

Communities of ferns communicate to decide an individual's sex

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Sex-determination, the process by which organisms develop into males, females, or hermaphrodites, happens in many different ways across nature. In many species, including humans, insects and birds, it's determined by genetics. In reptiles, sex is determined by the temperature, allowing mothers to change the sex of their offspring by laying their eggs in different places, or by burying them more or less shallowly. Therefore, in some species the environment plays a crucial role in determining an individual's sex. However, a recent study published in *Nature* has found that in ferns, not only parents, but the whole community has a say in determining an individual's sex.

The study was carried out by a group of molecular biologists at Nagoya University. Plants, unlike animals, have two alternating generations: one diploid state called 'sporophyte' and a haploid state called 'gametophyte'. During cell division, the sporophyte produces spores, which then germinate and grow into the gametophyte, which can either be male, female, or hermaphrodite. Some plants produce spores of different sizes, and small spores grow as males and large ones grow as females. Ferns however produce spores of the same size, each with the potential to become either sex or hermaphrodite.

Leading author Makoto Matsuoka and his team has shown that in Japanese ferns this decision is influenced by communicating chemical signals emitted by older ferns in the community. When there are no gametophytes around, then the spores germinate as a hermaphrodite. This way they can ensure reproduction, but with the potential cost of inbreeding through self-fertilization.

When older gametophytes mature as females, they emit signals to induce the younger gametophytes to germinate as males, therefore balancing the sex-ratio in the population and ensuring cross-fertilisation, which avoids inbreeding and maintains genetic diversity. Scientists around the world are now trying to understand how widespread this process is among fern species, and whether it could occur in other plant species, too.

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