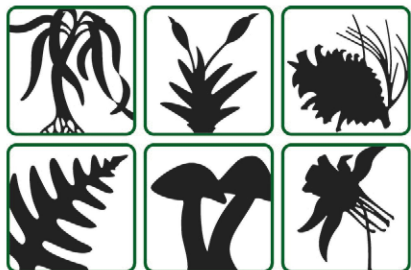


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**Cover Illustration:** Photograph of atypical bisporangiate strobilus (also called bisexual cone) of *Pinus johannis* at the time of pollination. During pollen receptivity (May–June), the ovules in ovulate and bisporangiate strobili produce pollination drops, where the pollen grains land; drops are subsequently absorbed, placing the pollen grains in the pollen chamber. Bisexual structures (hermaphroditic flowers) are common in angiosperms; however, they are scarce in gymnosperms. Sexual systems, (the arrangements of sexual organs on different flowers and/or individuals) and in particular the evolution of dioecy (population with female and male individuals) have been poorly studied in gymnosperms, even though dioecy is common among many gymnosperms. *Pinus* is generally considered to be monoecious, but *P. johannis* provides a model to understand sexual separation in gymnosperms because unisexual and monoecious (male and female organs are produced in different structures within the same individual) plants coexist in its populations. Unisexual individuals produce monosporangiate strobili (only female or male cones), whereas monoecious individuals produce predominantly one type of monosporangiate strobilus (e.g., female cone) and a minor proportion of the other type (e.g., male cone). Moreover, 1% of monoecious *Pinus johannis* individuals produce the unusual bisporangiate strobili, and the bisporangiate strobili are functional (Flores-Rentería et al., *American Journal of Botany* 98: 130–139). The unisexual or near-unisexual expression in *P. johannis* is stable; 99% of the individuals either remained the same sex or slightly increased or decreased the frequency of the minor sex. This sexual stability contrasts with the labile monosporangiate condition of other pines such as *P. edulis* in which sexual expression varies with herbivory and plant age. The sexual system of *P. johannis* can therefore be considered nearly dioecious (paradioecy–monoecy). The study of sexual expression in *P. johannis* offers a novel illustration of gender variation in gymnosperms. The variety of sexual morphs coexisting in the same population makes *P. johannis* a model for studying the evolution of dioecy in gymnosperms. See Flores-Rentería et al.—Sexual stability in the nearly dioecious *Pinus johannis*, pp. 602–612 in this issue. Image credit: Lluvia Flores Rentería.



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## Abbreviations

**Miscellaneous:** AFLP, amplified fragment length polymorphisms; a.s.l., above sea level; bp, base pair; BP, before present; BSA, bovine serum albumin; cpDNA, chloroplast DNA; CTAB, hexadecyltrimethylammonium bromide; cv., cultivar; ddH<sub>2</sub>O, double-distilled water; dNTP, deoxyribonucleotide 5'-phosphate; Enzyme Commission; EDTA, ethylene diamine tetra-acetic acid; f. sp., forma specialis; indels, insertions and deletions; ITS, internal transcribed spacer; LM, light microscopy; mya, million years ago; PAGE, polyacrylamide gel electrophoresis; PCR, polymerase chain reaction; RAPD, random amplified polymorphic dimorphism; SDS, sodium dodecyl sulfate; SEM, scanning electron microscopy; s.l., sensu lato; s.s., sensu stricto; subsp., subspecies; TEM, transmission electron microscopy

**Genetics:** *A*, mean number of alleles per locus; *D*, mean genetic distance; CI, consistency index; *F*, fixation index; *F*<sub>IT</sub>, total deviation from Hardy-Weinberg expectations; *F*<sub>ST</sub>, genetic diversity among populations; *F*<sub>S</sub>, inbreeding within populations; *G*<sub>ST</sub>, the proportion of genetic diversity among populations; *H*<sub>e</sub>, Hardy-Weinberg expected heterozygosity; *H*<sub>o</sub>, observed heterozygosity; MP, most parsimonious tree; *n*, individual chromosome number; *N*<sub>m</sub>, mean number of migrants per generation; *P*<sub>p</sub>, percentage of polymorphic loci; RI, retention index; *x*, base chromosome number

**Statistics and math:** ANOVA, analysis of variance; CV, coefficient of variation; df, degrees of freedom; *N*, number of individuals; *p*, probability; *P*, level of significance; PCA, principal components analysis; *r*, coefficient of correlation; SE, standard error; SD, standard deviation