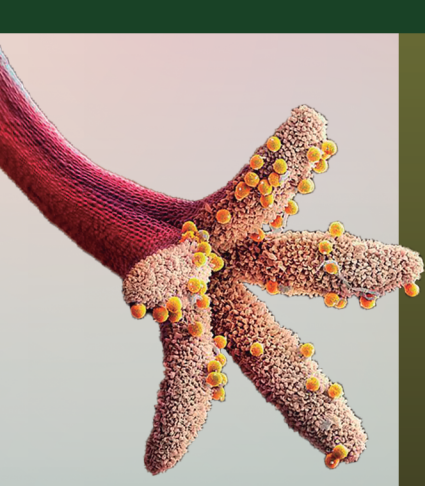




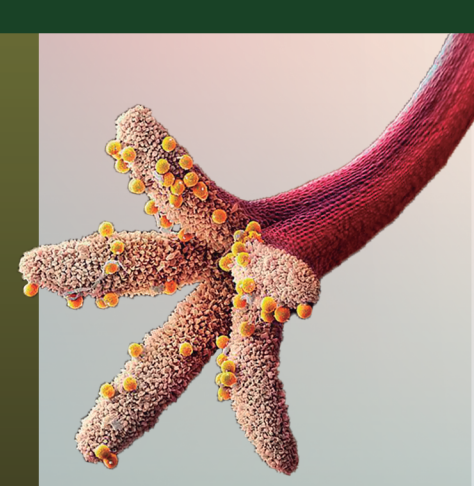
LVII REUNIÓN ANUAL
SOCIEDAD DE BIOLOGÍA DE CHILE

XLVII REUNIÓN ANUAL
SOCIEDAD DE GENÉTICA DE CHILE

VIII REUNIÓN ANUAL
SOCIEDAD CHILENA DE EVOLUCIÓN

XXI REUNIÓN ANUAL
SOCIEDAD DE ECOLOGÍA DE CHILE

XXV REUNIÓN ANUAL
SOCIEDAD DE BOTÁNICA DE CHILE



25, 26 y 27 DE NOVIEMBRE 2014

Hotel Patagónico- Puerto Varas

SIMPOSIO SOCIEDAD DE BOTANICA DE CHILE CONTEMPORARY STUDIES IN FLOWER STRUCTURE AND BIOLOGY

Coordinador: Kester Bull

FLOWER RESEARCH SYNECTICS (FLO-RE-S) - INTRODUCCIÓN AL SIMPOSIO EN ESTRUCTURA Y BIOLOGÍA FLORAL (Flower Research Synectics (FLO-RE-S) - Introduction to the symposium on flower structure and biology)

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Modern Botany has been an area of scientific debate for some 250 years, during which time an enormous amount of research and observations have contributed to the delimitation and characterisation of the quintessential angiosperm structure, *the Flower*. The goal of this symposium is to present the work of Flower Research Synectics (FLO-RE-S) members to the scientific community. The aim of FLORES is to create a space for discussion and cooperation towards the realization of scientific accounts about *the Flower*, taking its very structure as a starting point. Through a variety of research approaches floral structure can be addressed and various types of accounts can be made. This symposium intends to present a diversity of these, such as: the study of floral morphology; research on development of characters; mapping of floral attributes in the phylogeny and the related evolutionary inferences; and the mechanics of particular floral baupläne and their eventual interaction with pollinators. We anticipate that this range of topics presented by researchers from contrasting yet complimentary viewpoints will stimulate a wealth of interesting discussion and debate on all things floral.

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MERISTIC CHANGES IN FLOWERS. WHY NUMBERS MATTER.

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The merism (or number of parts within whorls) of flowers is a highly conserved character, as flowers are generally constructed on a di-, tri-, tetra-, or pentamerous Bauplan, with a wide distribution among major groups of flowering plants. Merism has a strong predictive value with a wide application. For example, trimery has become stabilized among monocots with very few exceptions and pentamery is mainly found among core eudicots (Pentapetalae). The establishment of major merisms appear to be key innovations, linked to a high diversification. However, further changes in merism are not rare, with some families characterized by unusual numbers, such as hexamery, heptamery, octomery, or more. Little is known about what triggers these changes and how they become stabilized in certain groups of plants.

An overview is given about the different factors responsible for changes in merism (meristic increases or reductions, loss of regular merism), which can be genetic or spatio-mechanical. A number of examples are discussed where meristic changes affect the number of organs within whorls but also the total number of whorls. Changes in merism can be triggered at the level of the whole flower, but also in individual organs. Different causes for meristic change are presented and discussed.

DESARROLLO FLORAL DE *CERATOPHYLLUM* - RELEVANCIA DE LAS FUERZAS MECÁNICAS EN PRODUCIR VARIACIÓN FILOTÁCTICA ENTRE FLORES (Floral development of *Ceratophyllum* - importance of mechanical force to produce phyllotactic variation in flowers)

Iwamoto, A.¹, Izumitate, Ryoko¹, Ronse De Craene, Louis², ¹Department of Biology, Faculty of Education, Tokyo Gakugei University. ²MSc course in the Biodiversity and Taxonomy of Plants Royal Botanic Garden Edinburgh. *Ceratophyllum* has been reported to be probably a sister group to the eudicots based on the results of molecular analysis. However, this position is still uncertain and there are other possibilities, in particular, a sister group relationship to the monocots could not be absolutely discarded. Hence, morphological features of *Ceratophyllum*, in particular the floral attributes are important for suggesting phylogenetic affinities. In this work we focused on the floral development of *Ceratophyllum demersum*, a representative species of the genus, whose male flowers have been observed to be arranged in variable phyllotactic patterns; spiral, trimerous, tetramerous and chaotic. Uncovering the floral development of this species also contributes significantly to our understanding and interpretation of the mechanisms governing floral phyllotaxy in the angiosperms. The male flowers of *C. demersum* are composed of more than ten stamens surrounded by tepals. Our study revealed that tepal primordia arise first and then they were followed by the stamen primordia. Interestingly, both tepal and stamens were firstly initiated on the abaxial side of the floral apex and only later on the adaxial side (unidirectional initiation), probably due to the contact pressure imposed by the leaf primordium at the superior node. Later the inner stamens initiate spirally and this should be the main pattern in the stamen initiation, which is basically similar to those of basal angiosperms and suggests a close relation between *Ceratophyllum* and them. The female flowers, considered to be very specialized through reduction, were composed of only one pistil and six to eight tepals and showed unidirectional initiation in early developmental stages, which is probably caused by the contact pressure as well. We conclude that mechanical pressure on the adaxial side of the flower meristem could be an important factor explaining the phyllotactic variation in the male flower of this species.

FORCE MATTERS: CHOICE EXPERIMENTS WITH *BOMBUS TERRESTRIS* AND *APIS MELLIFERA* AT ARTIFICIAL FLOWERS

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Many flowers demand physical force from their pollinators before rewarding them with nectar. A prominent example is the genus *Salvia* (Lamiaceae), in which the process of pollen transfer is mediated by a staminal lever mechanism usually demanding 1-10 mN force for its release. As force costs energy, flowers with levers are expected to be less attractive to bees than flowers without barriers. To test this hypothesis and to get a deeper insight into the evolutionary significance of force in flowers, we successfully trained two common pollinators, the honey bees (*Apis mellifera*) and a bumble bees (*Bombus terrestris*), to artificial flowers. We modelled two types of flowers, one in the style of a *Salvia* flower with adjustable forces and one without any barrier. Our results show, first, that both bee species significantly prefer the models without levers. Second, if nectar concentration is higher in the model with lever, this preference breaks down indicating the bees' cost-benefit calculation. Third, honeybees are less successful on flowers with levers than bumble bees. This might open a niche for bumble bees to favor flowers with barriers in the presence of honeybees. Based on the habitat-selection-model we conclude that force-demanding flowers increase niche diversity and contribute to transient specialisation in a given biotic environment.

EVOLUCIÓN DE LA INTEGRACIÓN FLORAL: RELEVANCIA DEL DESARROLLO (Evolution of floral integration: the relevance of floral development)

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La integración floral, se refiere a la variación coordinada de rasgos florales, y puede resultar de múltiples factores, incluyendo correlaciones genéticas, restricciones del desarrollo y aspectos funcionales. En el caso de las plantas polinizadas por animales, se ha propuesto que la selección mediada por polinizadores, sería la principal fuerza que promueve la integración. En este marco, se han realizado numerosos estudios donde se comparan los patrones y niveles de integración floral con los sistemas de polinización y reproductivos, con distintos resultados. Menos atención ha recibido el papel del desarrollo en la evolución de la integración floral. En este estudio evaluamos los patrones de correlación de rasgos florales durante la antesis y a lo largo del desarrollo en dos especies, *Schizanthus pinnatus* y *Alstromeria ligtu*, y contrastamos estos patrones con los de flores adultas. Además evaluamos el papel de los polinizadores en la evolución de la integración floral, contrastando los patrones de correlación fenotípicas con las tasas de visitas y la diversidad morfológica del ensamble de polinizadores.

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POLLEN CATAPULTS AND THE FLORAL DIVERSITY IN *CATASETUM* - DARWIN'S MOST REMARKABLE ORCHIDS

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Fast movements have evolved repeatedly in plants to support functions such as dispersal, pollination, and even feeding. One example of fast movement with important evolutionary implications is pollinarium ejection in the orchid genus *Catasetum* which, according to Charles Darwin, is "the most remarkable of all orchids". The pollen-carrying pollinarium is ejected at high velocity when the male flower is visited by pollinating bees. We demonstrated that the remote triggering of pollinarium ejection and the precise guidance mechanism in *Catasetum* have relaxed a structural constraint in the design of flowers allowing diversification of floral morphology. In particular, we have shown that one major axis of diversification – the degree of flower opening – correlates precisely with the key biomechanical parameter for pollinarium guidance.