

Taking Living Forms Seriously: A Goethean Approach to Floral Morphology and Anatomy of Two Chilean Loasa

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Summary

In October 2018, the first Intensive Course on Floral Morphology of the FLO-RE-S network was held at the Río Clarillo National Reserve in Chile (*Bull-Hereñu et al.* 2018). All students had to implement a short research project related to the flora present in the reserve. One of these research projects, carried out by Betsabé Abarca Rojas and Gabriela Matamala Gajardo, under the supervision of João Felipe Ginefra Toni, is reported here as an example of a Goethean approach to contemporary studies in floral morphology. By taking living formations seriously in the study of *Loasa* flowers, these students could learn how art and science can be united in a research project, and in what sense our thinking can become a mode of seeing and our seeing, a way of thinking (intuitive power of judgment).

Zusammenfassung

Im Oktober 2018 fand der erste Intensivkurs zur Blütenmorphologie des FLO-RE-S-Netzwerks im Nationalreservat Río Clarillo in Chile statt (*Bull-Hereñu et al.* 2018). Alle Studenten mussten als Übung ein kleines Forschungsprojekt durchführen, das sich auf die im Reservat vorhandene Flora bezog. Eines dieser Forschungsprojekte, das von Betsabé Abarca Rojas und Gabriela Matamala Gajardo unter der Leitung von João Felipe Ginefra Toni erarbeitet wurde, wird hier als Beispiel eines goetheanischen Ansatzes für zeitgenössische Studien in der Blütenmorphologie vorgestellt. Indem sie lebende Formen ernst nahmen, konnten diese Studenten lernen, wie Kunst und Wissenschaft in einem Forschungsprojekt verbunden werden können, und in welchem Sinne unser Denken beim Studium der *Loasa*-Blumen zu einer Art Sehen und unser Sehen zu einer Art Denken werden kann (anschauende Urteilskraft).

Introduction

This research project focused on the comparative floral morphology and anatomy of two endemic species of Loasaceae in Chile: *Loasa placei* Lindl. and *Loasa triloba* Dombey ex Juss. Floral morphology of Loasaceae is particularly complex and has been the subject of various studies in the past (*Brown & Kaul* 1981; *Hufford* 1990, 2003; *Leins & Winhard* 1973; *Paye*, 1857; *Urban & Gilg* 1900; *Weigend et. al* 2004). Loasaceae, a mostly Neotropical group of ca. 350 species in 21 genera, is one of the largest families

of Cornales (Basal Asterids) and has its center of diversity in Andean South America (Colombia to Chile). There are some very distinctive floral morphologies in the family (e.g, from a four-fold organization (tetramery) to a five-fold one (pentamery); from separate petals (apopetaly) to fused petals (sympetaly); from an equal number of stamens and petals (haplostemony) to a higher number of stamens in relation to petals (polystemony); and from tilt- to funnel-revolver flowers with a variety of pollinators, including short- and long-tongued bees, hummingbirds and even small rodents (Henning *et al.* 2018). One of the most morphologically intriguing and diverse groups in the Chilean Flora is the genus *Loasa* which comprises about 36 species, 19 of which are endemic in Chile (Moreira-Muñoz & Trenqualye 2011; Trenqualye 2016). By way of observation and drawing exercises in the field, photography and microscopic preparations, the participants of the 2018 Floral Morphology Course practiced the Goethean approach to plant morphology and trained cognitive skills such as exact sensorial imagination and aesthetic appraisal in order to access, as vividly as possible, some of the highly complex and striking morphological processes displayed by *Loasa* flowers in the Rio Clarillo Natural Reserve. In particular, the processes of heterophylly, perianth and androecial development, anthesis and pollen presentation linked to flower synorganization, and the morpho-anatomy of trichomes during petal late development are presented and discussed.

The dynamic way of seeing in Goethes Morphology: attending to heterophyly in Loasa placei and Loasa triloba

One of the most interesting and fruitful contributions of the Goethean approach to science can be described as following: Goethe was not someone who wanted to establish a philosophical system; instead he always praised experience that can furnish us with knowledge primarily. One particular mode of experience that he was very interested in was the *experience of form, living forms* especially. Goethe's study of formations and transformations of organic form, or Morphology, is the proper Goethean way of doing biology and can be understood, in the above sense, as an aesthetics of morphogenesis (Ginefra Toni 2018). It is the cultivation of a particular way of attending to living phenomena that is in accordance with the nature of the object of study (e.g., a *Loasa*) and, at the same time, opens up new modes of perception and thinking in us. In the case of living organisms like plants, Goethe was particularly concerned with two basic modes of perceiving and thinking such type of phenomena (Holdrege 2013):