

YaleNUSCollege

Teaching Biochemistry in a new liberal arts college

Professor KHOO Hoon Eng, Associate Dean of Faculty,
Yale-NUS College
National University of Singapore
ynckhe@nus.edu.sg



Vision & Mission Statement

VISION A community of learning,
Founded by two great universities,
In Asia, for the world.

MISSION Yale-NUS College, a residential college
located in Singapore, aims to redefine
liberal arts and science education for
a complex, interconnected world.



A community of learning





Founded by two great universities



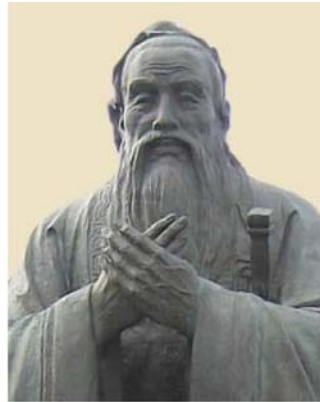
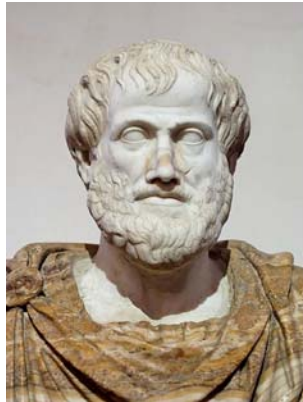


State of the Art Campus (June 2015)

- Acclaimed architects Pelli Clarke Pelli and Forum Architects
- 680K sq ft (63K sq m) total gross floor area
- 3 residential colleges, 40 teaching spaces, 300 offices integrated in nested communities
- Experiential Learning Center, Auditorium, Performance Hall, Art Studios, Black Box Theater, Science Centre, Sports Hall and state of the art Learning Commons with Multimedia Facilities



In Asia, for the world.



What must a young person learn in order to live a responsible life in this century?



Sample Student Experience at Yale-NUS

	Semester One	Semester Two
Year One	Literature & Humanities 1 Philosophy & Political Thought 1 Quantitative Reasoning Comparative Social Institutions	Literature & Humanities 2 Philosophy & Political Thought 2 Scientific Inquiry 1 Elective
Year Two	Modern Social Thought Scientific Inquiry 2 Elective Elective	Elective Elective Elective Elective/ Major
Year Three	Historical Immersion (any time in year 3 or 4) Major Major Elective	Major Major Elective Elective
Year Four	Capstone project in major Major Major Elective	Capstone project in major Major Major Elective



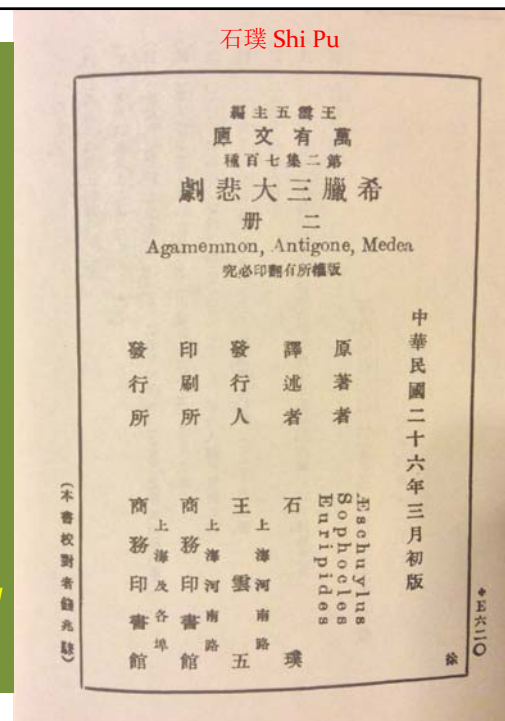
Example: Literature and Humanities 1 Reading List

- Sattar, A., trans. *Valmiki, The Ramayana* (2012) Penguin Books India.
- Fagles, R., trans. *Homer: The Odyssey* (2006) Penguin Classics.
- Waley, A., trans. *Shijing: The Book of Songs* (1996)
- Morwood, J., trans. *Euripides: Medea and Other Plays* (2008) Oxford World Classics.
- Alter, J. trans. *The Wisdom Books: Job, Proverbs, and Ecclesiastes: a Translation with Commentary.* (2011) Norton.
- Pendlebury, D., trans. *Jami: Yusuf and Zulaikha* (1980) Octagon.

Shi Pu, Preface to *Three Greek Tragedies* (Commercial Press 1937)

"... the three female protagonists in these three tragedies are three female heroes, three rebellious females, who have fearless spirit, and courageously pursue astonishing deeds that they, based on rational reasoning, judge that they should do. Regardless of whether their deeds are excessive or not, their rebellious, unyielding spirit even when facing the threat of death can surely provide cure to timidity, complacency, apathy, hesitation, deference, dejection, and so on, which are common diseases of the young female, and even of the male, youth of the present-day China."

Slide details courtesy of Prof. Jinyu Liu (Depauw University)



Science in the Common Curriculum

- Quantitative Reasoning
- Scientific Inquiry 1
- Scientific Inquiry 2

Quantitative Reasoning – Learning Goals

- Learn how to criticize and question claims in an informed way.
- Learn to think clearly, to understand logical and intuitive reasoning, and to consider appropriate standards of proof in different contexts.
- Develop a facility and comfort with a variety of representations of quantitative data, and practical experience in gathering data.
- Understand the sources of bias and error in seemingly objective numerical data.
- Become familiar with the basic concepts of probability and statistics, with particular emphasis on recognising when these techniques provide reliable results and when they threaten to mislead us.

Scientific Inquiry 1 – Learning Goals

- Understand the underlying assumptions of various methodologies in science.
- See how scientists design experiments to study objects that may not be directly observable, and how they aim to do science in circumstances in which controlled experimentation is not possible.
- Consider the ways in which scientists try to reconcile observations that seem inconsistent with one another.
- Recognise what is at stake when scientists make claims and counterclaims in peer-reviewed journals and the popular press.
- Grasp how scientists transfer useful ideas from one field to another
- Develop an ability to distinguish pseudo-science from science, and to understand how the boundary shifts with advances in understanding.
- Learn to communicate scientific ideas to a variety of audiences and discuss their importance in an informed and sophisticated manner.

Theme for 2016-17

Why Evolution is True

Scientific Inquiry 2 – Learning Goals

- Aims to develop the skills, patterns of thought, and facility with science and technology that will enable the non-science major to lead a responsible life in this century.
- The rapid expansion of biotechnology and medicine, the explosion of computer technologies, datasets of all kinds, and the impacts of society on the environment all challenge our capacity not only to understand our civilisation, but to sustain it for future generations.
- Students will engage in discussions that consider how the future will look through the interplay between the environment, the rapidly growing population and its consumption of energy and resources, and how this affects the health of the planet and its citizens.
- The primary learning outcome is to produce students capable of independent and critical thought, informed by data and experiment, and able to persuasively state their case with data-driven analysis.
- Students will explore the intersection of science and statistics, how to present data in visual and written forms, relate to Big Data, modelling and forecasting, distinguish causation and correlation, and determine when a scientific claim is valid.
- Through a series of case studies, students will acquire a toolbox filled with scientific skills that help them understand how science is done.

Majors

- Majors will draw on the material learned in the common curriculum
- Students will be taught the skills and expertise to conduct **independent research**
- Each major will offer a year-long seminar or lab (“**capstone** in major”) in the final year and culminate in a major research project or senior essay
- Current list of **14 majors**:

Anthropology	History	Philosophy, Politics & Econs
Arts & Humanities	Life Sciences	Physical Sciences
Economics	Literature	Psychology
Environmental Studies	Mathematical & Computational Sciences	Urban Studies
Global Affairs	Philosophy	

Aspects of Liberal Education

Small discussion-based seminars

Curriculum spans humanities, social sciences, and sciences

Breadth and depth

Robust intellectual community



Major – Life Sciences

- The Life Sciences endeavour to unravel the mysteries of living things at all scales from the mechanics of protein ‘machines’, to the development of organisms from a single cell, to the splendour and complexity of entire ecosystems.
- The questions in the life sciences are as varied and intriguing as life itself.
- How does a single cell “know” how to develop into a complex organism?
- How is genetic information interpreted?
- Can we predict the effects of gene mutations on the properties of an organism?
- Or the effect of climate change on ecosystems?
- How do organisms protect themselves from viruses, and how do viruses circumvent those protections, continuing on and on in an evolutionary arms race?
- How might life have arisen on Earth?
- What drives the formation and stability of ecological communities?
- What can human genetic variation tell us about the history of human evolution and migration?



Major – Life Sciences

- Part of the appeal of biology is that the methodologies and technologies we use to answer questions are as varied as the questions themselves. The methods draw on chemistry, physics and computational sciences, as well as some that are uniquely biological, like genetics.
- The Life Sciences major is ideal for the student with a fascination for where we come from, why we are the way we are, and how life works — as well as those motivated by the relevance of biology to issues of human health, the environment, and sustainability.
- The major provides excellent preparation for careers in biological research, biotechnology, law, conservation, public policy, and science writing, as well as the health professions, including medicine, veterinary medicine and public health.

Major – Life Sciences (Structure)

- Students must take a minimum of 9 courses (44 module credits) within the major and complete a Capstone project (10 module credits).
- All majors must take the **Biology Lab course** and **Research Seminar**.
- Students will select several of their optional courses from a category called Foundations for Advanced Biology (FAB). The FAB courses ensure that students get the broad education in biology that will be expected of them, while allowing more flexibility than traditional required courses.
- Remaining courses will typically be specialised courses that emphasise the reading and interpretation of primary scientific literature. Courses in other scientific disciplines can also be counted toward the major.
- Students will conduct a capstone project, involving original research.

Life Sciences [Foundations for Advanced Biology]

- Biochemistry and Cellular Metabolism
- Comparative Anatomy and Physiology (Human Biology)
- Computational and Systems Biology
- Developmental Biology
- Ecology and Ecosystems
- Genetics and Evolution
- Mathematics and Statistics for Life Scientists
- Molecular Biology and Genomics
- Neurobiology and Behaviour

Life Sciences - Capstone

- The capstone project will typically be a guided, independent project in laboratory or field research.
- Students will begin preparing for the project no later than the 3rd year with the Life Sciences Research Seminar, culminating in a proposal for their 4th year project.
- Students are encouraged to engage in research earlier in their college years, but the capstone project is required as an intensive research experience that will typically involve the development of hypotheses, design of experiments, collection and interpretation of data, and oral and written presentations of research findings.
- Proposals for alternative types of capstone projects that do not involve original research, such as policy papers, or the production of educational videos, will be considered with the approval of the Head of Studies.

Integrated Living & Learning Experience



Residential Communities

- Four-year residential program
- 3 residential colleges with live-in Rectors, Vice Rectors, Faculty Fellows, Dean's Fellows



Co-Curricular Activities

- Student-founded, student-run
- Faculty support and involvement
- Collaboration with NUS student groups



Int'l & Prof. Experiences

- Career services, international experiences and leadership programs all under one roof
- Guaranteed experience abroad for every student

All sitting under the EVP of Academic Affairs to link living and learning



Admissions

Holistic admissions process

Over 12,000 applications for admission this year

3.0% admission rate

55% yield: competing with US Ivy League schools

Some students chose Yale-NUS over all Ivy League schools, Oxford and Cambridge

60% Singaporean, 40% International

40 Countries, all continents

