

## **Researchers find ferns communicate with one another to decide gender**

October 24 2014, by Bob Yirka



Ferns at the Royal Melbourne Botanical Gardens. Credit: Wikipedia

(Phys.org) —A combined team of researchers from Nagoya University and the University of Tokyo has discovered that a certain type of fern plant communicates with others of its kind using pheromones as a means of choosing the gender of maturing plants. In their paper published in the journal *Science*, the researchers describe how their study of the Japanese climbing fern, led to a better understanding of the role that the



pheromone gibberellin plays in its reproduction process. Tai-ping Sun, with Duke University offers a perspective piece in the same journal edition, providing a more in-depth analysis of the work the team has done.

As farmers know, most <u>flowering plants</u> are both male and female—the Japanese climbing fern is an exception—individual plants are either male or female. Until now, it wasn't clear how it was that some of the plants grew to become male, however, while others grew to be female. In this new effort, the researchers have found that it's due to a form of intergenerational communication between the plants.

Scientists have known about the pheromone gibberellin for quite some time, it's been manipulated in some plants to cause them to grow more productively as part of the green revolution. But until now, the role it played in Japanese climbing ferns wasn't known. After much study, the researchers have found that in early life, the ferns are all female—they produce a precursor to gibberellin which is emitted into the local environment. When other older ferns with <u>sex organs</u> that haven't fully developed are exposed to the precursor in large enough amounts, they complete the process of developing the precursor into gibberellins, causing their sex organs to grow to become male. The result is groups of ferns where female plants tend to be surrounded by males—which of course, promotes diversity.

The intercommunication abilities demonstrated by the <u>ferns</u> is an example of a growing field in botany that some have taken to calling plant neurobiology—when plants exhibit behavior that resembles activities of animals. Some plants, for example, have roots that have been found to turn before they encounter rocks or other obstacles and some other plants have been found to inhibit root growth only when surrounded by <u>plants</u> of their own kind to allow them to flourish.



**More information:** Antheridiogen determines sex in ferns via a spatiotemporally split gibberellin synthesis pathway, *Science* 24 October 2014: Vol. 346 no. 6208 pp. 469-473 DOI: 10.1126/science.1259923

## ABSTRACT

Some ferns possess the ability to control their sex ratio to maintain genetic variation in their colony with the aid of antheridiogen pheromones, antheridium (male organ)–inducing compounds that are related to gibberellin. We determined that ferns have evolved an antheridiogen-mediated communication system to produce males by modifying the gibberellin biosynthetic pathway, which is split between two individuals of different developmental stages in the colony. Antheridiogen acts as a bridge between them because it is more readily taken up by prothalli than bioactive gibberellin. The pathway initiates in early-maturing prothalli (gametophytes) within a colony, which produce antheridiogen is absorbed by neighboring late-maturing prothalli, it is modified in to bioactive gibberellin to trigger male organ formation.

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