

Sex and the Busy Bee.

Most male bumblebees are easy to distinguish from females of the same species because they have little yellow moustaches and facial hair. They also have slimmer, hairier legs than the females.

You will never see male bumblebees around at the beginning of the year. It takes a few months before bumblebee colonies establish themselves and start to produce reproductives (males and new daughter queens). Once the males leave the nest they are never allowed back in again because they don't contribute in any way to the running of the colony. They spend their days foraging for nectar and 'hanging out' on flowers - or patrolling for new virgin queens. As they can't go back to the nest they often sleep overnight inside flowers.

Curiously, there are very few reports of anyone ever actually having seen bumblebees mating! Pre-mating behaviour, with the males scent-marking and defending territory and then darting out to grab a passing female has often been observed, but after the pair fall to the ground the female usually crawls away before mating takes place. Perhaps the male pursues the female to her nest and mates within.

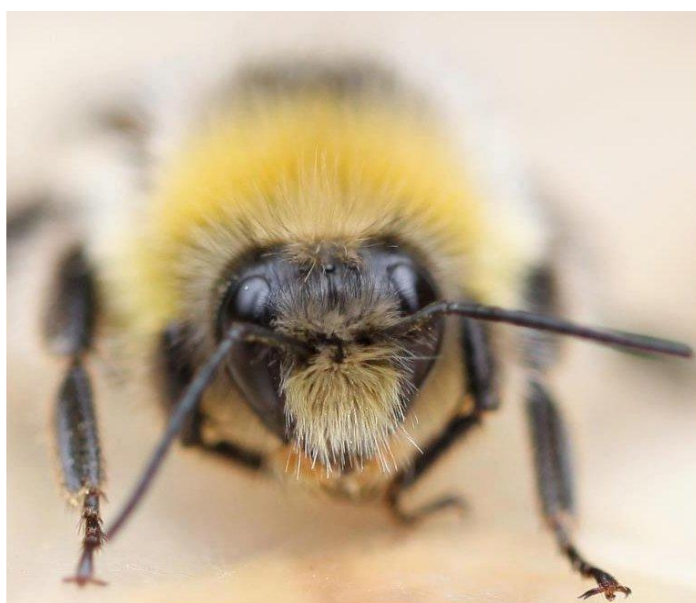


Photo: Brigit Strawbridge.

This bee is a male White-Tailed Bee, *Bombus lucorum*. As he was in no hurry to go anywhere, he posed beautifully for me for nearly half an hour whilst I took photographs of him from every conceivable angle!

The sex ratio, the number of males to females that are produced, varies. Usually, but not always, more males than females are reared but the reasons for the variation are not properly understood. In most bumblebees males predominate early in the season with more females developing later, but this is not always the case. The female, queen bee, 'chooses', in a bee-brained sort of way, whether her eggs produce male or female offspring. Males come from eggs that have not been fertilised while eggs that are fertilised from sperm that the queen stores in her body after mating produce female bees.

Text: Brigit Strawbridge



The Birds and the Bees (but mostly about bees).

“According to tradition, [or at least Wikipedia] the ‘birds and the bees’ is a metaphorical story sometimes told to children in an attempt to explain the mechanics and good consequences of sexual intercourse through reference to easily observed natural events. For instance, bees carry and deposit pollen into flowers, a visible and easy-to-explain example of male fertilisation. Another example, birds lay eggs, a similarly visible and easy-to-explain example of female ovulation.”

Trying to explain how bees reproduce is a whole lot more complicated. How come a male bee does not have a father and cannot have a son but it does have a grandfather and may give rise to grandsons?

Animals may be of two types, depending on whether they have one set of chromosomes in each cell, in which case they are ‘haploid’, or two sets of chromosomes, and so are ‘diploid’. Usually all the cells are diploid except for the female and male gametes, the ova and sperm, which are haploid. After fertilisation, all is diploid.



Ceratina cucurbitina copulating on a *Salvia dominica* flower, Judean Foothills, Israel, <http://bit.ly/GideonPisanty>

This solitary bee is famous for getting tricked by orchid flowers into trying to mate with them and thus pollinating, to the greater satisfaction of the flower than the bee.

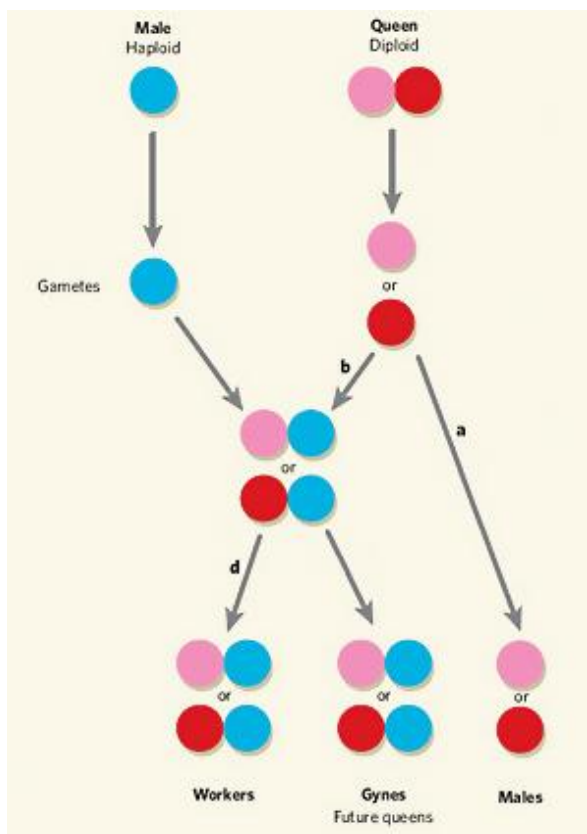
In bees, however, we have a different arrangement, called haplodiploidy, in which males develop from unfertilized eggs and are haploid, and females develop from fertilized eggs and are diploid. The diploid queen bee has her haploid eggs, which, when fertilised by a male bee with haploid sperm, result only in female offspring, the daughter bees. But the father of those daughters is a haploid creature, developed from an unfertilised, therefore haploid, egg, with just one set of chromosomes. All his sperms are genetically identical with the same single set of chromosomes that he inherited from his mother. The female worker bees are more closely related than the sisters we are familiar with, sharing 75% of their genes rather than the regular 50%.

On mating, the female bee stores the male’s sperm in her body for use throughout the year. But not all her eggs are fertilised. She ‘chooses’, in some bee-brained sense, whether to lay a fertilised egg, which will produce female offspring, or to leave the egg unfertilised to produce a male. In most colonial species she will lay fertilised eggs early in the season to build up a colony populated by a large number of female workers, switching to unfertilised eggs later to produce males to mate with those females that will over-winter to build a new colony for the next year.



What controls the timing of the switch to male production and the proportion of males to females produced remain something of a mystery but may be related to length of hibernation and other environment factors.

In many solitary bee species it is the smaller males that emerge first in the spring. Bees with linear nests in burrows or hollow plant stems lay slower developing female eggs at the back and male eggs at the front that block the female emergence until the leave. Some solitary bee species have nests arranged so that individuals can emerge without being blocked by their siblings. The female of the rare coastal-marsh mining bee, *Colletes halophilus*, excavates holes for individual egg cells off a central burrow in the sand. Each cell, lined with a cellophane-like material, is partially filled with a fluid food substance derived from nectar and pollen grains from the Sea Aster. She sticks a single egg to the upper inside surface of each cell above the food store. If it's a smaller cell with less food store she lays an unfertilised, haploid, therefore male, egg while in the larger, better provisioned cells she lays a fertilised, diploid, female egg. Just occasionally she lays a male egg in a female-sized cell, but one that is insufficiently provisioned. She appears to have 'changed her mind' after digging and lining the cavity, perhaps in response to inadequate supplies of nectar and pollen.



Picture: <http://bit.ly/Haplodiploidy>

In a bumblebee nest the first eggs to be laid in the spring after the queen comes out of hibernation are female workers. As the season wears on, the queen starts to produce reproductives, males, as well as females that are given extra food and become new unmated queens known as gynes. Some workers also start laying unfertilised male eggs but the queen tries to destroy these as they are less related to her than her own eggs. Eventually, however, the competition leads to the death of the queen, and no new fertilised eggs are laid. Worker populations are no longer restocked, and the colony ultimately dies off. But they gynes have flown, been mated, and are looking for a hibernation site, ready as queens to start new colonies next year.