4. Discussion and Conclusion

4.1 Comparison between site S1 and S2

The measured values and profiles of the physical parameters, such as temperature, salinity and pH are all in the expected ranges. The intra-transect, inter-transect and inter-site variations are not significant. They are not sufficient to explain the difference of organisms found in two sites.

The surroundings of these sites may indeed provide a better reason. S1 has a lower altitude and it is next to a large muddy shore. Therefore, S1 has higher chance to be invaded by sea water temporarily than S2. In this case, S1 should be considered as an estuary system while S2 is a totally-freshwater ecosystem. This can explain why the freshwater filamentous algae and midge larvae could only be found in S2.

4.2 Explanations for the low biodiversity found

The latitude gradient of decreasing biodiversity from the Tropics to the Arctic is well known in ecology. This pattern is concrete and it can be found across different continents, biota and time domains (Willig et al., 2003). Under this principle, the Arctic is expected to have low biodiversity. Culp et al. (2012) also stated that very low biodiversity is a characteristic of High Arctic freshwaters and they often contain only one type of freshwater fish species (*Salvelinus alpinus*).

To examine if the low biodiversity recorded in this study is trivial, we try to gather the results from the other ecological surveys conducted in order to make some parallel comparisons. Although we cannot find a survey that is directly comparable (conducted in West Greenland and took place in May) to our work, the other ecological works provide strong evidences that the biodiversity we found in S1 and S2 is significantly lower. Invertebrates and aquatic plants are commonly found in Arctic Rivers. Heino and Toivonen (2008) found at least 9 (out of 29) Helophyte species and 32 (out of 72) hydrophytes in the freshwaters in the northern part of Finland, which has a higher latitude (nearly 70 °N) than S1 and S2. Brittain et al. (2009) found that Dipterous insects are abundant in Arctic streams, especially in the high Arctic.

After excluding the latitude factor, we found there are two potential reasons left for explaining the non-trivial low biodiversity:

4.2.1 Visiting time and selected sites

From descriptions in section 2.1 and figure 1, it is clearly shown that the environment around the rivers was covered by snow and Mid-May is obviously not an active growing seasons for Greenland's organisms. Culp et al. (2012) stated that late summer and early fall is the time arctic rivers reach their peak abundance and diversity. This is also a historical and common practice to conduct the annual samplings at that time (Culp et al., 2012), in order to collect 'higher value' data.

Wrona et al. (2013) suggested that rivers originated from glacial melt usually have lower biodiversity due to the harsh physical conditions and low nutrient input from the source water. Furthermore, the rivers in site S1 and S2 are both quite Shallow. They were likely to be completely frozen or dried in the last winter thus no freshwater life could survive inside.

4.2.2 Inadequate data

The lack of landing time and instruments put a huge restriction on the amount and quality of data we could collect. In the surveys of rivers, we sampled only one quadrat per transect and we lost the resolution of biodiversity along the transect. We could not dig deep enough to sample underneath soil and rubbles, hence we might have missed a lot of macroinvertebrates. In addition, the large inconsistency in the sampling techniques of different teammates further decreases the reliability of data.

The inadequacy in data collected is the reason for us to give up the quantitative analysis on the biodiversity indices.

5. Conclusion

The qualitative results from the ecological surveys conducted in Greenland's river sites have been presented. Only one species and two species were found in S1 and S2, respectively. While there was only one individual organism found in S1, in S2 the community was much highly populated. The dominant species was a filamentous alga, which was distributed evenly across the river bed. Although some midge larvae was found among the alga, the majority of the individuals were found distributed evenly in the substratum. In this survey the biodiversity of Arctic streams were found to be much lower than that in regions of lower latitudes. The low biodiversity found in the surveys can be explained by the seasonal factor, rivers' specific properties and low data quality.

6. Tables and Figures

Table 1 Various physical parameters measured in the stream sites. All the measurements were taken at the start of the survey unless otherwise specified.

Site		S1	S2
Start time (UTC-3)		11:10	22:20
GPS Reading		65 °38.455 N, 53°05.650 W	65 °42.260 N, 52°28.116 W
Air Temperature (°C)		3.2	6.6
Relative Humidity (%)		60.8	51.5
Wind Speed (ms^{-1})		2.0	4.4
Wind Direction		N	SE
UV Intensity (μWcm^{-2})	245nm	0	0
	300nm	20	0
	365nm	30	0
Light Intensity (μmol photons $m^{-2}S^{-1}$)	At the start	349.0	117.1
	At the end	298.0	52.9

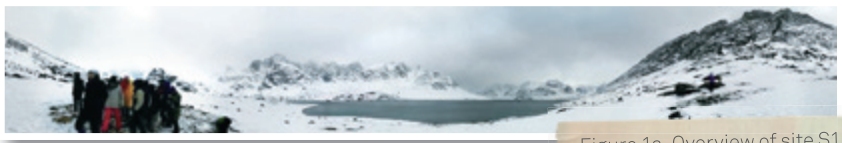

Figure 1a. Overview of site S1 (360 ° panorama).

Figure 1b. Overview of site S2 (360 ° panorama).

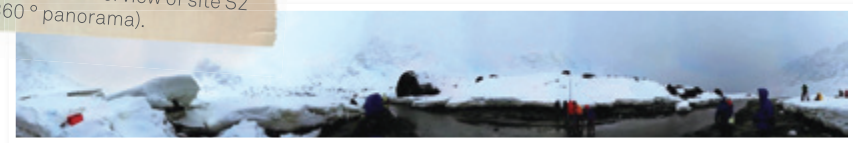

Figure 1. (a) and (b) are the 360 °panorama photos showing the surroundings of the S1 and S2, respectively.

Figure 2. Landscape at site S1.

Figure 3. Images took in site S2. 3a shows the original state of S2 before the ice cover over the stream was removed while 3b shows the exposed river after ice removal.

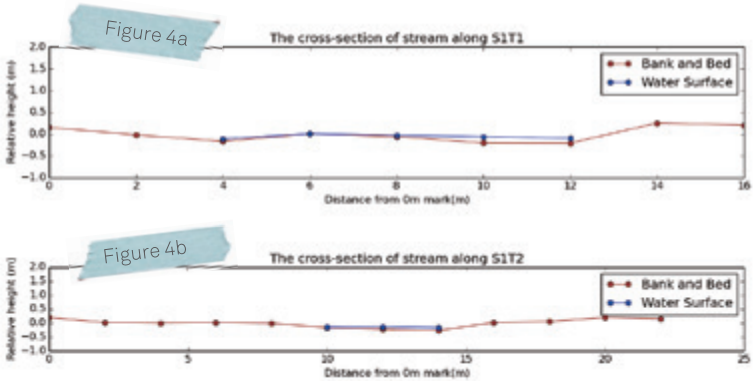

Figure 4. The cross-section for the stream along S1T1 (4a) and S1T2 (4b)

Figure 5a

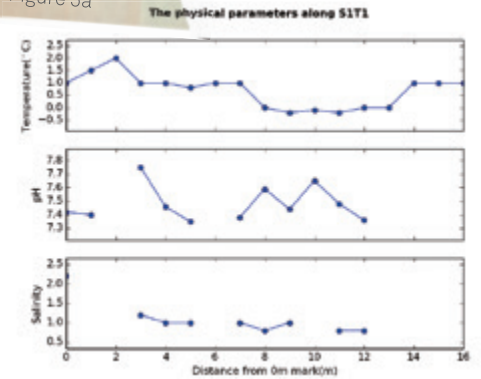

Figure 5b

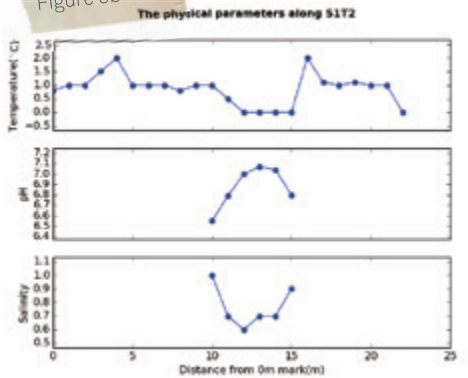

Figure 5. The profiles of temperature, pH and salinity along S1T1 (5a) and S1T2 (5b)

Figure 6. Teammates with the stalk of kelp collected in the river bank.

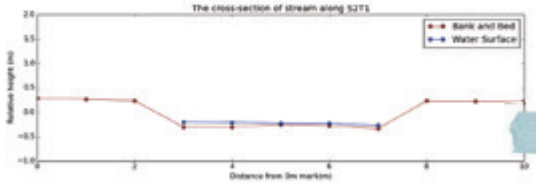

Figure 7a

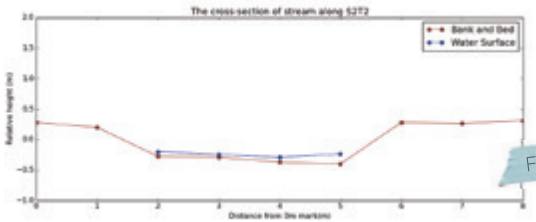

Figure 7b

Figure 7. The cross-section for the stream along S2T1 (7a) and S2T2 (7b) respectively.

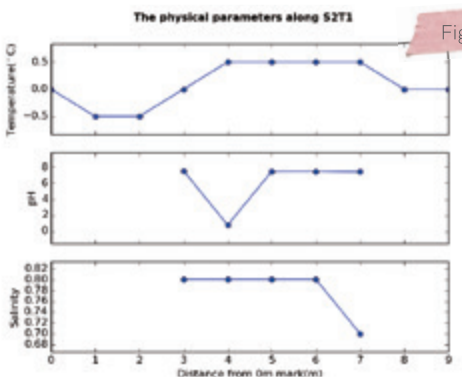

Figure 8a

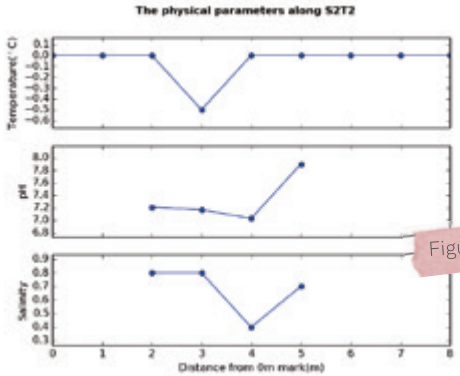

Figure 8b

Figure 8. The profiles of temperature, pH, salinity along S2T1 (8a) and S2T2 (8b)

Figure 9a

Figure 9b

Figure 9c

Figure 9. The filamentous algae found in S2. The 4m quadrat is shown in 9a. The growth form of algae in the steam is shown in 9b. The appearance of the algae is shown in 9c.

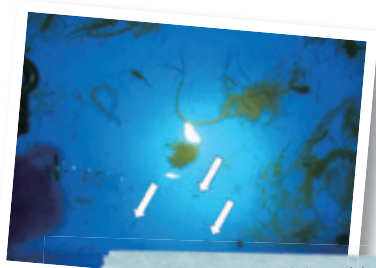

Figure 10. Photo of the midge larvae (indicated by arrows) found in S2.

References

Brittain, J.E., G.M., Gíslason, V.I., Ponomarev, J., Bogen, S., Brørs, A.J., Jensen, L.G., Khokhlova, S.K., Kochanov, A.V., Kokovkin, K., Melvold, J.S., Ólafsson, , L.-E., Pettersson and A.S. Stenina, (2009). Arctic Rivers. In K. Tockner, C.T. Robinson and U. Uehlinger (eds.) *Rivers of Europe*. Academic Press, London. 728 pps.

Culp, J.M., W. Goedkoop, J. Lento, K.S. Christoffersen, S. Frenzel, G. Guðbergsson, P. Liljaniemi, S. Sandøy, M. Svoboda, J. Brittain, J. Hammar, D. Jacobsen, B. Jones, C. Juillet, M. Kahlert, K. Kidd, E. Luiker, J. Olafsson, M. Power, M. Rautio, A. Ritcey, R. Striegl, M. Svenning, J. Sweetman, M. Whitman. (2012). The Arctic Freshwater Biodiversity Monitoring Plan. CAFF International Secretariat, CAFF Monitoring Series Report Nr. 7. CAFF International Secretariat. Akureyri, Iceland. ISBN 978-9935-431-19-6.

Hartmann, D.L., A.M.G. Klein Tank, M. Rusticucci, L.V. Alexander, S. Brönnimann, Y. Charabi, F.J. Dentener, E.J. Dlugokencky, D.R. Easterling, A. Kaplan, B.J. Soden, P.W. Thorne, M. Wild and P.M. Zhai (2013). Observations: Atmosphere and Surface. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Heino, J. and H. Toivonen (2008) Aquatic plant biodiversity at high latitudes: patterns of richness and rarity in Finnish freshwater macrophytes. *Boreal Environment Research* 13: 1–14

Kirtman, B., S.B. Power, J.A. Adedoyin, G.J. Boer, R. Bojariu, I. Camilloni, F.J. Doblas-Reyes, A.M. Fiore, M. Kimoto,G.A. Meehl, M. Prather, A. Sarr, C. Schär, R. Sutton, G.J. van Oldenborgh, G. Vecchi and H.J. Wang (2013). Near-term Climate Change: Projections and Predictability. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

National Snow & Ice Date Centre, US (n.d.) SOTC: Ice Sheets. Retrieved from https://nsidc.org/cryosphere/sotc/ice_sheets.html.

Post, E., Forchhammer, M.C., Bret-Harte, M.S., Callaghan, T.V., Christensen, T.R.,Elberling, B., A.D., Fox, O., Gilg, D.S., Hik, T.T., Høye, R.A., Ims, E., Jeppesen, D.R., Klein, J., Madsen, D., McGuirel, S., Rysgaard, D.E., Schindler, I., Stirling, M.P., Tamstorf, N.J.C., Tyler, R.V.D., Wal. J., Welker, , P.A., Wookey, N.M., Schmidt, P., Aastrup (2009). Ecological dynamics across the Arctic associated with recent climate change. *Science*, 325, 1355–1358.

Vaughan, D.G., J.C. Comiso, I. Allison, J. Carrasco, G. Kaser, R. Kwok, P. Mote, T. Murray, F. Paul, J. Ren, E. Rignot, O. Solomina, K. Steffen and T. Zhang (2013) Observations: Cryosphere. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Willig, M.R., D.M. Kaufman, and R.D. Stevens (2003). Latitudinal Gradients of Biodiversity: Pattern, Process, Scale and Synthesis. *Annual Review of Ecology, Evolution, and Systematics* 2003. 34: 273-309

Wrona, F. J., T. D. Prowse, J. D. Reist, J. E. Hobbie, L. M. J. Lévesque, and W. F. Vincent (2006). Climate Change Effects on Aquatic Biota, Ecosystem Structure and Function. *A Journal of the Human Environment* 35(7): 359-369.

Wrona, F.J. and J.D. Reist. (2013). Freshwater Ecosystems. *Conservation of Arctic CAFF Arctic Biodiversity Assessment Report*. Chp13 pp.443-483.

Food Culture in Greenland

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Introduction

The Inuit is facing a twisting point in their diet. Facing the westernization and increasing setting up branch in Greenland by foreign companies, the culture of western countries is influencing the traditions in diet of the Inuit. The diet of the Inuit is changing from traditional foods, mainly from domestic harvesting activities, to one which includes more and more imported industrial foods (Kuhnlein, 1989; Moffatt et al., 1991; Freeman et al., 1992; Wein and Freeman, 1992; Delisle et al., 1994). Besides, according to Duhaime, Chabot and Gaudreault, the changes in socioeconomic factors also take an important role in changes in Inuit diet. There is an old Chinese saying, " 民以食為天 "(Food is the first necessity of the people). Studying the food culture would be a starting point to understand Inuit. It would be interesting to study the Inuit food culture and the choice between traditional food and *industrial* food.

In West Greenlandic Inuit words, traditional food is "kalaalimineq", where "kalaaleq" means "Greenlander" and "-mineq" means "kind of". The imported food is "qallunaamineq" with "quallunaaq" meaning "Dane". In the past, the population of the local Inuit was low and widely scattered. They used to inhabit in different regions and the cultures

of different regions were greatly affected by the location of inhabitation. At the later time, different families started living together in one house and they shared their food together according to some specific rules. Food of that time was still mainly meat and animal resulted from hunting activities. When Denmark started her colonization in Greenland in 1721, she prohibited the import of European food into Greenland. However, the Greenlandic Inuit still could have a taste of import food like coffee and grains by illegal trade in black market. As the population grew and more Dane coming to Greenland for work, the supply of traditional food, the only food source in Greenland, failed to meet the demand. In 1860 the Danish government finally permitted the food import in Greenland in order to solve the problem of food shortage.

With the economic growth and modernization, the Greenlandic social structure and traditions had changed a lot. In the past, the major food items were mainly obtained from hunting and fishing activities, like seal, fish, whales and reindeer, and simple agricultural activities, like berries. However, when more and more people migrated and settled down in Greenland and the market opened for import, food items like coffee, cereal and tobacco started entering into the local market. Processing food was gaining its publicity in the local market. Nowadays, there is a great variety of imported food available in the local market.

Many researches focused on how the change in environment and diet affect the health of Inuit. For example, researchers had focused on the effect of environmental contaminations on the health of Inuit in Canada (Duhaime et al., 2004). However, there is not much research concerning the viewpoint of traditional Inuit when facing the changes in their tradition. Also, there is not much research related the traditions and current food supply situation in Hong Kong with that in Greenland. This research was aimed to have a brief analysis on current Greenland food supply situation and insight of how local Greenlandic face the changes in changing of traditional eating habit. In addition, we would like to be a pioneer in comparing the food import situation and changes taken place in traditional food culture in Hong Kong with that in Greenland.

Methodology

1. Questionnaires and Interview

1.1 Questionnaires

A questionnaire targeted on local Inuit (refer to Appendix 1) was newly designed before the departure in order to suit for the purpose of this research. It was created on how the locals valued the industrial and imported food, the effect of introduction of industrial food on their own eating culture and opinions towards the preservation of traditional eating habit. There were also questions related to the background information of interviewees in order to have a general understanding of interviewers' age group, gender, and family structure which may be a cause of variation in their responses.

1.2 Interview

Interview with the local Inuit was also carried out in the trip. Questions related to how the local valued the present eating habit and culture, the viewpoint towards preserving the traditional diet and the reasons of the changing of traditional eating habit were asked. These questions were not included in the questionnaire as these are all open-ended questions that would be a little bit difficult for the interviewees to write the answer in a short period of time and they might have hesitations in writing a long answer leading to failure in achieving the original purpose. Thus, interview was carried out to replace the open-ended question in the questionnaire.

2. Market visit

Maniitsoq, a town in Greenland where the interviews and distribution of questionnaires distributed, has a supermarket, Brugseni, and a few convenience stores. The local residents operate one of the convenience stores. Supermarket and convenience stores, the place where the local people get access to the food source, are the best way to get the first-hand information related to the local diet. It provided background information for accessing the availability and diversity of food and price level. These could be clues of whether price level and accessibility of industrial food was a factor affecting the eating habit.

3. Internet search

In order to understand the weight of imported food in Greenland and Hong Kong, an internet search was conducted and relevant data were collected and complied.

Results

1. Food Import Data

According to the World Bank, the Food imports (% of merchandise imports) in Hong Kong and Greenland from 2006 to 2014 are listed below (Table 1).

Table 1 Percentage of merchandise imports of food imports in Greenland and Hong Kong from 2006 to 2014.

Country Name	2006	2007	2008	2009	2010	2011	2012	2013	2014
Greenland	18.44	19.36	18.23	22.22	18.99	18.17	19.32	21.02	22.72
Hong Kong SAR, China	2.82	3.04	3.63	4.39	4.16	4.40	4.38	4.65	4.92

From the table, the percentage of food imports in Greenland was much greater than that in Hong Kong in all these 9 years. Despite the fluctuations in the food imports value, an increasing trend in food imports in Greenland could still be observed.

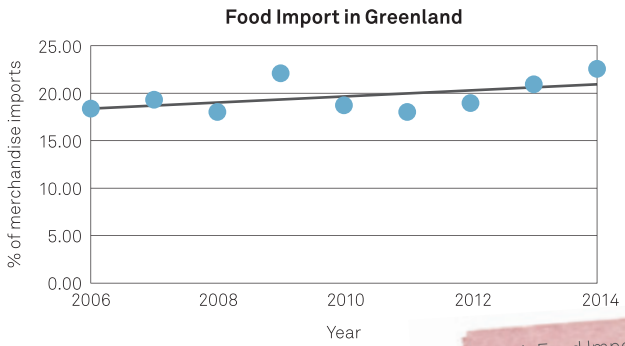

Fig 1. Food Import in Greenland from 2006 to 2014

2. Food Variety

From the market visit in Maniitsoq, it was observed that there was a large variety of imported industrial food from all over the world, including fresh meat, frozen seafood, vegetable and fruit, canned food, snacks and daily necessaries (Figure 2). There were plenty of industrial food imported from foreign countries like Denmark, China and USA. However, it was not common to see traditional meat food items like seal meat and reindeer meat in the supermarkets. In reality, the proportion of chicken, lamb, pork and beef was greater than that of traditional meat, like hare, salmon, seal and ptarmigan. According to the locals, the traditional meat is mainly sold in fresh markets rather than in supermarkets and those sold in supermarket are processed in the factories and frozen. Considering the agricultural product, the major vegetables and fruits were potato and different kind of berries. Especially in summer, the weather in Greenland is suitable for growing of berries. Other kind of vegetable like broccoli and lettuce were also well supplied, no matter it was local or imported.

Fig. 2a. Fresh food sold in market in Maniitsoq

Fig. 2b. Pizza (industrial food) found in the market.

Fig. 2c. Japanese frozen sushi (industrial food) found in the market.

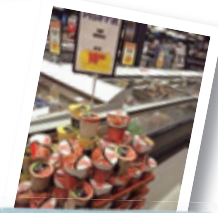

Fig. 2d. Cup noddle (industrial food) found in the market.

3. Food Price

Considering the food price, the industrial food in Maniitsoq was more or less the same as that in Hong Kong. For example, seven sticks of banana cost 20 DKK (~23 HKD, Figure 3) that was similar to that in Hong Kong.

Fig. 3. Advertisement at Maniitsoq supermarket Brugseni.

4. Eating habitat

According to the questionnaire, all the interviewees had daily consumption of industrial food and the major reason for the consumption is its convenience. When talking with a local, he told me that one of the biggest advantages of industrial foods was its stability of supply. The supply of traditional was relied on the rewards of the local hunters, which is highly dependent on the weather and luck. This brought a great instability to the supply of traditional foods. In addition, the number of local hunters was decreasing in recent years as youngsters preferred to pursue their career in other countries. The fact that hunters are treated as a side occupation rather than a career further lowers the supplies of traditional food. Furthermore, law in Greenland strictly limits the number of animals each hunter could hunt annually, and more hunters tend to hunt for the food factories rather than selling their hunt to the local markets. This further reduced the supply of traditional food to local fresh markets, which finally pushed the price of traditional meat high to a hard-to-bear level. The supply of industrial food is highly stable and a great variety of choices are available. Together with the factor of prices, although industrial food was a little bit expensive to a local family, when compared to price of traditional food, it seemed industrial food were a relatively cheaper choice with greater convenience and more choices. This is why nowadays people consume industrial food daily.

Considering the locals' view towards the preservation of traditional foods, they have diverse viewpoints. According to the results derived from the questionnaires, some locals believed that industrial food could replace the traditional one. When further asked for the reason, they thought the advantages of consuming industrial food, like convenience and availability, have outweighed the cost of losing their tradition. However, some locals still support to keep the traditional food as this was a unique feature of their culture.

Discussions

1. Comparison of food import between Hong Kong and Greenland

From Table 1 and Fig 1, food imports accounted for up to one fifth of merchandise imports of Greenland and it showed an increasing trend in the most recent decade. It suited the situation described by the local interviewees saying the imported industrial food accounts for greater and greater percentage in local market. For Hong Kong, there was also in an increasing trend in food import but the percentage of merchandise imports in food was much fewer than that in Greenland. This could be an indicator telling that how globalization is affecting Greenland food import. Hong Kong is an international financial city with mainly secondary and tertiary production. There are only few local agricultural activities and the food supply mainly relies on import. Greenland still has its agricultural activities as well as hunting and fishing practices. Although a great part of Greenlandic food supply still relies on local production, the total food import in Greenland in terms of percentage of merchandise imports was much larger than that in Hong Kong. This provided an evidence to show Greenland is now relying much on the import of industrial food and the imported industrial food is gaining its importance in the recent years.

2. Reason for changes in food habits in Greenland

From the interviews with local Inuit and past researches, it could be concluded that there are mainly four reasons for the Greenlandic Inuit having shift in their eating culture.

2.1 Westernization and Modernization

With more and more foreign companies and factories start their business in Greenland, western cultures are introduced into Greenland. Different eating styles, food and new business operating methods were introduced into Greenland. Supermarket emerged and a large variety of food products from all around the world is supplied in order to attract customers and enhance its competiveness. In addition, the entry of western companies also brings more foreign workers to Greenland. There are increasing needs for more international food choices in Greenland to meet the demand of increasing foreign workers. This brings a food culture exchange between traditional Greenlandic Inuit diet and foreign culture. At the same time, increasing population caused by increasing number of foreign workers also lead to an increase in food demand. However, with the law restriction in hunting and fishing practice in Greenland, it would be hard to enhance the traditional food supply to meet the increasing demand. More

industrial food imports would be the best way to solve the food shortage problem. This constitutes the changes in eating habit of local Inuit.

2.2 Change in family structure

In the past, different local Greenlandic Inuit families shared the same house. The families shared food, meat and the gain from hunting and fishing with others in the same house according to specific rules. But in the later time, the family structure changed. Individual family started to live in a separated house instead of sharing the house with other families. The bonding linked by the sharing practice of gain in hunting was weakened. However, the sharing practice was still the major source of traditional food for most families, especially for single-parent families. Weakening of sharing practice reduced the traditional food source. Because of the hard-to-afford price of traditional food in the market, industrial food would be the best alternative to the traditional food.

2.3 Socio-economic change

Increasing number of foreign companies in Greenland provides a large amount of job opportunity with higher salary, which has a better paid than being a hunter. Thus, many youngsters give up hunting or treat hunter as a side occupation. This decreases the supply of traditional food. In addition, the hunters prefer hunting for local food processing factories instead of hunting for sharing practice nowadays as the factories provide better offer to the hunters. This increases the difficulty for traditional local family to access to traditional Inuit food with low price, this gradually constitutes to shifting from traditional food to cheaper industrial food.

2.4 Price and convenience of industrial food

Because of the instability in supply of traditional food and the law restricting hunting and fishing activities in Greenland, the price of traditional food is expensive to the local families. With fewer youngsters willing to be hunters because of better career in other industries, the supply of traditional food is very limited and thus the price of traditional food are pushed to a high level. Comparatively, the price of industrial food is relatively cheaper than traditional food. In addition, the supply of industrial food is not limited by season and weather and it comes with greater variety of choices. It would be more convenient and economy for local family to buy industrial food products.

3. Preservation of Inuit traditional eating culture

It would be hard to conclude whether the Inuit should keep their traditional eating culture as both sides had similar numbers of supporters. But a local spotted out the necessities of having industrial food in Greenland. As Greenland is now opened for foreigners, mainly Danish, to come for work, the demand for foods has increased rapidly since the last few years. Because of the limitation on hunting practice restricted by law, the supply of traditional food, especially meat products, was restricted. Taking consideration of population growth brought by increasing numbers of immigrants, the supply of traditional food would be insufficient to meet the increasing demand. Industrial food becomes the only way to solve this inevitable food shortage problem. As mentioned above, the great variety of industrial food could meet the demand of different food cultures of the immigrants. Thus, opening market for industrial foods is an unavoidable fate in Greenland. However, the Inuit still put the tradition in a high priority. For example, they still consume Kiviak, a traditional Inuit food made by preserving auks in a hollowed-out seal body, in birthdays and weddings. The Inuit still teach their children hunting skills, which is of higher priority than attending school and taking exams. The locals are trying hard to keep their pace with the globalization and yet without losing their unique traditions. Their heart of admiring their culture and being proud of their culture is worth our respect.

4. Situation of eating habit in Hong Kong compares with Greenland

The situation of food culture change in Hong Kong is similar to that in Greenland. Facing westernization and globalization, it seems having western eating style is fashionable and stylish. For example, more and more people celebrate birthday with birthday cake but it would be regarded as an old-fashioned way if we celebrate birthday with Chinese birthday bun. Comparing with the Inuit, we are less appreciating our traditional eating habit. It would be regrettable if we let this mind grows in our community, resulting in losing our traditions with own characteristic. The attitude of the Inuit towards the traditions is worth our learning.

5. Limitation of the research

At the original planning, the target number of respondent of the questionnaire was 50 local Inuit in Maniitsoq. Unfortunately, there were not much local Inuit who was able to communicate in English. The number of respondents was far lower than expected. In addition, a comprehensive food frequency questionnaire (FFQ) and dietary assessment would provide more information for studying the consumption pattern of local Inuit. However, because of limited time and manpower, the FFQ could not be carried out throughout the trip.

Conclusion

It could be concluded that Greenland is affected by westernization to a great extent, which could be observed through its food import figures and their products available in the markets. Considering the accessibility and price of industrial food, it was easy for the local to purchase industrial food with reasonable prices and a large variety of choices. The major reasons for the local Inuit to have changes in their food culture were westernization resulted in change in economic structure and food exchange culture. Facing the conflict of preserving their own tradition, the locals are trying their best to do whatever they can do and they are still admiring their own unique culture. Their attitudes towards their own tradition is worth our respect. It is time for us, the Hongkongners, to reflect our attitudes towards Chinese traditional food and figure the way out to preserve our unique traditions before it became too late.

Reference

Freeman, M.M.R, Wein, E.E. and Keith, D.E. (1992). *Recovering Rights. Bowhead whales and inuvialuit subsistence in the Western Canadian Arctic*. Edmonton, Canadian Circumpolar Institute and Fisheries Joint Management Committee.

Duhaime, G., Chabot, M., Fréchette, P., Robichaud, V., & Proulx, S. (2004). The impact of dietary changes among the Inuit of Nunavik (Canada): a socioeconomic assessment of possible public health recommendations dealing with food contamination. *Risk Analysis*, 24(4), 1007-1018.

Duhaime, G. , Chabot, M. & Gaudreault, M. (2002). Food consumption patterns and socioeconomic factors among the inuit of Nunavik, *Ecology of Food and Nutrition,* 41(2), 91-118.

Kuhnlein, H.V. (1989). *Nutritional and Toxicological Components of Inuit Diets in Broughton Island, Northwest Territories*. Contract report to Department of Health, Yellowknife, NWT. McGill University, Montreal, Quebec.

Moffatt, M.E.K., O'Neil, J.D. and Young, T.K. (1991). Keewatin Health Status Assessment Study. Winnipeg, University of Manitoba (and the Keewatin Regional Health Board).

Wein, E.E. and Freeman, M.M. (1992). Inuvialuit Food Use and Food Preferences in Aklavik, Northwest Territories, Canada. *Arctic Medical Research*, 51(4), 159–172.

Choice between industrial food and country food

This questionnaire is designed to study the factors affecting the consumption of industrial food and country food in Inuit population. All the data collected would be used for research purpose only.

1. **Sex:** ☐ M ☐ F
2. **Age:** ☐ <10 ☐ 10-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60-69 ☐ >70
3. **Type of Household** ☐ Two-parent/ father working ☐ Two-parent/ only mother working ☐ Two-parent/ no head working ☐ Single-parent/ mother working ☐ Single-parent/ mother not working ☐ Others
4. **What is your frequency of the consumption of country food?**
   ☐ Null ☐ 1-3 times/week ☐ 4-6 times/week ☐ Everyday
5. **What is your frequency of the consumption of industrial food?**
   ☐ Null ☐ 1-3 times/week ☐ 4-6 times/week ☐ Everyday
6. **What is your source of industrial food? (Can be more than 1 answer)**
   ☐ Store ☐ Friends/relatives ☐ share practice ☐ Other: _____
7. **What is your proportion of income spending on getting industrial food?**
   ☐ Null ☐ 1-20% ☐ 21-40% ☐ 41-60% ☐ 61-80% ☐ 81-100%
8. **How much do you agree or disagree with the following statement?**

	Compare with 10 years ago,				
a.	I consume more industrial food now.				
b.	It is easier to get access to industrial.				
c.	I buy more industrial food now.				
d.	There are more choices of industrial food now.				

9. **How much do you agree or disagree with the following statement?**

a.	I prefer industrial food than country food.				
b.	The entry of industrial food is beneficial to economy.				
c.	The entry of industrial food is beneficial to health.				
d.	The entry of industrial food will not affect the culture of traditional food.				
e.	Industrial food can replace country food.				
f.	There is no need to reserve the traditional eating culture.				
g.	I support reserving the traditional eating culture				
h.	I support the entry of industrial food into local market.				
i.	I can strike a balance in consumption of industrial food and country food.				

10. How much do you agree or disagree with the following statement?

	I consume industrial food because				
a.	I think industrial food is tasty.				
b.	I think industrial food is cheap.				
c.	I think industrial food is convenient.				
d.	I think industrial food is worth buying.				
e.	I think industrial food is stylish.				
f.	I think industrial food is nutritious.				
g.	I think industrial food is of a large variety.				
h.	I think industrial food is safe for consumption.				
i.	I think industrial food is more stable in supply than country food.				

11. Please arrange the following order of importance when you choice between industrial and country food. (1: Most important, 9:Least important)

Items	Priority
Availability	
Convenience	
Family income	
Nutritious concern	
Pollution concern	
Price	
Taste	
Tradition	
Traditions	
Others (Please specify: _____) (if no, please put '9' in the box)	

Thank you very much for your kind participation!

Greenland – a Candidate for Independence?

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A. Introduction

Greenland has been part of Denmark since 1605, with a great degree of independence under the Home Rule law, the Greenlanders are allowed to manage their country affairs except national defense and some aspects of international trade.[1] However, most of the Greenlanders consider their island to be an Inuit nation instead of a part of Denmark, the anti-Danish feeling has also risen since 1970s.[2]

In 1973, the Danish people agreed to join the European Economic Community (ECC, now called the EU) with over 70% of the Greenlanders voted against the referendum.[3] They disliked the referendum as they feared it would lead to an invasion of Greenland's prime fishing waters by European fishing trawlers. Although Greenland was later exempted from the ECC and the Home Rule law was also enacted to grant a greater degree of independence in 1979, the anti-Danish feeling of some Greenlanders continued. The Greenlanders began to think they would better off with greater independence from Denmark.[4]

Under the Home Rule law in 1979, Greenland was allowed to set up their own government and responsible for the administrative departments within the country, such as those related to education, economy, and domestic policy, which had been under the control of Denmark.[5]

In 2005, the Greenland Home Rule and Danish Government established a joint committee to reform Greenland's political system. Subsequently, the Greenlandic Danish Self-Rule Act was issued in 2008 and endorsed by both governments to make Greenland a step forward to the self-rule.[6] The most significant change to Greenland's political establishment was that the Self-Rule Act lays down rules for the procedure of Greenland to become an independent sovereign state*.The Act on Greenland Self-government holds incredible symbolic and emotional value for the Greenlanders.[7] The people start to speak quietly of moving toward complete independence. Although the Act was a positive starting point for the self-rule, most Greenlanders realize that a complete break is unrealistic in short-term as the country has been relying heavily on financial subsidies from Denmark. The goal of independence can only be achieved until the day Greenland become economically self-sustainable.[8]

It remains a question how fast the world's biggest island will progress towards her independence and the potential challenges and chances accrue from the Greenland's road to self-rule.

* For the procedure to be an independent state, the first step is to require a decision by the Greenlandic people, presumably by way of referendum. The vote was passed in November of 2008 with 75% in favour of self-governance. The government of both countries will then have to negotiate a treaty on the practical organisation of independence. After so, the treaty has to be ratified by the parliaments and confirmed in a second referendum in Greenland.[3]

B. Methodology

To research on the above topic, a 10-days trip to Greenland was made in May 2015.

During the trip, about 20 face-to-face interviews were conducted to the people in Greenland to ask for their views on the issue of independence of Greenland. The interviewees vary in age groups, jobs and educational backgrounds. About 4 of them are Danes who moved to Greenland, while the rest are local Inuits.

Observations were also made to the communities, such as Manitsoq and Kangaamiut. Supermarkets, museums, schools, shops, locals' houses, post office, fish markets and churches were visited to record the lifestyle and culture of Greenlanders.

C. Results & Discussion (Face-to-Face Interviews)

About 20 face-to-face interviews were conducted to investigate the views of people lived in Greenland on the issue of independence. The interviews were mainly about their impressions on Greenland/Denmark, their lives in Greenland and their views towards independence.

C. I. Background Information of the Interviewees

The background information of all interviewees are shown below (Table 1.) and the comments of people from the same group or background would be summarized and shown together.

Table 1 Background of the interviewees

No.	Interviewee's Name	Sex	Age	Length of Residence in Greenland	Job Post	Language Spoken
1	David Sam	M	~40	Less than 1 year, moved from Denmark	Businessman	Danish, English
2	Charlotte Roger	F	~45	Over 20 years	Sales	Danish, English, Greenlandic
3	Mark Brewery	M	~30	About 5 years	Hostel Manager	Danish, English, Bare Greenlandic
4	Peter Nygaard	M	~30	About 2 years	Museum Manager in Manitsoq	Danish, English
5	Mr. Kotsbuck	M	~50	Local Inuit	Museum Manager in Kangaamiut	Bare English, Greenlandic
6	Mrs. Kotsbuck	F	~50	Local Inuit	Housewife	Greenlandic
7	Ms. Kotsbuck	F	~30	Local Inuit	Supermarket Assistant	Bare English, Greenlandic
8	Qulutannguaq Qaavigaq	M	25	Local Inuit	University Student	English and Greenlandic
9	Fulootuaacut Davoeduul	M	25	Local Inuit	University Student	English and Greenlandic
10	Kuluk Koreneliussen	F	24	Local Inuit	University Student	English and Greenlandic
11	Dorthe Qaavigaq	F	~35	Local Inuit	Head Master of the Primary School	Greenlandic, fluent English
12	Erik Bech Holm	M	10	Local Inuit	Primary School Student	Greenlandic
13	Sofie Skife	M	10	Local Inuit	Primary School Student	Greenlandic
14	William Lundbkad	M	10	Local Inuit	Primary School Student	Greenlandic
15	Qillaq Isaksen	M	11	Local Inuit	Primary School Student	Greenlandic
16	Westiqu Lammmui	M	~40	Local Inuit	Bus Driver	Greenlandic, simple English
17	Sammuelq Wetouis	F	35	Local Inuit	Shop keeper of handcraft shop	Greenlandic, simple English
18	Sammuelq Testina	M	37	Local Inuit	Shop keeper of handcraft shop	Greenlandic, simple English
19	Unknown	M	~30	Local Inuit	Postal officer	English, Greenlandic
20	Unknown	M	~30	Local Inuit	Postal officer	English, Greenlandic

C. II. Extract of the Interviews

a. Interview with the Danes who are living in Greenland

(a1) Museum Manager in Manitsoq (Peter Nygaard):

1. How do you think of the issue of independence?
   Fully understand the need of Greenlander who wish to gain independence. The reason behind is far more than nationalism. It's about the right of autonomy, the right to fully control the country.

2. Do you think Greenland has the economic ability to do so?
   For the concern of Greenland's economic sustainability, he agreed that Greenland would not have developed that rapidly without the help from Denmark. Every year, Greenland is accepting a direct subsidy of $EUD 3.6 billion from Denmark and $EUD 1 billion from European Union even though it's not a member of EU. It would be difficult for the Greenlander to continue the present living standard without these subsidies.

3. What are the other obstacles you observed for the independence of Greenland?
   If Greenland claims itself as a country, it has to gain recognition from the international platform. It's doubtful if the members of European Union would accept its status. Also, he fears America will take the advantages of Greenland and establish the military base on the island after its complete independence. But not many locals notice such danger. Also, he's suspicious if Greenland is able to establish its own military force.

4. How would you describe the urge of Greenlanders to gain independence?
   He says all Greenlanders in general support for the independence, but differs in the degree and paces of attaining independence. This is also the issue frequently discussed in elections. He notes that some Greenlanders see the need of independence prior than the economic concern, and believe there will be solutions to the potential economic problems eventually. But he disregard their idea and believed it's too risky.

5. **What should Greenlanders do to gain the total independence from Denmark?**
   He notices that more and more parents sent their children to Denmark for better education, with the hope that their children can replace the Danes who are holding the managerial positions in Greenland. He thinks this is a great way. Jobs like museum manager and hotel manager all require a university degree. Given the fact that there's only one university in the country and it has only about 100 students. Not many Greenlanders hold a university degree.

6. **How do you think of the trend that more and more parents reject to let their children to learn Danish?**
   He thinks it's a dangerous problem as learning a new language can provide more business opportunities to the locals, the parents act is actually marginalizing their children within the community. He doesn't agree that learning a foreign language will make the local language become inferior.

7. **In your opinion, what are the reasons for Greenlanders to strive for independence?**
   He thinks mostly is about the right of autonomy, as Greenlanders have considered their island to be an Inuit nation for decades. Many locals are not comfortable with the "control" or "supervision" from Denmark, although Denmark has already granted a large degree of autonomy to the locals under the Home Rule. They are asking for a complete independence.

   Also, some of them afraid the European culture would dominate the nation, and the Inuit culture or other traditional practice would become inferior. That explains some locals reject to adopt the European culture and learn their languages.

8. **Do you think the locals welcome the Danes who come to work in Greenland, like you?**
   He thinks there're many different opinions. Some are very friendly and see him as a part of the nation, while some are aggressive and think he's stealing the job from locals. Usually the young boys have adverse feeling towards the immigrants, as they are the "easy enemies" to many social problems.

9. How would you describe the relationship between Greenland and Denmark in present time?
   He thinks it's more like a kind of partnership with equal terms. He agrees that the Danes in general have prejudice to the Greenlanders, and categorize them as a group of alcoholic and homeless people.

10. Are there any misperceptions towards the Danes and Greenlanders? Why?
    He thinks that the Danes in general have prejudice to the Greenlanders, and categorize them as a group of alcoholic and homeless people. Not many Danes have been to Greenland as it's costly and time-consuming, this maybe the reason behind.

11. Who will visit your museum?
    Some locals who wish to learn their history and take a look of the traditional handcrafts. Also, the foreigners who want to learn about Greenland may come. But he has never seen a Dane visiting his museum. (He has been working in the museum for 6 months)

(a2) Hostel Manager in Manitsoq (Mark Brewery):

1. How do you think of the issue of independence?
   He sees no point Greenland can be independent from Denmark. Without the financial support from Denmark, Greenland cannot sustain its own economy as it still heavily relies on primary production. The largest company in Greenland is a fishing company which is still accepting subsidy from Denmark for its operation.

2. How do the Danes in general think of the issue of independence?
   The Danes do not show much concern to the issue. Most of them would like to follow the wish of Greenlanders. Whether Greenland be independent or not doesn't affect the economy or whatsoever of Denmark.

3. Are there any misperceptions towards the Danes and Greenlanders? Why?
   He thinks there're some misunderstandings on Greenlanders from Danes, it's originated from the lack of communication. The two "countries" are separated by the geographical boundaries, citizens can't drive from one town to another. Moreover, the two "countries" hold a very different culture and environment. For example, the Greenlander sees fishing and hunting as the major issues in life, while the Dane only sees fishing and farming as hobbies. The former heavily rely on the sale of seal and other fishes, while the latter voted for a ban of such sale like what other members in European Union did.

(a3) Sales Manager (Charlotte Roger):

1. **How do the Danes think of the independence issue of Greenland?**
   It's not a question frequently discussed in Denmark, even in election time. Hardly can read any news of Greenland in the mass media. It's not popularly debated and not an everyday topic. The Danes just don't concern how such city.

2. **How do the Danes think of the huge amount of subsidy paid to Greenland?**
   Again, it's not an issue commonly discussed in the society. As Denmark is not in deficit recently, not many citizens concern on the public expenditure. Also, to some elders who learnt the history of Greenland, they may have sympathy to the island and see the subsidy as a fair compensation to them.

Summary: In short, most of the Danes understand and respect the Greenlanders to gain independence. It's not an everyday topic that the Danes show little interest to the issue. They are neutral to the regular subsidy to Greenland as the country is currently prosperous and the citizens have attachment to Greenland. The only concern they have is the economic ability of Greenland to be independent from Denmark. They also afraid if other country will take advantage of Greenland after independence. It's not suggested to gain independence in short-term.

To achieve full independence, Greenlanders should have better development on secondary and tertiary production. The educational background of locals should also be risen to articulate to different pathways of career. The phenomenon of rejecting to learn Danish is dangerous and unwise, it will further weaken the competiveness of Greenlanders.

They observe some misperceptions towards the citizens of two "countries", it may due to the geographical boundaries and differences in culture. Some of them experienced discrimination and impolite treatment from the locals. More communication and visiting is needed to clear the misunderstanding among the people.

b. Interview with the local Greenlanders

(b1) Primary School Students in Monisoq (Erik Bech Holm, Sofie Skife, William Lundbkad and Qillaq Isaksen):

1. What language do you learn at school?
   We learn Greenlandic, English and Danish. All of us can speak fluent Greenlandic as it's our mother tongue. But we can only speak little English and Danish. Some of our parents disallow us to practice Danish at home. Some teachers reject to speak Danish with us too. But we don't know the reason behind.

2. How many hours do you learn the above languages at school?
   We have one-hour Danish lesson per week, six-hours English lesson per week, and about twenty-five hours' Greenlandic lessons per week.

3. Have you heard of the issue of independence?
   None of them have ever heard of the issue of independence. They welcome the Danes as some of their teachers are from Denmark too.

(b2) Head-master of Primary School in Monisoq (Dorthe Qaavigaq):

1. How do you think of the issue of independence?
   She thinks every individual in Greenland hopes for independence. It's the topic hotly discussed for decades, a dream that pass from one generation to another generation. However, she understands the practical difficulties, e.g. economic sustainability, military power, international recognition, which may arise if the country attains complete independence.

2. How would you describe the urge of Greenlanders to gain independence?
   She admits that the Greenlanders are different in the degree and pace of independence that are asking for. Some radicals, especially the youths, look for a complete independence from Denmark in short-term, while some citizens may only hope for a higher degree of autonomy on the trading and economic policies.

To herself, she has no motives to change the political situation or do anything to strike for the independence for her country. As she is satisfying with the current living and thinks that Greenland wouldn't be that prosperous without the subsidy from Denmark. She's willing to compromise to the political reality in order to maintain her comfortable living standard. She supports and appreciates those who ask for the independence for the country, but she doesn't agree to sacrifice any economic benefits in exchange for an independent status.

(b3) Villagers in Kangaamiut (Kotsbuck's family):

1. How do you think of the issue of independence?
   All of them show no concern to the topic of independence. They are all neutral to the issue and has not much consideration to it. Some think it's better to gain independence than not, but an even larger portion of villagers do not understand the political relationship between Greenland and Denmark. They seldom talk about politics with neighbors and are not familiar with the current political situation. They only concern on the cost of foodstuff, the sales in fish market, and so on.

Summary: In short, the Greenlanders in general hope for independence. They prefer to have higher degree of autonomy of the country than not. But they aware of the potential obstacles and economic problems followed by independence. Some prefers a better political status than a stable economy, while some are willing to compromise to the political reality. Also, quite a large number of them has little consideration to the matter and is not knowledgeable to assess the gain and loss for the independence. This may due to their educational background.

It is observed that a portion of parents and teachers reject to let the children to learn Danish. Most children can speak fluent Greenlandic, but little English and Danish.

D. Results & Discussion (Observations)

During the trip, observations were also made on two communities, at Manitsoq and Kangaamiut respectively. The observations aim to record the lifestyle and culture of Greenland, in attempt to analyse the potential advantages and difficulties of her independence.

D. I. Observations in Manitsoq

Hostel	There're 3 hostels in the town and all managers are Danes.
Supermarket	There're 4 supermarkets in the town and all shop keepers are Inuit.
	Nearly all products sold are imported, the price level is similar to those in Copenhagen
Church	There're two churches. All citizens in the town are Christians.
Primary School	There is only one school in town. The entrance door is always opened, children are free to enter and leave. Some children were playing rope-skipping in the sport ground.
Primary School Children	All children can speak Inuit fluently; they can speak little English. Danish is their second language, but their parents and teachers are not eager to teach them Danish.
	Children are active and friendly, they took the initiative to talk with visitors. Some of them accompanied our team for visiting the town till 12am at midnight
	Some children shared their Facebook account and email address with the team. Some demonstrated singing and dancing to the team.
Art Workshop	There is only one souvenir shop in the town. The shopkeeper is a couple.
	The product are marked with price DKK$200-$350. Very high flexibility on the discount and selling prices. The shopkeeper has no idea how much her handcrafts worth.
	Locals and tourists are their customers. Usually 1-2 transactions per month.
	The toilet in the shop has not been working for 1 month. But they have no motive to fix the problem.
	The shop is located 5 minutes walking distance from their home.
Bank	With ATM machine and exchange currency machine.

Elder House	Located at the top of a small hill.
	The elders usually live together voluntarily.
Police Station	Senior police officers are usually the Danes.
	All officers are appointed by and sent from the capital city.
Restaurant	It's a café selling hamburger.
Street	There's so elderly selling hats on the ground.
	3 out of 10 people on street are smokers
	There's no beggar on street.
	People know well about each other.
	5-6 vehicles running on the street, including trucks and private cars.
	Mosquitos everywhere.
House	All are small house with colorful painting on the roof and door.
Transport	There're private cars, bicycles, ship (for fishing) and airport.
Museum	There's 1 museum in town and the manager is a Dane who's been to Greenland for 6 months only. His assistant is a Greenlander who's been working in the museum for nearly 10 years.
Airport	A small-scale airport which can only allow 1 airplane to depart or arrive at the same time. With only 2 officers in the service counter. There is also no deicing equipment at the airport, which is costly and problematic in Greenlandic winter.

D. II. Observations in Kangaamiut

Supermarket	There's only 1 supermarket on town.
Police Office	No police office in town.
Post Office	The post office is the only governmental building in town, it provide postal service, banking service and also responsible for dealing with the conflicts in town.
House	All are small houses with colorful painting on the roofs and doors.
School	No school in town.
Museum	There's 1 museum in town. The manager is a Greenlander who can only speak little English.
People	The people in Kangaamiut are usually shy and quiet. They're not very willing to interact with tourists.
Fish Market	Many people buying fish from the fish market. It's the main economic center in the town.

Summary: To summarize, Manitsoq is the second largest city in Greenland. With an airport and 3 hostels in town, it aims to be the tourist spot in Greenland. The living standard and educational background of citizens in Manitsoq are relatively higher than other cities in Greenland. However, when compared to the European countries nearby, the scale and facilities provided in Manitsoq are still far below the standard. Concerning the facilities in airport, it can only allow 1 airplane to depart or arrive at the same time. There're also 2 officers working in the service counter only. It cannot afford and entertain a large amount of visitors, not to say to develop tourist industry.

Concerning the economic activities in town, the restaurant and art shop are usually flocking by the locals. The transaction amount is also not high and the shop keeper do not see their business as the main way to earn a living. Rather they can rely on the subsidy from the government to maintain the current living standard.

For the children in town, most of them go to work after completing primary school education. As there're no secondary school or other articulations to further study, the children usually help their parents to do fishing or hunting in town. With a low educational background and no special skills, they can only be a primary producer.

There's one point to note that the manager of museum is a Dane who's been to Greenland for 6 months only. While his assistant is a Greenlander who's born in the town and has been working in the museum for nearly 10 years. It shows that the Greenlander cannot hold the managerial position in town and can only work as assistants in the professional field. This may due to the educational background of Greenlanders and the extremely low percentage of university graduates in the country.

In comparison, Kangaamiut is aimed to be an industrial city in Greenland. The main economic activity in town is fishing. They seldom have visitors so villagers are not used to welcome and interact with the tourists.

In regard to the children in town, as there're no school to provide formal education for the children, most of them follow their father to do hunting job since they're small. For girls, they would help to do housework or be the assistant in supermarket. There's one teacher from Denmark teaching the children English in free time, but the parents are not so eager to send the children there. They rather prefer the children to spend time on hunting and doing housework at home.

E. Results and Discussion (Literature Review)

To justify and enrich the above results, a number of secondary sources are included in the research to take the discussion further.

E. I. Denmark's Subsidies to Greenland

Denmark has been granting a giant amount of direct subsidies (3.5 billion Danish kroner – the equivalent of £400 million) to Greenland each year under the Home Rule.[9] It accounts for about two third of the economy. While Greenland is grateful for the subsidies, they also place Greenland in a politically crucial position. There's general sentiment that the independence of Greenland can only be reached one day when the country can supply enough revenue to replace the annual Danish subsidies.[10] Some Greenlanders show hesitation to the independence issue as they worry it would provoke Denmark and affect the block grant receiving.[11] The giant subsidies have undoubtedly hampered Greenland's process of becoming economically self-sufficient and gain the independence.

On the other hand, there're opinions that the road to independence has not effect to the receipt of Danish subsidies. They believe the grant to Greenland is just an instrument of Denmark to secure the potential military and geographical interest in Greenland.[12] The natural resources of the Artic area, the possible opening up of the North-West Passage and its existing infrastructure and economic perspective, all these attract the international attention to Greenland's enormous potential.[13] Also, Greenland has served as a host for numerous America military bases and installations, by taking a dominant position in Greenland, Denmark grew in significance to the American administration.[14] As a result, Denmark has an obvious interest in remaining a player with a stake in the region. The grant to Greenland, which is approximately 0.75% of the Danish state budget only, is an effective tool to gain a dominance position in the region.

E. II. Alternatives to the Danish Subsidies

Many Greenlanders and critics expressed concerns to the economic sustainability of Greenland. They believe the goal of independence can only be reached when the Greenlandic economy grows and as the educational level of population rises– which is not possible to happen in short-term.

On the contrary, there're suggestions that extraction of minerals and oil could be a fast and effective key to economic growth. Being an independent state, Greenland could take complete mineral and oil rights from Denmark.[15] It includes the exclusive right to use, to legislate and to sell the permits to companies for exploration and development. Critics believe it holds the key to create job opportunities, which could take the pressure off the high reliance on primary industry.[16] It can hopefully supply the adequate revenue for the Greenlandic public budget to replace the Danish subsidies in soon future. It should also be noted that the parliament of Greenland has just passed the lifting of its ban on mining uranium in a close and controversial vote and getting ready to start her mining industry in the globe.[17]

However, there're secret worries to the pace of development which would be not as optimistic as the government of Greenland anticipated due to the steep declines in iron ore prices and unrealistic expectations of results for rare earth elements.[18] Taking oil as an example, the first exploratory drillings were conducted in 1970s – without any result. Neither have current explorations along the Greenland's coast provided concrete evidence.[19] There're also doubts if there are adequate infrastructure and professionals for the development of mining industry in Greenland. Greenland may have to heavily rely on the export of equipment and professionals from China and Canada.[20] Moreover, the lifting of the ban has been controversial with Greenland's population. The vast country upset with decision and demanded for a referendum for the lifting.[21] The youth of Greenland generally disagree the country for being a mining nation where thousands of people coming outside to work.[22] They think the mining industry won't benefit the locals and create much jobs for the next generation.

F. Limitations of the research

A limitation of the current study was the small, non-probability sample of convenience. Due to the time and financial constraints, the sample size of interviewees and scope of observations did not reach statistical significance.

Due to the language barrier, only respondents who can speak English are invited to the interviews. This may suggest the respondents in the interview are the group of people with higher educational background or more opportunities to interact with foreigners than the rest. Their response maybe biased and cannot reflect the view of people in general.

In relation to the time constraint, only two Greenlandic communities were observed and included in the study. They are the tourist and industrial center of the country respectively, therefore the results may not reveal the whole picture of Greenland. It should be expected that the development in the capital, Nuuk, would be different from the above observation.

G. Conclusion

The entry into force of the Greenland's Self-Rule Act opens the prospect of complete separation from Denmark and full independence. However, there are challenges ahead for the road to independence.

The obstacles to independence that can be predicted are the economic stability and international recognition of an independent or autonomous Greenland. Referring to the economic scale and activity in Greenland, it's doubtful if it can maintain the current national income and living standard. Given that Greenland is accepting €3.8 billion from Denmark unconditionally every year, most Greenlanders heavily rely on the governmental subsidy for living. Also, the low educational background of citizens limits the future development of the country. Gaining independence from Denmark may not be an appropriate decision for Greenland in short-term.

In regard to the willingness of Greenlanders to gain full independence from Denmark, it is observed that they show positive attitude to the issue. However, they have no unique idea on the pace and scale of independence. An even larger amount of them show indifference to the matter and are not knowledgeable to make such a political decision. It's suspicious if Greenlanders who have generally low educational background can make a well-informed decision on the country's political status in short-term.

It's hesitate to say the ordinary Greenlanders are that eager to gain independence as what their politicians claimed in the media. The Danes are "easy enemies" to the social problems, it is paused to say if gaining full independence is the catholicon to the social conflicts in the country. What the locals concerned are rather about the food cost and everyday lives.

As a result, the largest obstacle towards full independence is the national strength of the nation, including economic development, educational standard of the people and the social consensus in the community.

Bibliography

1. Gosch, C.C. A., Munk, J. (1897). *Danish Arctic expeditions, 1605 to 1620: In two books*. London: Printed for the Hakluyt Society.
2. Ibid.
3. Loukacheva, N. (2007). *The Arctic promise legal and political autonomy of Greenland and Nunavut*. Toronto: University of Toronto Press. 255 pp.
4. Silis, I. (1996) "Greenland on its way: Home rule since 1979." Copehagen, Ministry Danida, Greenlands Television.
5. The Greenlandic Danish Self-government Commission's report on Self-government in Greenland. (2008, April 1). Web site: http://www.arcticgovernance.org/the-greenland-danish-self-government-commissions-report-on-self-government-in-greeland.4633171-137746.html. Retrieved September 14, 2015.
6. Ibid.
7. Views summarized from the personal interviews of Greenlanders in 2009, after the enactment of Self-Rule Act. Refers to interviews with Christensen, Else. Senior Researcher at The National Research and Worm, Adam. Senior Advisor, Greenland Representation in Humanity in Action (2009 August 1). Web site: http://www.humanityinaction.org/knowledgebase/52-self-rule-of-greenland-2009-a-step-further-towards-independence.
8. Ibid.
9. Nuttal, M. (2008) Self-rule in Greenland. Towards the World's First Inuit State? Indigenous Affair (2008, March 1) 64-70. Web site: http://www.iwgia.org/iwgia_files_publications_files/IA_3-08_Greenland.pdf. Retrieved September 13, 2015.
10. Kleist, M. (n.d.). Greenland is getting ready to stand alone. Web site: http://www.theguardian.com/commentisfree/2010/jun/15/independent-greenland-mineral-resources-denmark. Retrieved September 13, 2015.
11. Milne, R. (2013, October 20). Greenland prime minister eyes independence from Denmark. Web site: http://www.ft.com/intl/cms/s/0/4eb3e29c-416c-11e3-9073-00144feabdc0.html#axzz3lcN6qG2t. Retrieved September 14, 2015.
12. Ibid.
13. Ibid.
14. Petersen, N. (2013). The politics of US military research in Greenland in the early Cold War. In Centaurus (3rd ed., Vol. 55, p. 302).
15. Refer to the interviews with Mark Brewery and Dorthe Qaavigaq.
16. Greenland's mineral rush 'could lead to independence (2012, September 10). Euractiv. Web site: http://www.euractiv.com/specialreport-rawmaterials/expert-foreign-interest-greenlan-news-514011. Retrieved September 3, 2015. and Greenland: Oil fortune to fund independence. (2014). Web site: http://www.unric.org/en/indigenous-people/27308-greenland-oil-fortune-to-fund-independence. Retrieved September 13, 2015.
17. Ibid.
18. Milne, R. (2013, October 20). Greenland prime minister eyes independence from Denmark. Web site: http://www.ft.com/intl/cms/s/0/4eb3e29c-416c-11e3-9073-00144feabdc0.html#axzz3lcN6qG2t. Retrieved September 14, 2015.
19. Dark Clouds Gather over Greenland's Mining Ambitions. (2015, January 16). States News Service. Web site: http://www.brookings.edu/blogs/planetpolicy/posts/2015/01/16-greenland-mining-boersma-foley. Retrieved September 13, 2015.
20. Ibid.
21. Ibid.
22. Milne, R. (2013, October 20). Greenland prime minister eyes independence from Denmark. Web site: http://www.ft.com/intl/cms/s/0/4eb3e29c-416c-11e3-9073-00144feabdc0.html#axzz3lcN6qG2t. Retrieved September 14, 2015.

Project on Glacier Recognition

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Abstract

Scene recognition and object detection are two of the basic tasks of computer vision. Although an amazing variety of image recognition tasks are in progress, automated classification on glaciers and their forms are rarely seen. At the same time, there are also other glacier-related tasks under exploration and research. This report will introduce the on-going glacier recognition project and aspects for further research.

1. Introduction

Various kinds of models have achieved great performance on classifying objects into categories and types within one category using Convolutional Neural Networks (CNNs), inspired by the hierarchical layers in the human brain, together with large databases. However, classifying glaciers introduces challenges over other categories. Specifically, great similarity appears among different types of glaciers. Several morphological characteristics can be assigned to one glacier. In addition, differentiation between snow and ice is inevitable, which increases the difficulties in distinguishing the glacier type with snow covering ice features. Though statistical information of glaciers (World Glacier Inventory) is available, annotated images are needed to be retrieved.

Classification of glaciers may suggest the inner dynamics, development as well as the surrounding climatic conditions of the glaciers. Utilizing the classification of World Glacier Inventory (WGI) and Google Earth as well as a crowd-sourcing platform with a standard CNN architecture, morphologically based glacier classification datasets can be established.

This report will introduce the expedition as well as tools used in the project, brief the on-going progress and discuss some aspects for further research.

2. The Expedition

During the trip, I marked down the major places that we have visited with Google Earth (Figure 1), so that I could track the glaciers. We went to Eternity Fjord and met around six remarkable glaciers including Sermitsaq Glacier, Sammisoq Glacer and Glaciers 1 to 4 as shown in Figure 1.

Figure 1: Map of our voyage routes

Due to the limitation of our trip, we basically saw two types of glaciers, namely marine-terminating glacier (tidewater glaciers) and land-terminating glacier (terrestrial glaciers). As their names suggested, marine-terminating glacier goes down to the ocean and terminates there, while land-terminating glacier stops at the land. Sammisoq Glacier (Figure 2, left) is a typical land-terminating glacier and Sermitsaq Glacier (Figure 2, right) is a marine-terminating glacier.

Since we only saw six glaciers during the voyage, data is inadequate for model training. Therefore, we decided to use satellite and aerial photographs for the reason that, firstly they provide a holistic perspective of glaciers, getting rid of pose variation; and secondly, the WGI provides Keyhole Markup File (KML) with details information of glaciers including latitude, longitude and classification so that we can retrieve images from Google Earth. Furthermore, a general crowd-sourcing annotation platform has been developed for concept retrieval, image description and concept annotation.

Figure 2: Sammisoq Glacier (left) and Sermitsaq Glacier (right)

3. Tools

3.1. World Glacier Inventory (WGI)

The World Glacier Inventory (WGI) contains information for over 130,000 glaciers with inventory parameters including geographic location, area, length, orientation, elevation, and classification. The WGI is based primarily on aerial photographs and maps with most glaciers having one data entry only.

The WGI adopts a classification scheme to characterize the morphology of glaciers using a series of six key parameters. The morphological glacier parameters are primary classification, form, frontal characteristics, longitudinal characteristics, dominant mass source and tongue activity with two newly-added moraine codes. In this project, we decide to focus on the first three parameters, namely, primary classification, form and frontal characteristics. Primary classification parameters differentiate glaciers into morphologically distinct units (e.g. ice field, ice cap, valley glacier). Form parameters describe the outline of a glacier (e.g. compound basin, cirque, niche). While frontal characteristics depict the frontal shape of the glaciers (e.g. piedmont, expanded foot).

Figure 3: Data pointers in Eternity Fjord from the WGI database

The entire WGI database is available in Comma Separated Values (CSV) and Keyhole Markup Language (KML) format so that we can easily view in Google Earth and export photographs of relevant types of glaciers based on the latitude, longitude and topographic scale.

Figure 4: Inventory parameters of Sermitsaq Glacier

3.2. Convolutional Architecture for Fast Feature Embedding (Caffe)

Inspired by biological process, Convolutional Neural Networks (CNNs) are designed to recognize extremely various visual patterns from pixel images with minimal preprocessing. The deep convolutional neural networks

greatly improve the performance in image recognition. Caffe provides a deep learning framework with careful modularity of the code and clean separation of network definition. From training, testing, fine-tuning and deploying models, the complex toolkit can easily and swiftly adopt algorithms. Pre-trained reference models are also provided.

3.3. Crowd-sourcing Annotation Platform

Although the WGI provides KML file with latitude, longitude as well as the covering scale for image extraction, we still risk obtaining irrelevant or useless images (e.g. GPS drifting, light, low resolution). In addition, frontal characteristic of the glacier is needed to be marked. Therefore, a crowd-sourcing image annotation platform is built with three sub-tasks. Concept retrieval serves to pick out the false positive annotations manually after automatic classification. For example, if the machine classifies a land-terminating glacier as a marine-terminating type, we can pick it out here. Image description is for tagging the picture with different annotations. It can be used to mark out the frontal part of the glaciers. Concept annotation is for categorizing a set of concepts to different groups. For example, there are multiple units of melting lakes or horizontal cracks on the glacier.

4. Progress

Due to limited time and resources, the project is still under development. A general crowd-sourcing annotation platform has already built. The project proceeds to retrieve data from both the WGI and Google Earth. It will involve a large set of data. Afterwards, pre-trained models will be used for trials, after which further training on the networks will be performed in Caffe. Finally, performances between methods (e.g. SIFT[1], SVM[2]) will be compared.

1. Scale-Invariant Feature Transform (SIFT) algorithm is used as a feature detector and feature descriptor. SIFT first describes an image into a collection of feature vectors. The feature vectors are invariant to image scaling, rotation and distortion, which deals with the problem of changes in the scale and position of the objects. Then key points are stored for further processing. Feature matching uses nearest neighbors algorithms which defines nearest neighbors as key points with minimum Euclidean distance so as to match key points from trading images.
2. Support vector machines, a supervised learning model used for classification and regression analysis.

5. Aspects for Further Research

After coming back from Greenland, I also consulted a professor, an expert on glaciers, from Earth System Science Programme. There are two possible aspects to go forward.

1. Glacier advance and retreat. We found that the ice cover of Sammisoq Glacier differs quite a lot in different seasons, so patterns of seasonal changes could be studied. For example, when it starts to advance or retreat, what is the speed, et cetera.

2. Melting tracking. For geoscientists, their focus is more on ice dynamics since there are still lots of unsolved mysteries on how glacier changes due to climate change and global warming.

Hence, tracking the information of melting, for instance the area of the melting lake (Figure 5) along years and the crack pattern (Figure 6) on the glacier, would be useful for their research.

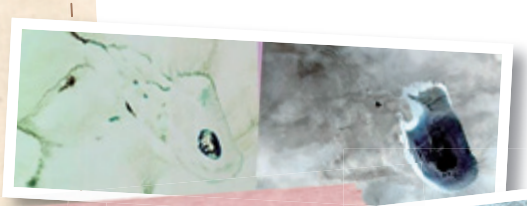

Figure 5: June 10, 2012 (left) and July 19, 2012 (right) at 65°56'N, 48°51'W

Figure 6: August 25, 2010 (left) and June 12, 2012 (right) at Sermitsaq Glacier

6. Conclusion

The report presents the idea of building a classifier for glacier recognition using the WGI and Google Earth as the database and deep convolutional neural networks for image recognition. Although the project is still on-going, the expedition to Greenland and implementation of the project are introduced. At the end, different aspects for further research and future work are discussed.

References

Google Inc. (2015). Google earth V 7.1.5.1557. 65°05'08.29'' N, 53°24'42.50'' W, Eye alt 72,11 km, *DigitalGlobe 2015, IBCAO, Landsat*. Retrieve from http://www.earth.google.com. 30 August 2015.

Google Inc. (2015). Google earth V 7.1.5.1557. 65°43'16.50'' N, 52°31'03.97'' W, Eye alt 142.15 km, *Landsat, IBCAO*. Retrieve from http://www.earth.google.com. 30 June 2015.

Google Inc. (2015). Google earth V 7.1.5.1557. Sammisoq Glacier. 65°49'29.00'' N, 52°16'30.12'' W, Eye alt 6.33 km, *DigitalGlobe 2015*. Retrieve from http://www.earth.google.com. 30 June 2015.

Google Inc. (2015). Google earth V 7.1.5.1557. Sermitsaq Glacier. 65°59'04.24'' N, 52°48'49.19'' W, Eye alt 4.12 km, *DigitalGlobe 2015*. Retrieve from http://www.earth.google.com. 30 June 2015.

Google Inc. (2015). Google earth V 7.1.5.1557. 65°55'58.37'' N, 48°54'16.74'' W, Eye alt 8.28 km, U.S. Geological Survey, *DigitalGlobe 2015*. Retrieve from http://www.earth.google.com. 30 June 2015.

Google Inc. (2015). Google earth V 7.1.5.1557. 65°57'56.71'' N, 52°14'56.05'' W, Eye alt 1.45 km, *DigitalGlobe 2015*. Retrieve from http://www.earth.google.com. 30 June 2015.

Jia, Y., Shelhamer, E., Donahue J., Karayev S., Long J., Girshick R., Guadarrama S., Darrell T. (2014). *Caffe: Convolutional Architecture for Fast Feature Embedding. Proceedings of the ACM International Conference on Multimedia (MM '14)*. doi:10.1145/2647868.2654889 or http://doi.acm.org/10.1145/2647868.2654889.

Krizhevsky, A., Sutskever, I., Hinton, G. (2012). ImageNet Classification with Deep Convolutional Neural Networks. *Neural Information Processing Systems (NIPS), 2012*.

Lowe, D.G. (1999). Object recognition from local scale-invariant features, *Computer Vision, 1999. The Proceedings of the Seventh IEEE International Conference on*, vol.2, no., pp.1150-1157 vol.2, 1999

Müller, F., Caflisch, T., Müller, G. (1977). *Instructions for the compilation and assemblage of data for a world glacier inventory*. IAHS (ICSI)/UNESCO report, Temporal Technical Secretariat for the World Glacier Inventory (TTS/WGI), ETH Zurich, Switzerland.

Nilsback, M-E. and Zisserman, A. (2008). Automated flower classification over a large number of classes. *Proceedings of the Indian Conference on Computer Vision, Graphics and Image Processing, 2008*.

Press, W., Teukolsky, S., Vetterling W., Flannery, B. (2007). Section 16.5. Support Vector Machines. In *Numerical Recipes: The Art of Scientific Computing (3rd ed.)*. New York: Cambridge University Press.

Rau, F., Mauz, F., Vogt, S., Khalsa, S.J., and Raup, B. (2005). *Illustrated GLIMS Glacier Classification Manual: Glacier Classification Guidance for the GLIMS inventory*. Institut für Physische Geographie, Freiburg, Germany. Retrieve from http://www.glims.org/MapsAndDocs/assets/GLIMS_Glacier-Classification-Manual_V1_2005-02-10.pdf.

Wah C., Branson S., Welinder P., Perona P., Belongie S. (2011). The Caltech-UCSD Birds-200-2011 Dataset. *Computation & Neural Systems Technical Report*, CNS-TR-2011-001.

WGMS and NSIDC. 1989, updated 2012. World Glacier Inventory. Compiled and made available by the World Glacier Monitoring Service, Zurich, Switzerland, and the National Snow and Ice Data Center, Boulder CO, U.S.A. doi: 10.7265/N5/NSIDC-WGI-2012-02.

Yang, L., Luo, P., Loy, C. C., Tang, X. (2015). A Large-Scale Car Dataset for Fine-Grained Categorization and Verification. In *Computer Vision and Pattern Recognition (CVPR), 2015*.

Zhou, B., Lapedriza, A., Xiao, J., Torralba, A., Oliva, A. (2014). Learning Deep Features for Scene Recognition using Places Database. *Advances in Neural Information Processing Systems 27 (NIPS) spotlight, 2014*.

Rocky Shore in Greenland

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Introduction

A rocky shore is an intertidal area in which solid rock predominate the area.

The rocky shore is a biologically rich environment. This place provides favorable living conditions for the macro-organisms. Different kinds of animal and seaweed have been found in this area. Therefore, rocky shore is a good place for studying intertidal ecology.

There are several factors make rocky shore an ideal place for the living of organisms. One of the main reasons is the coastal water that contains a high level of nutrients with the effect of tidal. Each tidal brings the plankton and organic substances to the coastal. Therefore, it increases the survival rate of the organisms. Also, the light ensures the continuous of primary productivity.

However, the species have to face different challenges in rocky shore, such as temperature, wave exposure, salinity, desiccation and other threats that affect their survival.

In this Arctic Expedition, we did field study in Greenland rocky shore on May 14, 2015 and May 15, 2015. And we did field study in Hong Kong rocky shore on July 1, 2015. The Greenland rocky shore is quite different from Hong Kong. There are still boulders and rocks in Greenland rocky shore which is similar to that in Hong Kong but some of the area in Greenland rocky shore is muddy and is covered by seaweed which is very different from Hong Kong. The Greenland rocky shore can be basically divided into four parts which are ice, rock, muddy area and the seaside.

We had divided into two groups to investigate the shore in Greenland. One large group was allocated to investigate the area while the small group was allocated to take underwater video. In Hong Kong, we had one group to investigate the shore.

Field Study

1. Measure tidal height
   A student set up the auto level set. A ruler was set at each quadrat point and height readings were seen through the screen, and the values were collected.
2. Putting the quadrats along the transect
   A transect line was set by Dr. Chung, and the first quadrat was set at 0m, facing the sea. In Greenland rocky shore, for every 4 meters, the quadrat was placed. In Hong Kong rocky shore, for every 3 meters, the quadrat was placed.
3. Counting the species within each quadrat
   The number of different species was counted within each small square of the quadrat. Only the top and left boarder was counted if any organisms fall on the boundary of two squares.
4. Measure air temperature
5. Measure light intensity
6. Measure wind speed
7. Measure relative humidity

Data Analysis

1. Calculating actual tidal height
   Since we did not have the m C.D. for Greenland, therefore the actual tidal height was calculated by following equation.
   Actual tidal height=(Lowest tidal height in m)-(Measured tidal height in m)

2. Using the Margalef's Index to determine species diversity
   The Margalef's Index was calculated with the following equation:
   $$D_a = (s-1) / \log N$$
   Where:
   s = number of species;
   N = total number of individuals

3. Using Brillouin Index of Diversity to determine species diversity
   The Brillouin Index of Diversity was calculated with the following equation:
   $$H = (\log N!) - \sum \log n_i!) / N$$
   Where:
   N = total number of individuals
   N_i = number of individual for each species

Results

The environmental parameters and biodiversity indices are tabulated below.

Table 1 Environmental Parmeters of the Two Rocky Shore Sites at Greenland.

Parameters	May 14,2015	May 15,2015
air temperature	11.0°C	3.55°C
light intensity	start: 1710μmol end: 1890μmol	start: 870μmol end:2170μmol
wind speed	0.9 m/s	3.2 m/s
relative humidity	40.4%	44.6%

Table 2 The number of species (s) and the total number of individuals (N) for transect 1 in Greenland on May 15, 2015.

Quadrant	N	s
1	4	3
2	1	1
3	452	4
4	88	2
5	148	5
6	48	5
7	144	6
8	45	3

Table 3 The tidal height and the calculated biodiversity indices for transect 1 in Greenland (May 15, 2015)

Quadrant	Tidal height	Margalef's Index	Brillouin Index of Diversity
1	0.334m	3.32	0.268
2	0.242m	0	0
3	0.222m	1.13	2.21
4	0.163m	0.514	1.49
5	0.124m	1.84	1.71
6	0.091m	2.38	1.19
7	0.0375m	2.32	1.69
8	0m	1.21	1.18

Table 4 The number of species(s) and the total number of individuals (N) for transect 2 in Greenland on May 15, 2015

Quadrant	N	s
1	53	3
2	76	3
3	76	3
4	11	1
5	11	3

Table 5 The calculated biodiversity indices for transect 2 in Greenland (May 15, 2015)

Quadrant	Margalef's Index	Brillouin Index of Diversity
1	1.16	1.27
2	1.06	1.41
3	1.06	1.41
4	0	0.596
5	1.92	0.538

Table 6 With compared to the result in Hong Kong that we had did on July 1, 2015.

Parameters	July 1, 2015
air temperature	32.8°C
ligh intensity	1570μmol
wind speed	4.0m/s
relative humidity	77.3%

Table 7 The number of species(s) and the total number of individuals (N) for transect 1 in Hong Kong on July 1, 2015

Quadrant	N	s
1	178	4
2	153	5
3	109	7
4	62	2
5	59	7
6	106	7
7	224	5
8	224	5

Table 8 The calculated biodiversity indices for transect 1 in Hong Kong (July 1, 2015)

Quadrant	Margalef's Index	Brillouin Index of Diversity
1	2.13	1.89
2	1.70	1.89
3	2.96	1.55
4	3.39	1.28
5	0.558	1.34
6	2.94	1.56
7	1.83	1.74
8	1.33	1.80

Table 9 The number of species(s) and the total number of individuals (N) for transect 2 in Hong Kong on July 1, 2015

Quadrant	N	s
1	68	2
2	375	4
3	104	3
4	40	3
5	473	16
6	106	4
7	1.83	1.74
8	1.33	1.80

Table 10 The calculated biodiversity indices for transect 2 in Hong Kong (July 1, 2015)

Quadrant	Margalef's Index	Brillouin Index of Diversity
1	1.48	1.56
2	5.61	2.21
3	1.25	1.13
4	0.992	1.56
5	1.17	2.13
6	0.546	1.37
7	1.83	1.74
8	1.33	1.80

Figure1 Relationship between Margalef's Index and Tidal Height

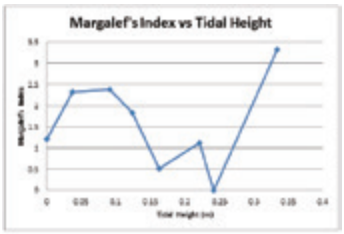

Figure 2 Relationship between Brillouin Index of Diversity and Tidal Height

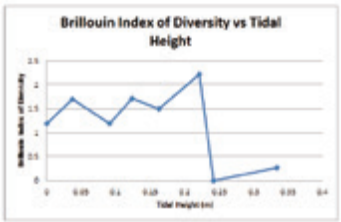

Figure 3

Figure 4

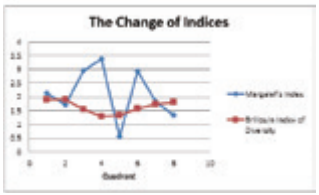

Figure 5

Discussion

The Margalef's Index and Brillouin Index of Diversity are indices commonly used for describing the diversity of a given area of a community. The larger the value of the Margalef's index and Brillouin Index of Diversity, the greater diversity of a community is. For transect 1 on May 15, 2015, the relationship between the tidal height and the diversity was studied. Theoretically, the major factor affecting the distribution pattern and diversity of the transect line is the length of time to water exposure. At higher tidal height, the time of water exposure is decreased. Therefore, the tidal height would have effect to the diversity of species.

According to the table 2 and figure 1, the Margalef's index increases generally, and decreases when tidal height increases from 0.1m to 0.25m, then increases rapidly when tidal height is 0.334m.

According to the figure 2, the Brillouin Index of Diversity firstly has fluctuation from tidal height 0m to 0.2m, and then decreases when tidal height is 0.2m.

Generally, the greater the tidal height leads to the lower species richness. This is because organisms at higher tidal height will have a longer to exposure to the air will lead to higher chance of organisms' desiccation which will make organism die, due to the lack of water. Also, there is fewer food supply Therefore, it is harsh for the organisms to live at higher tidal height. But there are other factors such as competition affect the species diversity. Also, the values of two indices are based on different parameter in their formula, so they show different results.

Since there was an error of our auto level set, therefore we took the number of quadrant as the distance to discuss the relationship between distances to the species diversity for the transect 2 in Greenland and the field trip done in Stanley, Hong Kong on July 1, 2015.

Compare the result of Greenland and Hong Kong

From table 5, 8 and 10, the Margalef's index and the Brillouin Index of Diversity of transect 2 in Greenland on May 15, 2015 is lower than that of the two transects done in Hong Kong on July 1, 2015. From the definition, the larger the value of the Margalef's index and Brillouin Index of Diversity, the greater diversity of a community is. Therefore, these data indicates that the Greenland rocky shore is less biodiverse

than that of Hong Kong. From Table 1 and 6, different climate condition was seen between Greenland and Hong Kong. Therefore, the climate condition is one of the factors that determine the species diversity.

Conclusion

In the study of transect 1 in Greenland on May 15, 2015, the tidal height was the most significant factor in determining the survival and distribution of living organisms on the rocky shore. However, with insignificant data, it only can be conclude that the tidal height did have relationship with the species diversity. But there may be other biological factors that are not yet studied. These factors should be studied together to get a better conclusion.

From the compare of transects done in Greenland and Hong Kong, Greenland rocky shore is different from that of Hong Kong. Although Greenland rocky shore is already a well-development environment, due to the different climate and other biological factors, the Greenland rocky shore is less biodiverse than that of Hong Kong.

References

Bakus, G.J. (2007), Quantitative analysis of Marine Biological Communities; Field Biology and Environment. London: John Wiley and Sons LTD.

Gary, A.W. (2003). Hong Kong Field Guides 1: Rocky Shores. Hong Kong: Hong Kong University Press.

Høgslund, S., Sejr, M. K., Wiktor Jr, J., Blicher, M. E., & Wegeberg, S. (2014). Intertidal community composition along rocky shores in South-west Greenland: a quantitative approach. Polar Biology, 37(11), 1549-1561.

Little, C. & Kitching, J. A. (1996). The Biology of Rocky Shores. New York: Oxford University

從北極考察之旅 思考天人合一的思想 對中醫學發展的意義

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摘要

目的

本研究在中醫理論指導下，以香港及北極地區作為考察地點，分析不同人在不同環境之下所出現的身體變化。從而透過自身觀察及文獻佐引兩方面，探討天地與人之間的關係，並思考「天人合一」的思想對中醫學之學術體系的形成及其發展的意義。

方法

在本年四月至六月期間，來自中大的17名香港學生分別在香港及北極地區接受了三個階段的中醫健康評估。透過連續評估參與研究人士的健康狀況，從而分析北極地區的環境對人的影響。

結果

北極地區的環境與香港甚為不同，參與研究的人士在北極地區的考察期間亦因而出現不同的身體變化，例如有些人患上了外感卒病，有些人則被觸動其內傷雜病，因此可以肯定天地之氣對人的影響。所以，我們必須透過瞭解天地與人之間的關係，去捕捉這些變化的路徑及趨

勢。惟有透過觀察生命在自然的情況下所出現的規律，我們才能對當中的變化作出準確的判斷及應對。

結論

中醫的優勢在於對天地與人之間的關係上有非常精密的觀察及思考，其中時間及空間乃掌握整體變化的關鍵。只有以天人相應的角度，思考生命在自然狀態下的變化，醫者才能完整地把握疾病的發生、發展及變化，掌握治療的時機。醫者的高下正正取決於把握整體的能力。因此，若醫者能夠在治病必求於本的基礎上，結合多方面的變化作整體的考慮，便能對求診者的狀態作出更全面及精確的判斷，從而提高其臨床療效。

1. 研究背景

本研究在中醫理論指導下，以香港及北極地區作為考察地點，觀察不同人於不同環境之下所出現的身體變化，並期望結合自身觀察及文獻佐引兩方面，探討天地與人相互之間的關係，從而思考「天人合一」的思想對中醫學之學術體系的形成及其發展的意義。

1.1 形而上者為之道

《易經．繫辭上》：「形而上者謂之道，形而下者謂之器」從方法論的觀點上來說，這是認識事物的兩種截然不同的方法。這兩種認識事物角度使東方及西方各自形成了其獨特的文化，並對日後在這兩種文化的底蘊下所形成的知識體系有非常深遠的影響，醫學的發展便是其中之一。基於對生命的本源上有截然不同的認識，形成了中醫與西醫兩種獨有的醫學文化，並以各自的方式觀察及思考生命。因此，中醫學乃植根於中國的傳統文化之中，運用動態的系統方法去認識天地與人相關的知識體系。

1.2 氣

《老子・四十二章》:「道生一,一生二,二生三,三生萬物。萬物負陰而抱陽,沖氣以 和。」古人以「氣」去認識天地萬物,氣聚而為萬物,氣散而為太虛,此為萬物生成之本。氣有陰陽之分,陰陽之消長即氣之運動,而氣則始終處於不停運動的狀態。《素問・陰陽應象大論》:「陰陽者,天地之道也,萬物之綱紀,變化之父母,生殺之本始,神明之府也。」天地萬物乃陰陽相互消長變化之下的結果,因此陰陽乃萬物變化之道。《靈樞・陰陽二十五人》:「天地之間,六合之內,不離於五,人亦應之,非徒一陰一陽而已也。」在陰陽的消長變化下,五行乃生,各存其性,相生相制,是為萬物制衡之理。《素問・寶命全形論》「天覆地載,萬物悉備,莫貴於人,人以天地之氣生,四時之法成。……夫人生於地,懸命於天,天地合氣,命之曰人。」由此可見,人稟天地之氣而生,與天地相應,與四時相輔,順之則生,逆之則死。

1.3 天人合一

《老子・二十五章》:「人法地,地法天,天法道,道法自然。」循上文所言,人處於天地之間,與天地之氣相通,隨自然變化而活。《金匱要略・臟腑經絡先後病脈證第一》:「夫人稟五常,因風氣而生長,風氣雖能生萬物,亦能害萬物,如水能浮舟,亦能覆舟。若五臟元真通暢,人即安和。」按上文所言,人與天地之間的關係正如舟行水中,舟破則水覆之,舟牢固者,則難為水淹,故《素問・刺法論》:「正氣存內,邪不可干」。

2. 研究設計

2.1 研究計劃

是次研究在本年四月至六月期間進行,參與研究人士分別在香港及北極地區接受了三個階段的中醫評估。透過連續評估參加者的健康狀態,並結合各種因素作考慮,從而分析北極地區對人的影響。本研究分為三個階段:

第一階段的目標為在旅程前的一個月內,紀錄各人的基本身體狀況作基線。
第二階段的目標為在七天的航行旅程中,每天連續觀察參加者的身體變化。
第三階段的目標為在旅程完結後的一個月內,紀錄各人回港後的身體狀態。

2.2 研究對象

本研究的對象為參與北極考察旅程的香港學生，年齡介乎19至22歲，當中包括10名男生及7名女生，合共17人。

2.3 研究日程

	第一階段	第二階段	第三階段
日期	20/4-10/5	12/5-18/5	26/5-30/6
地點	香港	*格陵蘭	香港
內容	一個月內每人至少一次或以上的健康評估	連續七天，每人每天一次的健康評估	一個月內每人至少一次或以上的健康評估

* 航行路線：本考察團所使用的船隻沿著格陵蘭島西面的海峽航行了七天，每天會有至少兩次下船進行實地考察，而其餘日常生活皆在船上。

2.4 健康評估的內容

《醫宗金鑒・四診心法要訣》：「望以目察，聞以耳占，問以言審，切以指參。」

望診	1. 觀察病人的神色形態，言行舉止等 2. 舌象
聞診	聽其音，嗅其味，辨其言
問診	主要問題： 1. 主訴 2. 現病史及既往史 3. 個人生活史(納食、二便情況、夜寐、精神情志等)
切診	1. 脈象 2. 其他檢查

2.5 自身觀察及訪問

本研究會以自身觀察及文獻探究的方式，瞭解北極地區的環境，並會訪問當地居民從以瞭解其生活方式及起居習慣。

3. 研究結果

3.1 環境

3.1.1 北極地區

對格陵蘭島的觀察

格陵蘭島處於北冰洋和大西洋之間，有五分之四的地區處於北極圈之內，其位置約在北緯60至90度之間，屬於高緯度地區。格陵蘭島是全世界最大的島嶼，擁有很長的海岸線，水深流 。在島上可見許多高山，地勢陟峭，具有眾多如冰川、峽谷、河溪、瀑布等地貌。當時大部份土地皆被冰雪覆蓋，土地上的植物多以苔原植物為主，未見有高大的樹木。島上大部分的居民都住在靠近海岸線，地勢較為平坦之處。每個城鎮的民眾人數不多，約為數百人，其生活簡樸，熱情好客，樂於與人相處。當地原居民族名為因紐特人，其長相不一，有如蒙古人的面孔，黃皮膚，頭髮、眼珠皆為黑色，體型魁梧者；亦有如歐洲人白皮膚，較淺色的頭髮及眼珠，高個子般的體態，因此可推斷當地居民的祖先來自五湖四海，及後定居於此，開枝散葉。除了一般城鎮的工作種類外，當地的居民仍有保留捕獵的文化。他們捕獵後所獲得的獵物如鯨魚及海豹等，會於當地的魚市場出售。當地亦有少量超級市場及餐廳，食物大多從外地進口，款式多樣化，五穀雜糧，蔬果肉食一應俱存。他們的飲食習慣以肉食為主，亦多喜歡食用捕獵所得的漁獲，如鯨魚肉及海豹肉等。

數據資料

在北極考察期間，當地的平均溫度為攝氏1˚C，平均日照時間由凌晨4點至晚上10點，約19小時，間中偶爾伴有一陣陣強風，風向多變，同時亦有下雪及下雨同時出現的情況。

	12/5	13/5	14/5	15/5	16/5	17/5	18/5
天氣狀態	有雲	有雲	多雲	多雲	有雨	有小雨	有雪
溫度（攝氏）	1˚C	2˚C	1˚C	-1˚C	-2˚C	2˚C	-2˚C
風速（公里/小時）	13	32	32	26	14	35	24
風向	東北	西南	東南	東南	西	東南	西南
濕度（%）	53%	63%	75%	73%	83%	74%	97%
日照時間（小時）	19	18	18	18	19	19	19

3.1.2 香港

香港位處中國，屬嶺南一帶，其位置約在北緯22.3度，為亞熱帶地區。香港乃沿海而建的一個小城市，地貌豐富，與格陵蘭島相比，則以平地居多。香港四季分明，以炎熱且潮濕的天氣為主，少見冰雪，最寒冷之時亦不似北極地區的夏季般嚴峻。香港天然資源豐富，夏季之時，多見樹木茂盛，百花爭豔的狀態。香港大部分居民都住在平地，居民數目眾多，約有七百萬人，以黃種人為主。整個城市的生活節奏偏快，居民多從事於金融及旅遊等服務業，工時長，工作環境的壓力較大。當地的飲食習慣則以五谷雜糧為主，食物多從外地進口，款式多元化。

3.2 健康紀錄

男 一

此人素來精神暢旺，作息安定，納可，眠可，二便調。初診，脈滑數，舌尖邊紅苔中根部稍膩黃白相兼。旅程期間，曾於第二日及第三日夜寐之時自覺發熱惡寒，醒後復常，脈滑數，舌淡偏紅苔稍厚色白夾黃。回港後第二日始覺痰多色黃，鼻塞流涕，聲音不響，口渴欲飲，兩顴及眉心稍紅，脈滑實有力，舌紅苔黃白稍膩有紅點。

男 二

此人初診之時，適逢考試，作息不定，每天只睡四至六小時，神疲，嗜飲咖啡，唇紅，脈滑夾弦，右關中取大而有力，尺浮，舌尖邊紅苔黃白微膩中有裂紋。旅程期間，第四日起自覺輕微發熱，咳嗽聲重，痰多色黃，咽中痛，口乾，大便難，納尚可，夜寐安，脈滑數，舌淡偏紅苔稍厚色白夾有微黃中有裂紋。半日後，發熱退去，諸症如前。第五日，咽中痛增，咳嗽偶作，晨起痰多色黃，口渴，精神不爽，雙頰微紅，繞唇處亦紅，納尚可，夜寐安，大便不行，舌紅苔薄黃中有裂紋，左脈滑數，右脈滑數關弦。第六日及第七日，諸症緩。回港後，仍有輕微咳嗽，舌稍紅苔薄黃中有裂紋，脈滑右關弦尺浮。

男 三

此人素來精神暢旺，生活規律，舌淡紅苔薄白，脈滑緩。旅程期間，第五天中午自覺咽中乾，口渴，鼻塞，故為其施針雙側合谷、曲池、風池穴，並督促其多加休息，醒後則復常。回港後，無大恙，舌淡紅苔薄白，脈滑緩。

男 四

此人素有鼻敏感，鼻塞涕清，轉季明顯。今見面色微青，納可，眠可，大便日一行成形，精神尚可，舌淡紅苔薄白，左脈滑緩，右脈滑稍軟寸細。旅程期間，鼻中乾痛，曾作一次鼻衄，咽中乾，口渴欲飲飲不解。曾作兩次注船，目眩，頭重，心悶亂，脈虛浮滑數，故囑其閉目平躺，並為其按壓合谷及內關穴，數分鐘後復常。回港後，諸證去，舌淡紅苔薄白，脈滑緩。

男 五

此人精神一般，納可，夜寐安，便調，舌淡紅苔白稍膩尖紅，脈滑緩。旅程期間，第一天登山後，右膕窩痛連小腿，舌脈尚安，故為其按壓小腿，並囑其自行拉筋，多休息。第二天及第三天曾涉水做研究，患處痛增，故施針右側委中、承山、陽陵泉，疼痛減。回港後，右膕窩仍偶作輕微隱痛，舌淡紅苔薄白，脈滑緩。

男 六

此人素來汗多，動後則甚，手心亦多汗，多思慮，容易焦躁，精神尚安，納可，眠可，二便調，舌淡紅苔薄白，脈滑數右尺浮。旅程期間，咽乾，口渴，鼻中乾，曾作鼻衄兩次，數分鐘後自止，大便不行，納可，眠可，舌淡紅苔薄白尖邊紅，脈滑數。回港後，無大恙。

男 七

此人每遇工作繁重，則胃脘作痛，自覺精神難以放鬆，手足冷，雙側眉棱角隱痛，精神尚可。近月工作忙碌，神疲，心情難暢，舌稍淡苔薄白尖邊紅有紅點，脈弦細數略沉。旅程期間，精神欠佳，咽乾，口渴欲飲，舌紅苔白微膩，脈弦細數。回港後，諸證緩，舌淡紅苔白稍膩有紅點，脈細數略弦。

男 八

此人初診時咳嗽兩周，痰初色黃，入夜咳甚，發熱，微惡寒。今見咳嗽仍作，痰色清，精神欠佳，面色不鮮。近月工作忙碌，夜寐少，平均約五小時，納食可，大便調，舌淡紅略暗苔白稍膩，脈沉滑夾弦。旅程期間，咽乾，口渴，神疲，納可，眠可，大便不行，舌暗紅苔白膩，脈沉滑數。回港後，諸證去，舌暗紅苔薄白，脈細數略弦。

男 九

此人精神尚可，納可，寐安，便調，舌淡紅苔薄白有瘀點，脈沉取滑大。旅程期間，精神欠暢，咽乾，口渴，納可，眠可，大便難，舌淡紅苔薄白有瘀點，脈沉滑數。回港後，無大恙，舌淡紅苔黃白中根部稍尖邊有瘀點，脈沉滑緩。

男 十

此人近來適逢考試，經常溫習至凌晨三至四點，夜寐多夢，其夢多與工作相關，精神不佳，納食一般，大便一至二日一行成形，舌色淡苔白微膩尖邊紅，右脈滑數尺浮，左脈細數。旅程期間，神色疲憊，大便不行，鼻乾，咽乾，口渴，舌淡紅苔薄白，脈沉滑數。回港後，諸證去，精神尚可，舌淡紅苔薄白，脈沉滑緩。

女 一

此人手足冰冷，惡寒，精神尚可，多眠睡，月經多後期，舌淡紅苔薄白，脈沉滑而軟。旅程初期，足底出現一粒扁平疣狀丘疹，約2-3毫米，呈圓形狀，周邊質地堅硬，走路時自覺有小痛。當第四天外出考察後，其後皮疹之處則有明顯疼痛。病人欲以針灸治療，以足底傷凍，受寒後氣血凝滯，故立疏經通絡之法，淺刺疹處周邊，留針約十分鐘，及後疼痛大減。其人曾作兩次注船，身微熱，心悶亂，目眩，脈沉細數，故囑其閉目平躺，並為其按壓合谷及內關穴，數分鐘後復常。回港後，無大恙，舌淡紅苔白稍厚，脈沉滑乏力。

女 二

此人自小手足多汗，手足心冷，全日如是。數年來每每受寒或多食飲冷後，大便必爛，一日二至三行後自止。近年夜寐多遲，作息不定，醒後常見項背強几几，活動過後稍順，月經多後期，經行泄瀉，多血塊。現見面色萎黃，舌色淡苔薄白有瘀點，脈沉細，雙尺浮。旅程期間，手汗大減，指頭則出現小粒狀皮疹，脫皮，咽中乾。第三天見鼻塞而流清涕，頭重，舌稍紅苔白稍膩有瘀點，脈沉細略數。回港後，精神暢，醒後肩背痛大減，舌稍紅苔薄白有瘀點，脈沉滑。

女 三

此人心悸數年，疲勞則甚，汗多，精神尚可，每當進食濃味之物則常作頭痛，月經尚調。今見舌色暗苔薄白尖邊稍紅，脈沉滑略數。旅程期間，曾鼻衄七次，發作不定時，止血後則感頭暈，手震，口渴而不欲多飲，舌暗紅苔薄黃，脈沉弦滑數。回港後，諸證去，舌暗紅苔黃白稍厚，脈沉滑。

女 四

此人胃痛十餘年，遇事則起，長年來多服西藥止痛。一年前因學業煩瑣，易惱怒，胃痛明顯，自覺記憶力減，月經後期，色略暗。近來工作繁忙，胃痛頻頻，納不馨，食後腹脹，不知飢飽，神疲乏力，夜寐不安，難以入睡。今見神色漠然，面色略黃，唇色淡，左脈沉細乏

力，右脈氣滯而脈氣不順，舌暗紅苔薄黃。旅程期間，頭痛難當，以兩額為主。其人咽喉不利，口渴，神色呆訥，舌色淡苔白稍膩，脈沉細乏力略澀。第三天中午始覺周身有微熱，神疲，舌色淡苔薄白，脈沉細數，故囑其飯後，多渴熱水，多休息，半日後熱自退。回港後，精神稍暢，舌淡紅苔薄白有紅點，脈沉細略弦。

女五

此人痛經數年，多次經痛至不能下床，要服用西藥止痛，多思慮，容易受情緒所困。今見納食一般，夜寐不寧，多夢，精神一般，面色薄，手足冰冷，四肢瘦削，舌淡紅苔少尖紅，脈沉細乏力尺甚。旅程期間，納食不馨，食少，甚至不欲食，神疲，咽乾，口渴，舌淡紅苔薄白，脈細略數。曾作注船，胸悶欲吐，頭暈，故囑其閉目平躺，輕按其合谷及內關穴，稍舒。回港後，夜寐不安，多天難以入睡，舌稍紅苔少尖邊紅，脈沉細數。

女六

此人素來多思慮，夜寐多夢，神疲，納食可，二便調，月經尚調，舌淡紅苔薄白尖紅，左脈細而略沉，右寸細關尺沉弱。旅程期間，咽乾，口渴，第二天始覺發熱，無汗，身重。月經適至，其人精神不佳，惡寒甚，左脈沉細略數關弦，右脈尺沉，舌色淡苔薄白微黃。第三至五天，熱去，神色呆滯，鼻塞流涕，仍惡寒，舌淡紅苔白微膩尖邊紅，脈細數，尺沉。回港後，諸證去，舌色淡苔薄白，脈沉細。

女七

此人精神不佳，難以集中，氣短，夜寐安，然而作息不定，醒後仍感疲憊，納食尚可，大便二至三日一行，便難，有血塊，腰痛，惡風寒，月經後期，近數月來尤為明顯。今見面色黧黃，唇色暗，目澀乾，舌色淡苔白膩尖邊紅有瘀點，左脈沉細澀，右沉弱。旅程期間，咽乾口燥，大便不爽，精神差，常欲睡，舌淡苔白微膩有瘀點，脈沉細數。回港後，精神仍不爽，大便難，舌淡苔黃白稍膩有瘀點，左脈沉滑細弱，右脈滑數。

4. 討論

4.1 論香港與北極地區其氣各異

4.1.1 香港

古人對南方的描述與香港的情況相似，如《素問．異法方宜論》：「南方者，天地所長養，陽之所盛處也，其地下，水土弱，霧露之所聚也，其民嗜酸而食腑，故其民皆緻理而赤色，其病攣痺，其治宜微鍼，故九鍼者，亦從南方來。」及《漢書．西南夷兩粵朝鮮傳》：「南方暑濕，近夏瘴熱，暴露水居，蝮蛇釀生，疾癘多作，兵未血刃而病死者什二三，雖舉越國而虜之，不足以償所亡。」因此，南方之氣以盛長為特點。《周易．說卦》：「離也者、明也，萬物皆相見，南方之卦也。」

4.1.2 參與研究的學生在香港的健康表現

在是次研究當中，大部分人都有精神緊張、神疲、夜寐不安等表現。《素問．移精變氣論》：「得神者昌，失神者亡。」因此，《淮南子》中有言「神貴於形也。故神制則形從，形勝則神窮。」從以上所見的表現中，可以反映出香港學生在學業及工作這兩方面有較多思慮與擔憂，從而容易傾向影響其精神狀態及夜寐狀況。此外，邪氣傷人較容易傾向先犯其出現問題的臟腑。因此，大多香港學生在前往北極地區後，會出現大便難的情況，追本溯源，皆可反映在其自身腑氣不通、中土不健的問題。香港位處嶺南沿海之地，古書多云嶺南一帶，瘴氣尤盛，其人多病，故亦可參《李待制瘴瘧論》之所言，「嶺南既號炎方，而又瀕海，地卑而土薄。炎方土薄，故陽燠之氣常泄；瀕海地卑，故陰濕之氣常盛。而二者相薄，此寒熱之疾所由以作也。陽氣常泄，故四時放花，冬無霜雪，一歲之間，暑熱過半，窮臘久晴，或至搖扇。人居其間，氣多上壅，膚多汗出，腠理不密。蓋陽不返本而然。陰氣盛，故晨夕霧昏，春夏雨淫，一歲之間，蒸濕過半，三伏之內，反不甚熱，盛夏連雨，即復淒寒，或可重裘。飲食、衣服藥物之類，往往生醭。人居其中，類多中濕，肢體重倦，又多腳氣之疾。」

4.1.3 北極地區

古人對北方的描述與北極地區的情況亦為相似，如《素問．異法方宜論》：「北方者，天地所閉藏之域也，其地高陵居，風寒冰冽，其民樂野處而乳食，藏寒生滿病，其治宜灸焫。」及《漢書．五行志》：「坎在北方，為冬為水也。春與秋，日夜分，寒暑平，是以金木之氣易以相變，故貌傷則致秋陰常雨，言傷則致春陽常旱也。至於冬夏，日夜相反，寒暑殊絕，水火之氣不得相併，故視傷常奧，聽傷常寒者，其氣然也。逆之，其極曰惡；順之，其福曰攸好德。」當時雖為春夏之際，但與香港相較，當地陽氣生發之象並不明顯。《素問．厥論》：「春夏則陽氣多而陰氣少；秋冬則陰氣盛而陽氣衰」。因此可以說明日照時間的長短並不等於陽氣之狀況。天為陽，地為陰。天地之氣相合而萬物生。從觀察所得，北極地區亦以藏為主，如當地的崇山峻嶺及豐富的天然資源多藏於裡，而較少顯露於表。《周易．說卦》：「坎者、水也，正北方之卦也，勞卦也，萬物之所歸也，故曰：勞乎坎。」因此，北方之氣以閉藏為主。

4.1.4 專論北極地區的寒氣與燥氣

《素問．天元紀大論》：「寒暑燥濕風火，天之陰陽也…。」此名六氣，為天之氣，各有其特點。《素問．五運行大論》：「燥以乾之，暑以蒸之，風以動之，濕以潤之，寒以堅之，火以溫之……。」據觀察，北極地區的寒氣及燥氣明顯。寒主收引，其性凝滯，並以傷人陽氣為主。縱然當時為春夏之交，正當天地陽氣生發之時，當地仍然寒氣迫人，因此每人平均也穿著三至四件禦寒衣物，並配以帽子、手套及蒙面巾等裝備。除此之外，當地燥氣亦為明顯。古人對燥氣的認識與現今濕度的概念不同。濕度是反映空氣中水份含量的指標，燥氣則是從整體的角度說明。《素問．陰陽應象大論》：「燥勝則乾。」燥氣以乾為特點，劉完素亦言「諸澀枯涸，幹勁皴揭，皆屬於燥」在這數天的考察中，當地的寒風亦令眾人能感受到乾澀的感覺。

4.1.5 參與研究的學生在北極地區的表現

在這七天的考察中，大部分人都有口渴欲飲而飲不解、咽喉不利、皮膚乾澀、大便秘結、鼻衄等表現。他們都表示這些表現在香港並不常見。《燥氣論》亦有如此論述「然究其本源，皆緣血液不足所致。……燥變多端，或燥於外而皮膚皴裂，或燥於內而精血枯涸，燥於上則咽鼻乾疼，燥於下則便溺閉結」從以上可見，燥氣襲人，肺為關鍵。肺通天氣，貴為嬌臟，喜潤惡燥，故燥氣傷人，先傷於肺。肺氣受傷，津液不能布散，故見咽乾口渴；肺主皮毛，故見皮膚乾澀；肺與大腸相表裡，肺氣不通，大便則秘。

4.1.6 地域特點對辨證論治的重要性

從以上可見，此二地環境大為不同，不同人亦因而出現不同的身體變化。這些表現多隨參加者到達北極地區而生，並在旅程結束後回港而去。《嶺南衛生方》：「然天地之化，四方風氣異宜，時亦相生勝。」四方風氣各異，如北極地區以藏為主，《素問．玉機真藏論》：「北方水也，萬物之所以合藏也……」；香港則以長為主，《素問．玉機真藏論》：「南方火也，萬物之所以盛長也」。每個地域都有其各自的特點，當人轉變了所處的環境，便會受該地域的影響。各種疾病會按著不同的地域特點，發展為不同的狀態及趨勢，因此在治法及用藥上亦理應按著不同人的狀態作調整。因此透過掌握病人本來的狀態、所身處的地方及發病的時間等等各種因素，醫者便可對其疾病的趨勢和特點有更好的把握。

4.2 論不同病候之理

4.2.1 脈多細數

《靈樞．癰疽》「寒邪客於經絡之中，則血泣……」寒主收引，故脈多急。《說文解字》：「急者，褊也」，即緊迫也。《金匱要略．臟腑經絡先後病脈證》：「五邪中人，各有法度，風中於前，寒中於暮，溫傷於下，霧傷於上，風令脈浮，寒令脈急，霧傷皮腠，溫流關節，食傷脾

胃，極寒傷經，極熱傷絡。」然而，在這次的考察過程中，脈急者並不多見，卻多見脈細而帶數者。《脈經》：「數脈，一息六至。」。《素問．玉機真藏論》：「冬脈如營，何如而營。岐伯曰：冬脈者腎也，北方水也，萬物之所以合藏也，故其氣來，沈以搏，故曰營，反此者病。帝曰：何如而反。岐伯曰：其氣來如彈石者，此謂太過，病在外；其去如數者，此謂不及，病在中。」由此可見，寒令脈急只是其中一種狀態，若其人本有陽氣不足，而外受寒氣所逼，衛陽亦會因而被調動起來，故可見脈數。因此病無定脈，必須從疾病的過程，思考脈象的變化，正本清源，才能作出準確的判斷。

4.2.2 病多見先發於四肢

考察之時，有不少人在手足處出現脫皮、紅癢、小水泡或皮疹等表現。四肢為四末，為身體末端之處。《傷寒論》：「凡厥者，陰陽氣不相順接，便為厥。厥者，手足逆冷者是也。」若陽氣不足或運行不暢，便失卻其濡養之能，四末為陰陽之氣交接之所，亦處身體之末，故病多先見於四末。因此，傳變之路，從表從裡，亦為關鍵。

4.2.3 不同人對外在環境的適應力

人的狀態往往都會受外在的環境所影響。從是次考察可見，平素精神暢旺，生活規律，作息安定的人對外在環境會有較高的適應力。《四氣調神大論》：「故與萬物沉浮於生長之門，逆其根則伐其本，壞其真矣。故陰陽四時者，萬物之終始也，死生之本也，逆之則災害生，從之則苛疾不起，是謂得道。」此外，若能保持較輕鬆的心態去面對工作及環境的變遷的人，大多比較能夠適應環境上的轉變。《淮南子》：「神貴於形也。故神制則形從，形勝則神窮。」由此可見，當面對外在環境的變化時，往往都是神最易先受影響。《説文解字》：「神者，天神引出萬物者也」，此處可引申指生命力的表現。《中庸》：「喜怒哀樂之未發，謂之中；發而皆中節，謂之和。」因此當我們面對外在環境的變化時，我們應作出適度的應對，以中為用，以和為貴。《中庸》：「致中和，天地位焉，萬物育焉。」

4.2.4 寒病

是次考察團中，有數人曾出現外感病候，如惡寒發熱、鼻塞流涕、咽乾咳嗽、頭痛項強等表現。當中女子比男子的人數較多，亦需要用較長的時間方愈。以疾病的趨勢而言，男子多往陽熱方面發展，多見熱象，如咽痛口渴，痰黃質稠等；女子則往虛寒方面發展，多見虛象，如惡寒甚、神疲、納食不馨、面色青蒼等。《婦科玉尺》：「男子之為道也以精。婦女之為道也以血。精為陽。此其所以成男子也。血為陰。此其所以為婦女也。」男子以陽為本，女子以陰為本。男子陽氣較旺，多先見發熱，疾病亦多轉趨化熱的狀態，整個疾病多往陽熱發展。女子在此則多見虛象，若適逢月事，其人狀態亦顯得較差。《金匱要略》：「婦人之病，因虛、積冷、結氣。」因此女子受寒後，病情多見纏綿反覆，整個疾病多往陰寒發展。然而，這並不能夠說明所有男女若得傷寒病後的必然之路，因此還需從疾病的過程中作思考及判斷。

4.2.5 注船

注船，即今常見之暈船浪，病者多見惡心嘔吐、頭暈目花、面色蒼白等表現。《諸病源候論．婦人雜病諸候論》：「無問男子、女人，乘車船則心悶亂，頭痛吐逆，謂之注車注船，特由質性自然，非關宿挾病也。」在這次考察團中，有不少人曾出現注船的情況，且多見於平素體虛，脾胃不健等人。然而，《寓意草》中可見注船之證並非虛人獨有，「吳添官生母。時多暴怒。以致經行複止。入秋以來。漸覺氣逆上厥。如畏舟船之狀。動輒暈去。久久臥于床中。時若天翻地覆。不能強起。百般醫治不效。因用人參三五分。略寧片刻。最後服至五錢一劑。日費數金。意圖旦夕苟安。以視稚子。究竟家產盡費。病轉凶危。大熱引飲。腦間有如刀劈。食少瀉多。已治木無他望矣。聞余返婁。延診過。許以可救。因委命以聽焉。余以怒甚則血菀於上。而氣不返於下者。名曰厥巔疾。厥者逆也。巔者高也。氣與血俱逆於高巔。故動輒眩暈也。又以上盛下虛者。過在少陽。少陽者足少陽膽也。膽之穴皆絡於腦。郁怒之火。上攻於腦。得補而熾。其痛如劈。同為厥巔之疾也。風火相煽。故振搖而熱蒸。土木相凌。故艱食而多瀉也。」因此，從注船一事可見，同為氣逆於上，其理不一，一虛一實當細分之。

4.2.6 目疾

在登上雪山之時，遍地白雪，寒風凜凜，然而久久在外則覺雙目乾澀，痛癢並作，故外出之時一眾學生均會配戴太陽眼鏡，以作擋風及遮光之用。然而，在格陵蘭的城鎮中，縱然白雪紛紛，卻不常見當地人於外出時會佩戴太陽眼鏡，亦不多見人彌患眼疾。根據現代醫學文獻記載，居住於北極的居民多有眼疾之患，如雪盲症、白內障、黃斑病變等。古人在北方所發的眼疾亦有以下論述，《經驗丹方匯編．目疾》：「治北方人與南方異。北方之人患眼最多，皆因日冒風沙，夜眠火炕，二氣交蒸，治之多用涼藥。」然而目疾的表現縱然相似，但在不同人身上的發病機理各有不同，《目經大成．治病必求其本論》：「夫目本陰陽五行，相生配而神明，少有偏損，六淫之客氣乘之，其所以為疾者，固非見症醫症之所能治也。」由此可見，縱然北極地區之氣候嚴峻，易損及目，但目疾的出現不只取決於當下的環境，還受個人因素所影響，從而出現不同的疾病狀態。因此，《目經大成．治病必求其本論》亦有訓示，「夫目不求五行製化、陰陽六氣之本，見紅退紅，見腫消腫，寒不應則熱之，熱不應則寒之，是疾不廢而人速其廢也。」

以上乃就是次考察團所出現的情況作綜合論述，皆為本人親身的觀察及經歷，並作整理及分享。每人的身體狀況各異，故必需以中醫辨證論治的思維，方可見病知源，作出準確的判斷及應對。然而，本研究亦有諸多匱乏之處，如研究對象太少及研究時間太短等，因此仍存在很大的改善及進步空間。倘若將來再有機會進行同類型的研究，可就擴大研究對象及延長研究時間這兩點，再作深入討論。

4.3 天人合一的思想對中醫理論的意義

天地在循環不息的變化中，無時無刻都在影響人的生命，這些變化就是生命的象徵。《潛夫論．本訓》：「是故天本諸陽，地本諸陰，人本中和。三才異務，相待而成，各循其道，和氣乃臻，璣衡乃平。」然而，若在生命的過程中，當人失卻與天地之間協調的關係，此謂陰陽失調，便為病。《素問．至真要大論》：「謹候陰陽所在而調之，以平為期。」因此，中醫在治療疾病時，會透過不同的方法，以達至調和陰陽的目的，幫助人恢復面對天地變化的能力。

從以上的研究可見，天地之大，其氣各異，人立其中，必受其氣而生變，順之則生，逆之則死。《嶺南衛生方》：「夫正氣不能自病，邪之所客輒病焉。以正氣之亂虧損也。苟使正氣充實，精元內守，病何從來乎？四方有高下之殊，四時有非序之化；百步之內，晴雨不齊；千里之外，寒暄各異。豈可以一定之法而待非常之變？」因此，在天人相應的思想之下，中醫所面對的是天地之人，是在自然狀態下的人，這說明了中醫在治病的過程中由始至終便不能離開天地作整體考慮。

中醫「以人為本」的思維方法並不是單純指因時、因地、因人制宜的具體用藥原則，而是整套掌握變化的思想。若病人證見咳嗽，便將之診斷為「咳嗽病」，治法以「降逆止咳」，此乃以其證候的機理論治，並不是以整個疾病的發展機理作出判斷。這種以消除證候作為治療核心的診斷方法，失去了中醫審視整體的意義，亦很容易令醫者出現判斷及治療策略上的矛盾，或往往會演變成以「大包圍」的方法去治療，因而大大降低了臨床的療效。

病之所以有名，皆因其獨有的發病規律。這是由古人從慎密的觀察所得，經由長年累月的驗證，用以啟迪後人。《素問．陰陽應象大論》：「陰陽者，天地之道也，萬物之綱紀，變化之父母，生殺之本始，神明之府也，治病必求於本。」病必有因，醫者必需從病人以往的狀態，其中包括對病人的性情及所身處的地域等作整體的認識，才有辦法判斷當刻的變化，然後推知疾病的發展路徑，從而掌握治療的時機。因此，從中醫以人為中心的思想去思考疾病的本質，便會得出完全不同的判斷及治療策略。

由此可見，在古人長年累月對天地萬物仔細的觀察之下，形成了天人相應的思想。這種將天地萬物視為整體，讓事物在自然狀態下發展，並以動態系統的方法去認識生命的思想，奠定了中醫理論體系的基礎，並決定了中醫學研究生命的方法及其發展方向。

5. 結論

當醫者只見病人的證候，而不思考背後的病機，往往就如瞎子摸象，不但事倍功半，還會拖延病情，錯過治療良機，甚至危及病人的性命。中醫的優勢在於面對天地與人之間的關係上有非常精密的觀察及思考，其中時間及空間乃掌握整體變化的關鍵。只有以天人相應的角度，思考生命在自然狀態下的變化，才能完整地掌握疾病發生、發展及變化的全過程，把握治療的時機。醫者的高下正正取決於這種掌握整體的能力。《素問．四氣調神大論》：「聖人不治已病治未病，不治已亂治未亂，此之謂也。夫病已成而後藥之，亂已成而後治之，譬猶渴而穿井，鬥而鑄錐，不亦晚乎。」因此，若醫者能夠在治病必求於本的基礎上，結合多方面的變化作整體的考慮，便能作出更全面及精確的判斷，從而提高其臨床療效。

參考資料

1. 專書

田代華：《靈樞經》，北京：人民衛生出版社，2005年，新1版。
李耳、莊周：《老子．莊子》，北京: 北京出版社，2006年，新1版。
張仲景：《金匱要略》，北京：人民衛生出版社，2005年，新1版。
張仲景：《傷寒論》，北京：人民衛生出版社，2005年，新1版。
田代華：《黃帝內經素問》，北京：人民衛生出版社，2007年，新1版。
李璆、張致遠：《嶺南衛生方》，北京：中醫古籍出版社，2012年，新1版。

2. 期刊論文

張清苓、姜元安（2002）〈從抓主證論中醫臨床的辨病與辨證層次〉，《北京中醫藥大學學報》第25卷，第4期， 頁 5-9。
李致重（2008）〈哲學是中醫的科學源頭〉，《中醫藥通報》第7卷，第3期，頁14-18。
姜元安（2012）〈中醫臨床之方與法〉，《香港中醫雜誌》第7卷，第1期，頁27。
吳梓新、連建偉(指導)、姜元安(指導)（2014）〈《金匱要略》「辨病」與「辨證」的關係〉，《浙江中醫藥大學學報》第38 卷，第五期，頁548-550。

3. 網路資料

〈先秦兩漢〉，《中國哲學書電子化計劃》網站，2006-2015 年，網址：http://ctext.org/zh（在2015年6月至9月期間上網）。


The End

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