

Yushan Fellow Program

Performance Report

Assessment of effectiveness of tangible work (The implementation results can be presented cumulatively, including the annual performance report of the second year, which can include the results of the first year and the second year)

Main points of assessment	The anticipated goals	Concrete work achievements or results	Supporting documents
1. Chief content of the Yushan (Young) Fellows' research work and overview of full research process.	<p>“暗能量光譜儀”計畫中的銀河系巡天項目 (DESI-MW)</p> <p>DESI-MW 是 DESI 計畫下三個主要的巡天項目之一，以恆星為目標進行光譜巡天的國際合作。三個主要巡天項目將在 2020 - 2025 年間，使用 DESI 計畫下位於美國亞利桑那州的 Mayall 天文望遠鏡，對宇宙三度空間的結構進行不同尺度的測繪。DESI 計畫由美國國家 Lawrence Berkeley 實驗室以及其他世界各地共 77 個研究機構共同出資（約七千五百萬美金）。自 2020 年開始觀測起，DESI 將成為接下來十年間在觀測宇宙學部分最醒目的計畫之一。由 Dr. Cooper 共同主持的 DESI-MW 工作小組由 19 位專精銀河系科學的研究者組成（幾乎皆有在歐美機構的終身職），負責對一千萬顆銀河系內的恆星採取光譜的此一突破性工作的設計、執行以及後續光譜的分析。DESI-MW 預計將發現銀河系的新結構，並對宇宙學與恆星天文物理提供獨到的新知。Dr. Cooper</p>	<p>The DESI Survey began science operations in March 2021. The bright-sky component (including DESI MW) is currently ahead of schedule (approximately 30% complete). DESI already ranks among the largest spectroscopic surveys, having accumulated more than 10M extragalactic and 3M stellar observations to date.</p> <p>Dr. Cooper is leading the first paper from the DESI-MW project, presenting the design of the survey and validating that design with early data. This paper is now under internal review in the collaboration and will be published as part of the first round of DESI “Key Project” papers in the summer of 2022. One of two PhD students supported by Dr. Cooper’s Yushan grant has also made important contributions to this paper. The thesis project of this student is to construct simulated versions of the MW survey data based on theoretical models (Dr. Cooper’s main area of expertise). This project, which</p>	<p>https://www.desi.lbl.gov/desi-builders/</p>

	<p>獲選共同主持本項目工作小組的重任，反映出他於此國際合作計畫內被同儕高度肯定的事實。他對此合作的努力與貢獻，已使他獲得未來能在國立清華大學校方零出資的條件下，得繼續參與 DESI-MW（註：個別新成員的參加費用是美金 25 萬元），並且還可將未來巡天計畫取得的相關資料用於（清大）學生研究計畫。</p> <p>(Adapted from the original submitted proposal)</p>	<p>we are leading from NTHU, is making good progress. The first published results are expected in the coming year.</p> <p>Dr. Cooper will also be among the leading authors of at least one further papers in the initial DESI key project (describing the DESI target selection software) and will co-author a number of others. For the first 2.5 years of the Yushan grant, Dr. Cooper served as co-chair of the DESI MWS survey group. In recognition of his service to the collaboration, he was awarded the status of ‘survey builder’ in March 2020, with a citation for “outstanding contributions to the support of the Bright Galaxy and Milky Way science”.</p> <p>Dr. Cooper supervises a second PhD student on studies of the evolution of galaxy structure using data from the DESI Legacy Imaging Survey (DESI-LS, a photometric precursor to DESI). The student’s first paper on this topic was submitted for review in 03/2022.</p> <p>With colleagues in Spain, Dr. Cooper has co-authored a study on the use of DESI-LS for a large survey of low-surface brightness features around galaxies and comparison with Dr. Cooper’s STINGS models. Dr. Cooper has co-authored two further publications with NTHU undergraduates (one sponsored</p>	
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		in part by his Yushan grant) and colleagues at ASIAA on the evolution of the dust content of galaxies.	
<p>2. The link between Yushan (Young) Fellows' future research topics and the university's development and the anticipated benefits (including Higher Education SPROUT Project):</p> <p>(1) Fellows' research plan and goals</p> <p>(2) The link between scholars' research content and the university's development</p> <p>(3) Specific work performance or achievements, please include the mid-term progress report of the particular research plan</p> <p>(4) Anticipated goals (including qualitative or quantitative working performance or results)</p>	<p>Dr. Cooper 目前研究重點在於將 STINGS 數值模擬工具（及其他理論技術）應用於未來在星系考古學方面的觀測資料，特別是 DESI 計畫中的 Milky Way Survey 項目。結合他在 DESI-MW 項目主導的地位加上在其他觀測及理論研究的各種合作計畫，可以預見 Dr. Cooper 的研究工作將在快速發展的星系考古學領域產生更大的影響。而他具有國際能見度的研究工作的持續，也將提供國立清華大學各種研究導向的教學內容：包括對碩博士生特別具有吸引力的觀測宇宙學、星系形成及理論天文物理的計算方法等課程。</p> <p>(Adapted from the original submitted proposal)</p>	<p>The Centre for Informatics and Computation in Astronomy (CICA) is a grant-funded project of the NTHU 國際競爭重點領域人才培育計畫 under MoE's 深耕計畫. As part of CICA, the NTHU Institute of Astronomy has built the CICA Cluster, a medium-scale high performance computing facility specialized for research in astronomy and astrophysics. The CICA cluster is available for use by all IoA faculty, postdocs and students. Dr. Cooper is one of three faculty who share responsibility for the planning, administration and day-to-day technical support of this facility. The cluster has been built in three yearly design and procurement phases. A significant fraction of the design and procurement work has been led by Dr. Cooper and the administrative assistant employed on his Yushan grant. The most recent phase (installation of a petabyte-scale Lustre parallel filesystem) will be completed in June 2022. CICA is now the most versatile and powerful in-house HPC facility for University-based astronomy in Taiwan. It provides first-class computing resources and training opportunities to IoA students, allowing them to develop valuable and marketable skills in high-performance computing and machine learning. In further support of this program, Dr. Cooper used part of his research fund to upgrade the IoA computer classroom and to install an all-sky</p>	

		monitoring camera in the NTHU teaching observatory, which is used for undergraduate astronomy projects.	
3. Support provided by the university and the project's original goals (please specify the type of support or funds provided by the university to assist in research, such as research equipment and funds, research assistant personnel expenses, accommodation, relocation, children's education assistance, etc.)	<p>(一)學校整體的配套措施</p> <p>1. 新進教師學術專案補助費(start up 起始費)</p> <p>(1)補助目的：鼓勵本校新聘教師從事學術研究，協助建立必須之研究設施。</p> <p>(2)補助對象：到校任職半年內，經系所(中心)推薦之新進教師。</p> <p>(3)補助內容：補助研究相關之經費，惟不包括申請人之薪資津貼。</p> <p>補助經費總額及項目：總額以不超過150萬元為原則，由校款及學校管理費支付。由系所(中心)、院(含清華學院)、校以對等比例共同補助。</p> <p>2. 宿舍及房租津貼補助</p> <p>(1)新聘教師原則優先配住「學人宿舍」，房型為一房及兩房。此外，尚有清華會館及第二招待所可供申請。</p> <p>(2)房租津貼補助：編制內新聘專任教師符合本校房租津貼要件者每月補助10,000元，自到職日起至多3年。</p> <p>3. 子女入學</p> <p>(1)國立清華大學附設實驗小學及幼兒園優先入學：</p>	NTHU provided office space and a 1.5M first-year start-up package, which contributed to the development of the CICA cluster in support of Dr. Cooper's computing needs. On-campus housing, 3-year rent subsidy and the other benefits listed were provided by NTHU.	

	<p>依國立清華大學附設實驗國小學新生入學辦法及幼兒園招生簡章，本校編制內專任之教職員工之子女享有清華附小與幼兒園優先入學資格。</p> <p>(2)子女教育補助費：依「全國軍公教員工待遇支給要點」標準補助。 http://person.web.nthu.edu.tw/files/14-1138-12001,r940-1.php</p> <p>4. 福利事項：</p> <p>(1)生日禮券：編制內教職員每人每年郵政禮券 1000 元。</p> <p>(2)健康檢查補助：年滿 40 歲以上編制內教職員，兩年補助一次最高 3500 元。</p> <p>(3)自費團體保險。</p> <p>(二)擬聘單位之配套措施</p> <p>理學院天文所將規劃 Dr. Cooper 一間辦公室。Dr. Cooper 主要需要放置電腦的空間。天文所現有的電腦室，仍可容納一定數量的電腦。若是 Dr.Cooper 需要更大的空間，物理系在清華實驗室的機房也可容納。</p> <p>(Adapted from the original submitted proposal)</p>		
4. Yushan Fellows ' team cooperation (please list team members and cooperation methods) (Yushan Young Fellows don't need to fill in this)			

<p>5. Yushan (Young) Fellow should aim to cooperate and exchange foreign academic resources, which should be linked to university development. It's suggested to make good use of these global academic network resources to assist the internationalization of the host university and promote international exchanges and cooperation, including teachers and students exchange activity between universities, international research collaborations, dual degree programs and so on.</p>		<p>As described in section (1), Dr. Cooper's membership of the international DESI collaboration and his leading role in its high-profile Milky Way Survey project contribute to the international visibility of NTHU and the Taiwanese astronomical community. Although opportunities for in-person exchanges have been limited by the pandemic, a number of Taiwanese researchers based overseas but engaged in DESI have given colloquia at NTHU. Several of the undergraduate research projects supported by Dr. Cooper involve contact with collaborators outside Taiwan.</p> <p>Dr. Cooper is a founding member of the "Theoretical Astrophysics" thematic group in the most recent incarnation of the National Center for Theoretical Science, which supports the growth of the computational and theoretical astrophysics community in Taiwan as a whole, including international engagement and recruitment. He serves on the hiring committee for this group. He also serves on time allocation / proposal review committees for international observing facilities in which Taiwan is a partner.</p>	
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Quantitative Assessment Form

Item		Results and concrete work performance	Explanation
1. Manpower training		Graduate courses:_____6_____ Undergraduate courses:___0_____ Doctoral students:_____2_____ persons Master's students:_____2_____ persons Undergraduate students:___3____ persons Others:___0___ persons	Graduate cosmology, (3 semesters), Graduate galactic astrophysics (2 semesters) Astronomy Colloquium (single course over 2 semesters).
2. Papers and research works	Domestic	Journal papers:_____ Academic books and papers in books:_____ Conference papers:_____ Technical reports:_____ Others:_____	
	Overseas	Journal papers:_____2_____ Academic books and papers in books:_____ Conference papers: _____ Technical reports:_____ Others:_____1_____	2 published (MNRAS), 1 RNASS research note [2 further papers are under review (MNRAS, AJ) and multiple DESI papers in late stages of preparation.]
3. Keynote speaker		_____5_____panels /sessions	1. Invited talk, ASROC 2019, Taichung (05/2019) 2. Conference Summary (Theory), “Light In The Suburbs: Structure and Chemodynamics of Galaxy Halos” Sexten, Italy (Jun 2019) 3. Invited talk, “Galaxy Formation and Evolution Across Cosmic Time”, ASIAA, Taipei (12/2019) 4. Conference summary, NCTS

			<p>Workshop on Feedback in Galaxy Evolution (Oct 2020)</p> <p>5. Invited talk on behalf of the DESI collaboration, American Astronomical Society annual meeting 237 (Jan 2021)</p> <p>+ Session Chair at DESI collaboration meetings 07/2019 and 03/2020, and several domestic seminars.</p>
4. Patents (including patents pending)	Domestic	Quantity:_____	
	Overseas	Quantity:_____	
	<input checked="" type="checkbox"/> N/A		
5. Industry-Academia Cooperation	Number of partnered enterprises :_____		
	Number of industry-academia research projects:_____		
6. Technology licensing	Technology licensing cases:_____		
	Total technology licensing royalties (amount) NT\$_____		
	<input checked="" type="checkbox"/> N/A		
7. Others			