

## 課程介紹

# Plant Biotechnology and Synthetic Biology

## 植物生物技術與合成生物學

Dr. Wilhelm Gruissem and Dr. Shuen-Fang Lo

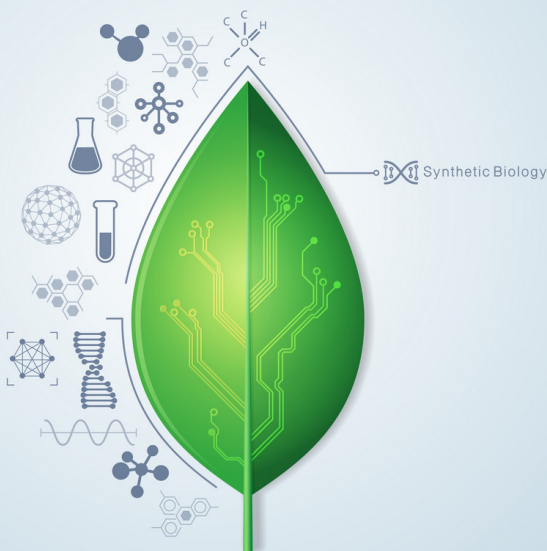
### Course Outline (課程綱要):

Climate change and population growth are global challenges for sustainable agriculture and crop production that must be addressed using **efficient breeding technologies and novel breeding tools** such as CRISPR-Cas9. The new course 'Plant Biotechnology and Synthetic Biology' will introduce students to conventional and advanced methods of plant genome engineering and biotechnology approaches applied to crop plants. Novel synthetic biology techniques for the regulation of plant genes and metabolic processes will be explained.

氣候變遷及人口增長已成為全球永續農業及作物生產的挑戰，必須開發**高效率及新穎的育種技術**以之應對。本項新的課程「植物生物技術與合成生物學」將介紹傳統及先進之植物基因體基因工程及生物技術的方法、演進與農作物改良之應用。課程亦討論應用新穎之合成生物學的策略，以及植物基因調控與代謝途徑。本校玉山學者Dr. Gruissem 將引導學生從傳統生物技術至最新穎的基因體編輯及合成生物學等，兼具實用與知識充實之價值，歡迎同學選修。

### About the Key Instructor:

[Dr. Wilhelm Gruissem](#) has been the former Director of the Department of Plant Biology at UC Berkeley (USA) and scientific consultant of the Executive Yuan. Since 2000 he is Professor at the Eidgenössische Technische Hochschule Zürich (ETH Zurich) in Switzerland. Currently, he is also a Professor at NCHU and a Yushan Scholar. Dr. Gruissem has a laboratory and research team at NCHU and participates in the University's higher education and training programs. His research focuses on improvement of rice and cassava for traits that cannot be achieved by conventional breeding. He is also well known as Editor of the acclaimed book 'Biochemistry and Molecular Biology of Plants'.



1. Principles of plant genome engineering
2. Early transgenic plant traits (insect and herbicide resistance)
3. Advances in crop genome engineering and new traits
  - a. Abiotic stress tolerance
  - b. Pathogen resistance
  - c. Nutrient-use efficiency
  - d. Yield increase
  - e. Micronutrient improvement
  - f. Novel bioproducts (plant-produced vaccines, renewable chemicals)
4. CRISPR-Cas and conventional mutagenesis
5. Genome editing and fast breeding for new traits
6. New tools and technologies in synthetic biology
7. Using 'omics datasets for modeling networks in developmental processes
8. Direct and indirect biosensors for plant hormones
9. Bump-and-hole approach for synthetic plant hormone regulatory circuits
10. Building photosynthetic factories
11. Ethical and societal aspects of plant genome engineering and synthetic biology