

CONTENIDOS DEL CURSO Y BIBLIOGRAFÍA

El curso será impartido en inglés y español dependiendo del docente a cargo. En este programa los títulos de cada tema se indican en español y los contenidos en inglés a modo de referencia.

A. CONTENIDOS GENERALES

I. Morfología floral y taxonomía - *Louis Ronse de Craene (LRDC)*

1. Introduction to flower morphology
 - Definition of flowers
 - Floral organ identity
 - Accessory structures
 - Fruits
2. Description of floral structures
 - Floral formulae
 - Floral diagrams
3. Structural changes in flowers
 - Phyllotaxis: spirals and whorls
 - Merism
 - Symmetry change
 - Homeosis
 - Floral tubes and hypanthia
4. Increased complexity and reduction
 - Polyandry and polygyny
 - Staminodes and stamen loss
 - Pseudomonomery
 - Organ loss and shifts of organs
 - Reversals
5. Identifying major groups of plants with floral characters
 - APG classification
 - Characterization of major clades of flowering plants
6. Major evolutionary trends in angiosperms
 - Changes in the floral ontogeny
 - Convergent and parallel evolution
 - Pseudanthia
 - Petal evolution in the Pentapetalae

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- Ronse De Craene L.P., Iwamoto A., Bull-Hereñu K., Dos Santos P., Luna-Castro J. and Farrar (2014). Understanding the structure of flowers – the wonderful tool of floral formulae: a response to Prenner & al. Taxon 63: 1103-1111.
- Ronse De Craene L.P. (2016). Meristic changes in flowering plants: how flowers play with numbers. Flora 221: 22-37.

II. Biología de la polinización y la reproducción - Regine Claßen-Bockhoff (RCB)

1. Flowers as functional units

- Introduction to pollination biology
- Pollination and fertilisation
- Pollination by animals (zoophily), wind and water
- Flower-pollinator interaction: attraction, reward and deceit
- Reproductive units: flowers, pseudanthia and inflorescences
- Floral syndromes and co-evolution
- Attracting animals
- Diversity of pollinators' bodies and cognitive capacities
- Scent, colour, shape

2. Flower rewards and deception

- Pollen
- Nectar and nectaries
- Fatty oils
- Parfumes
- Egg deposition place
- Mimicry
- Traps
- Sexual deception

3. Flower- pollinator interactions

- Floral syndromes
- Pollinator groups
- Selected pollination mechanisms

4. Beyond flowers - the plant as a reproductive unit

- Introduction to reproduction biology
- Fitness
- Flower arrangement in space: basic inflorescence types

Phenology, flowering sequence and floral display
Perfect flowers and sex separation: monoecy, dioecy
Reproductive systems
Breeding systems: autogamy, geitonogamy, xenogamy
Promotion of outcrossing: herkogamy, dichogamy

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<https://doi.org/10.1016/bs.abr.2016.10.004>

III. Anatomía floral - Paulette I. Naulin (PIN)

1. Flower evolutive context
 - Flower ontogenetic origin
 - Tissue of sterile whorls (sepals and petals)
2. Tissue of fertile whorls (androecium and gynoecium)
 - Relationship between flower and fruit tissues

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- Dickson, W. C. 2000. Integrative plant anatomy. San Diego. HP Harcourt.
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Raven, P. H., Evert, R. F., & Eichhorn, S. E. 2013. Biology of plants. W. H. Freeman and Company.
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Taiz, L., & Zeiger, E. 2010. Plant Physiology. Sinauer associates incorporated.

B. CONTENIDOS ESPECÍFICOS

IV. Dibujo botánico en el campo - Joao Felipe Ginefra Toni (JT)

The workshop invites the participant to develop observational skills and to recognize specific changes in floral structures over time. Botanists like Humboldt, Goethe and Martius also performed attentive and accurate drawings in the field during scientific journeys as an important tool for their research in plant morphology. The relevance of Anschauung (Seeing) in morphological studies will be discussed. As Goethe has already distinguished; there is a great difference between “seeing” and seeing. The former can only grasp static representations of living structures reduced into abstract explanations based on genetic and/or environmental

determinism. On the other hand, seeing in a Goethean morphological sense means, through direct and exact observation, to grasp in a dynamic or process-oriented way the unity that underlies the multiplicity of morphemes (unity in multiplicity), and by so doing, conversely, to see how such multiplicity originates out the whole or unity (multiplicity in unity). Therefore, focus will be given to species which have different developmental stages in the field, because such drawing exercise should be not only about representing a structure with lines on a paper but also about training cognitive skills such as exact sensorial imagination, memory and aesthetic appraisal in order to reconstruct as vividly as possible the developmental stages that a given plant goes through. Thus, by practicing botanical drawing we could learn in which sense our thinking becomes a mode of seeing and our seeing a way of thinking in the study of flowers.

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V. Bauplan floral en monocotiledóneas - Akitoshi Iwamoto (AI)

The floral Bauplan of monocots, pentacyclic flower are remarkably shared in monocots. But, the origin of floral Bauplan remains controversial. I will explain what is the floral Bauplan of monocots and discuss its origin using the results of studies on floral developments of both of basal monocots and basal angiosperms. I'll also refer to the results of our article of JPR about the floral development of Alismatales.

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- Akitoshi Iwamoto, Ayaka Nakamura, Shinichi Kurihara, Ayumi Ohtani and Louis P. Ronse De Craene (2018) *Floral development of petaloid Alismatales as an insight into the origin of the trimerous Bauplan in the flower of the Monocots* *Jour Plant Res* 131: 395–407

VI. Estructura floral en Sapindales del Neotrópico - Juliana Hanna Leite El Ottra (JLO)

- Current issues in the systematics of Sapindales
- Comparative floral structure of neotropical representatives of Rutaceae, Simaroubaceae and Meliaceae
- Floral sexuality in Meliaceae representatives: structural vs functional sex

-Evolutionary pattern of nectary bearing structures and floral architecture in Sapindales

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VII. Morfología de inflorescencias - Kester Bull-Hereñu (KBH)

- General diversity of inflorescences
- Ramification patterns and sequences of blooming
- Floral units and maristem fractionation
- Ontogenetic perspective for an inflorescence classification

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VIII. Diversidad morfológica floral en *Croton* (Euphorbiaceae) - Pakkapol Thaowetsuwan (PT)

Croton L. is a non-cyathial Euphorbiacean mega-diverse genus possibly comprising about 1,200 species, globally present in tropical and subtropical regions (one species presence in Chile). Flowers of *Croton* have many interesting features, e.g., various forms of inflorescence, complex trichome types, diverse stamen forms and number in male flowers. Inflorescences of *Croton* and related genera are diverse ranging from determinate racemes to indeterminate racemes, thyrses and panicles. Stamen forms were found to be highly different among different genera but within *Croton* the inflexed stamen is the most abundant. Stamen number in *Croton* is highly fluctuating but the presence of 11 stamens is found to be the most common and possibly the ancestral character of the genus.

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IX. Adaptaciones florales – Patricia dos Santos (PDS)

- Eco-evolution of flowers
- From strategy to diversification
- Adaptations to the environment
- Resource allocation to reproduction
- Plant longevity
- Flowering phenology
- Adaptations to pollination
- Biotic vs abiotic pollination syndromes
- Adaptations to pollen limitation
- Case studies

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X. Integración floral y diversificación morfológica en *Schizanthus* - Javiera Chinga (JC)

- Mechanisms of floral integration: pollinator-mediated selection and developmental factors
- Changes of integration along ontogeny (ontogenetic integration)
- Growth dynamics along ontogeny (ontogenetic allometry)
- Changes in ontogenetic integration and ontogenetic allometry underlying morphological evolution in *Schizanthus* flowers.



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