

'Different forms of flowers' continues to fascinate

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Although Charles Darwin is most well-known both for his book "On the Origin of Species" and his theories on natural selection, he once stated, "I do not think anything in my scientific life has given me so much satisfaction as making out the meaning of the structure of these plants." What could be more satisfying than unraveling the mysteries of evolution?

Darwin was referring to his studies of different forms of hermaphroditic flowers that occur in a single species. In "'A case to which no parallel exists': The influence of Darwin's *Different Forms of Flowers*," published in the May issue of the [American Journal of Botany](#), James Cohen discusses Darwin's pioneering work concerning the complex breeding system known as heterostyly and what scientists have discovered since Darwin's time.

"Heterostyly is one of, if not the most, complex type of breeding system found in [flowering plants](#). The presence of heterostyly affects the morphology, ecology, development, genetics, and evolution of a species. Given the far-reaching effects of the complex breeding system, along with the fact that it appears to have evolved over 40 times independently, it is fascinating to think about the function and evolution of heterostyly," Cohen commented.

In heterostylous species, two or more different forms of flowers with both male (anthers) and female (stigmas) parts exist. The anthers and stigmas are at different heights within each form, with the anthers of one

flower at the same height as the stigmas of the other flower.

Darwin stated, "The benefit which heterostyled dimorphic plants derive from the existence of the two forms is sufficiently obvious, namely, the intercrossing of distinct plants being thus ensured. Nothing can be better adapted for this end than the relative positions of the anthers and stigmas in the two forms."

"Darwin, along with many of his contemporaries, understood the importance of outcrossing and not mating with close relatives," Cohen said. "Heterostylous species provide at least two different manners in which not only to outcross, but also to avoid inbreeding. These include the morphology, which encourages outcrossing, and a barrier against fertilization by a plant's own pollen, which discourages inbreeding."

Although the presence of this unique type of breeding system is not common, it is found in many economically important plants. A variety of species, from daffodils to purple loosestrife to buckwheat to cocaine, are heterostylous, so understanding the genetics and ecology of the system could have significant economic implications.

Current research related to heterostyly involves trying to determine the underlying genetics of the breeding system. "Although heterostyly appears to be inherited in a Mendelian manner, the exact genes that control the morphology are, for the most part, still unknown," Cohen commented. "Given recent advances in molecular biology techniques, we should be able to determine the genes responsible for the heterostylous syndrome, and that will provide us with many more questions concerning the evolution, development, and ecology of the breeding system that we will address".

More information: Cohen, James I. (2010). "A case to which no parallel exists": The influence of Darwin's Different Forms of Flowers"

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