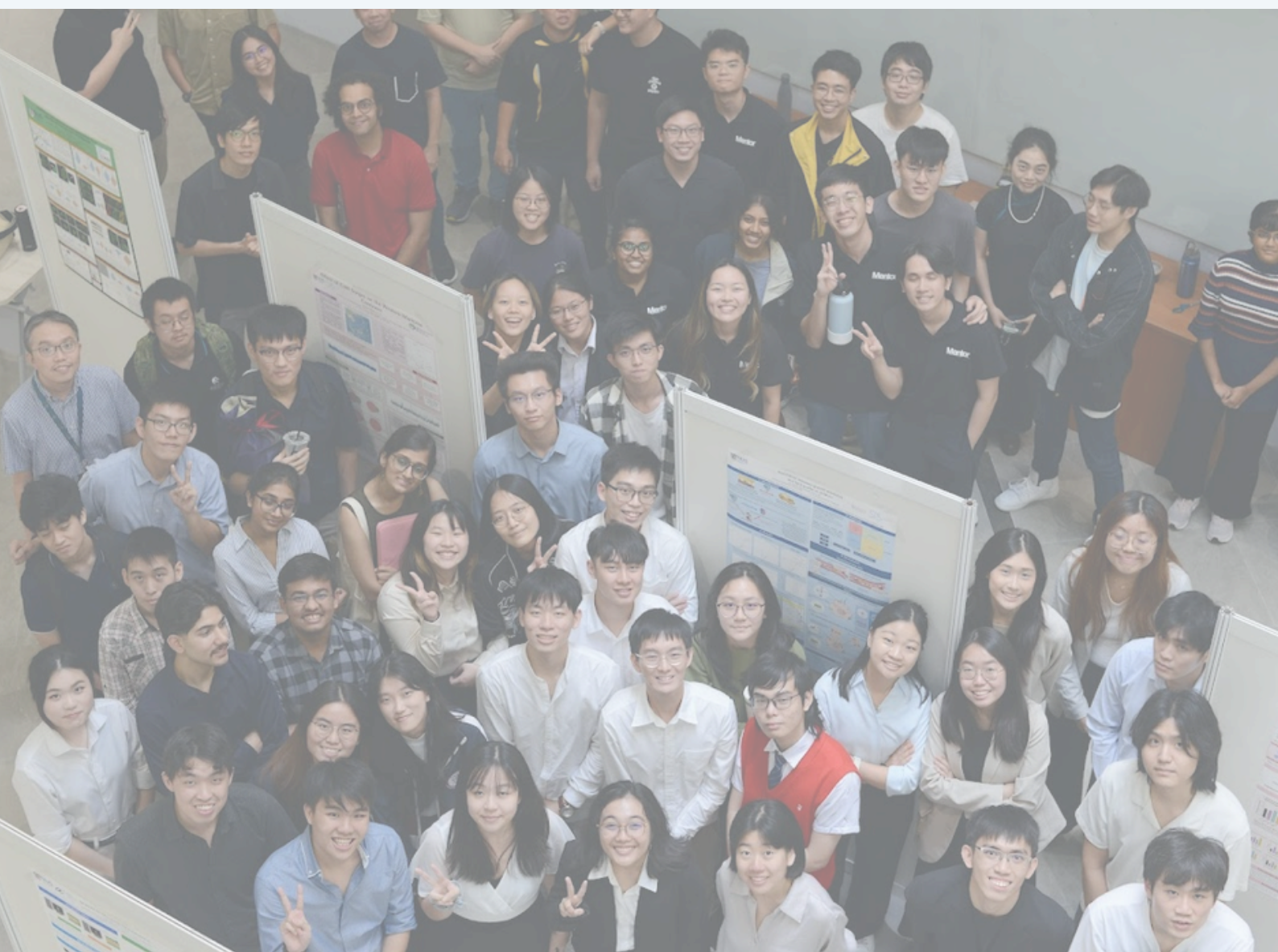


Special Programme in Science





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Welcome Message



Hi, Welcome to the Special Programme in Science (SPS).

SPS is a talent development programme established in 1996 at the Faculty of Science, National University of Singapore, to nurture students interested in interdisciplinary science and scientific research. Designed for intellectually curious and highly motivated students, SPS provides an immersive learning environment that fosters critical thinking, scientific inquiry, and innovation across multiple scientific disciplines.

SPS offers a unique curriculum that blends foundational science with interdisciplinary research exposure, collaborative projects, and independent learning. Students explore diverse fields—from physics, chemistry, and life sciences to data science and beyond—through small-group tutorials, peer learning, hands-on workshops, and ample research opportunities.

Beyond academics, SPS provides a structured mentorship programme where senior students play a significant role in guiding junior students in SPS courses and research projects. Mentorship is a key part of the student development and this where programme where students learnt to develop soft skills in teaching, communication and learning how to work with peers, essential skills for the work place.

Through SPS, students gain not only scientific knowledge but also the leadership, collaboration, and interpersonal skills necessary to thrive in diverse academic and professional environments.

We are excited to have you as part of this vibrant and intellectually engaging community!



Dr. Robert Lieu
DEPUTY DIRECTOR

<https://sps.nus.edu.sg/>

What is SPS about?

Our History

The Special Programme in Science (SPS) was established in 1996 to nurture enthusiastic students to pursue their passion for science. The programme brings together students from the different disciplines of the Faculty of Science into a tightly-knit community.

Our Mission

Encompassing multidisciplinary research, active peer-learning, and student mentorship, SPS hopes to develop scientific reasoning and independent study skills in students. Students are introduced to some of the broad areas of contemporary scientific concerns through an interdisciplinary approach, a key hallmark of the programme.

Our Goals

SPS aims to promote scientific discourse across all disciplines of Science. The hope is for every student to graduate with the skills and knowledge to gain an appreciation for research outside their major specialisation. Through group projects and small-group seminar classes, students will build scientific communication and teamwork skills that will come in useful in their further education or future workplace. At SPS, every group project is designed to stimulate the students' creative thinking and further their learning.



Our Courses



SP2271 Introduction to the Scientific Literature

In this course, students are taught how to understand peer-reviewed scientific journal articles. This involves critically analysing and comparing a paper against existing scientific knowledge to determine its merits, limitations, reliability, and significance. This skill is crucial for keeping abreast of scientific progress and making evidence-based decisions. Students will learn to analyse methodology, interpret results, and evaluate conclusions of papers across a variety of scientific disciplines. Based on library research, they will evaluate a paper in the context of its field, and substantiate, challenge, or extend its conclusions. Students will learn to communicate their analysis constructively in multiple modes.

SP2274 Engineering a Life-like Cell

This course introduces students to the possibility of constructing the smallest unit of life, the cell, using the central question: what are the minimum components and processes required to build an artificial living cell from scratch? Students will explore how the fundamental chemical and physical principles underlying biological processes allow cells to work together and function as an autonomous machine, enabling self-replication, self-assembly, self-repair, and reprogramming in response to changes in the environment.



SP2273 Working on Interdisciplinary Science, Pythonically

Computing plays a crucial role in how science understands our world. It is often considered the 'third pillar' of science, alongside theory and experiments. This course allows students to experience how computers can be used to solve fun and interesting problems (e.g. climate models, real-time measurements) in interdisciplinary science. Students will also learn how to approach complex problems by breaking them into smaller ones, noting similarities, identifying what data is essential, and devising steps that will lead to a solution. The Python programming language will be taught for the implementation of some of these solutions.



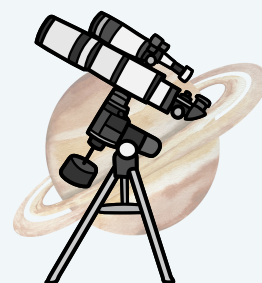


SP3275 Science for a Sustainable Earth

In this course, using the United Nations Sustainable Development Goals (UN SDGs) framework, students will develop critical and inventive thinking, communication, collaboration, and information skills. A system thinking approach will be used to analyse and understand the complex interconnections between the planet and life. Topics include climate, environment, oceans, biodiversity, energy, social challenges, and more. Projects will venture from computational modelling, to measurements and analysis of scientific data, to the communication and discussion of global problems. Fieldwork projects will focus on gathering scientific data in local settings and collaborations with local and international organizations.

SP3176 The Universe

This is the fourth course of an interdisciplinary program covering nature at different scales from 'Atoms to Molecules', 'The Cells', 'The Earth' and 'The Universe'. This course traces the developments in theoretical and observational cosmology, starting from Newtonian cosmology, Hubble's observations, the Big Bang, formation of stars and black holes to recent ideas in the origin and fate of the Universe.



SP3172 Integrated Science Project

This course serves to initiate students into the arena of scientific investigation using project based learning. The students get to design and to conduct laboratory experiments for their project under the supervision of mentors and PI. Here, students are strongly encouraged to undertake projects that integrates different discipline of science together. With the interdisciplinary flavour, this course provides an avenue for students from several disciplines to work together and it also lays the foundation for further work in experimental science.



SPS Mentorship (Year 3 and beyond)



Mentors play a key role in supporting and guiding their juniors through their academic journey. Acting as a bridge between students and the academic world, mentors help them navigate research, understand their strengths and challenges, and make the most of their learning experiences.

Along the way, mentors themselves grow as well, developing skills in mentorship, communication, collaboration and more. It's a chance to teach, guide, and learn together as part of the SPS community.

1 Junior Mentors (Year 3)

Prospective SPS students are selected through an interview process as part of their application for the Junior Mentors role. As Junior Mentors, students will gain valuable experience in guiding and mentoring their fellow juniors for the first time.

3 Graduate Mentors (Graduate students)

Senior Mentors may choose to continue their mentorship journey as Graduate Mentors should they continue their graduate studies in NUS, or any other universities abroad.

2 Senior Mentors (Year 4)

Upon completing all milestones as Junior Mentors, students will be promoted to Senior Mentors, where they will take on greater responsibilities in facilitating discussions and providing mentorship. Additionally, students will receive remuneration for their time, in accordance with the University's guidelines.

*** Head Mentors**

Head Mentors are students who have been appointed by the SPS director as leader representatives to help in SPS. Head Mentors work very closely with the SPS staff and their peers in the running and teaching of SPS. They serve as mentors, advisors, and resource persons to the SPS students and community.

SPS Fireside Chats

Fireside chats are mini sharing sessions that occur weekly/ fortnightly during the semester that seek to foster a culture of knowledge sharing among faculty, mentors and students. These informal gatherings provide a relaxed environment where participants can share personal experiences, insights, or lessons learned from their academic, professional, or personal journeys.

Examples of past fireside chats may be found below!



How to apply for Overseas Graduate Schools

This SPS Fireside Chat will cover the process of applying to overseas graduate schools, with graduate mentors sharing their experiences and tips on university selection, personal statements, recommendation letters, and interview preparations.

Dive into the Nano-world

In this edition, SPS students are invited to explore the Nano-materials lab at NUS, hosted by Prof Sow Chorng Haur. The visit includes hands-on experiments like nano-fabrication with a focused laser and observing nanostructures using a Scanning Electron Microscope.



SPS Events



✦ Dean's Tea

The highlight of the SPS Dean's tea is to confer the SPS graduation certificates on the final-year SPS students who have completed the 2-year programme. These students will be graduating from NUS and hence, this will be their last year being in the programme. Many students from this most senior batch in SPS also serve as mentors in the programme.

✦ Astronight workshop

A workshop hosted by SPS's very own seniors on how to overcome the difficulties of astronomy and stargazing in urban environments with the help of software and post-processing.

✦ Engagement Day

Every year, we conduct an engagement session for incoming and prospective science undergraduates. On this day, staff, mentors, as well as students participate in meaningful discussions about the activities that are done in SPS.



SPS Events



✦ Chinese New Year celebrations

Every year, SPS celebrates the Chinese New Year with an evening of louhei, hotpot and games!



✦ Mentor Development Workshop

Conducted annually just before the semester begins, this workshop aims to impart newly-appointed Junior Mentors the basic skills required for effective mentorship and highlight avenues for continued education and development.



✦ SPS Induction Programme

On this very day, SPS seniors welcome the next batch of SPS freshmen into our SPS community through a series of exciting activities.

And more!



SP3172 Congress

SP3172 is an SPS-only course that serves to initiate students into the world of scientific research. Students spend one semester with groupmates working on a research project, culminating in a presentation on Congress Day. Projects are entirely up to students and can range across a wide variety of fields, from reproductive health, to anti-cancer peptide synthesis, to quantum computing!



Finding a Project

SPS students use the first semester in Y2 to find groupmates and a general project topic that interests all of them.

Planning

With the guidance of their group mentors and professor(s), students outline their project's hypothesis and planned workflow.

Research!

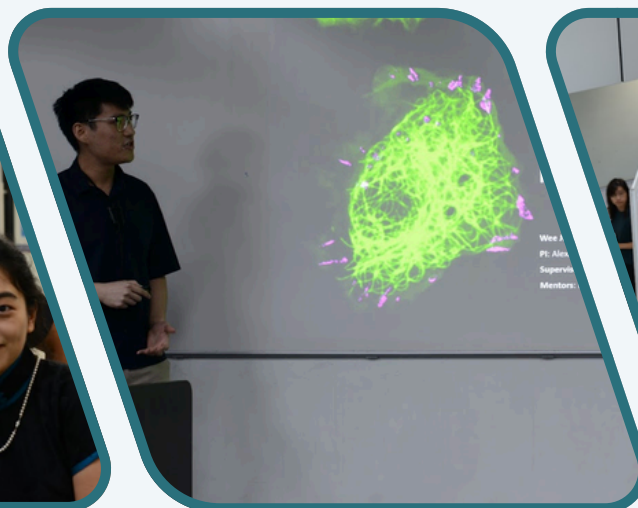
The fun part! Students can research and edit their project direction accordingly with how their project workflow is going.

Submissions

Students are typically required to submit a report and a poster for graders near the end of the semester.

Congress

A culmination of all their efforts, students present their project to the cohort and possibly the wider SPS community!



SP3172 Congress

Plant Fuel

George, Terence

This group tackled the challenge of converting the plant-based chemical furfural into hydrofuroin, a useful biofuel ingredient, using electricity and metal catalysts. After testing different metals, pH levels, and furfural concentrations, they found the specific conditions necessary to steer the reaction towards a higher product yield. These insights pave the way for smarter design of green, efficient processes to turn biomass into sustainable fuels.

A Ciliated Brain

Samantha, Benjamin, Joanna

Learning and cognitive flexibility are abilities often impaired in conditions like autism, which can be affected by primary cilia on brain cells. This group uses techniques like gene expression and brain imaging in mice to reveal that cilia play distinct roles during different learning phases and may influence how neurons communicate, especially through dopamine. These insights help uncover how cilia contribute to goal-directed learning and may open new paths for understanding and treating learning-related conditions.

The Binary Knapsack

Jun Rui, Roger, Jerry

This project explores a new way to solve the Binary Knapsack Problem using a cutting-edge type of quantum computer called a qumode-based system. By applying a technique to simulate a system naturally evolving to its lowest energy state, they successfully simulated accurate solutions and developed helpful rules for tuning the system efficiently.



Our SPS Staff



Yih-Cherng Liou

SPS Director



Chammika Udalagama

Courses taught: SP2273, SP3176



Robert Lieu

Courses taught: SP2274, SP3172

Our SPS Staff



Linda Sellou

Courses taught: SP2271, SP3275



Chee Onn Ku

Courses taught: SP2271, SP3275



Ryan Shawn Phillips

Courses taught: SP2271, SP2273, SP3275, SP3176

