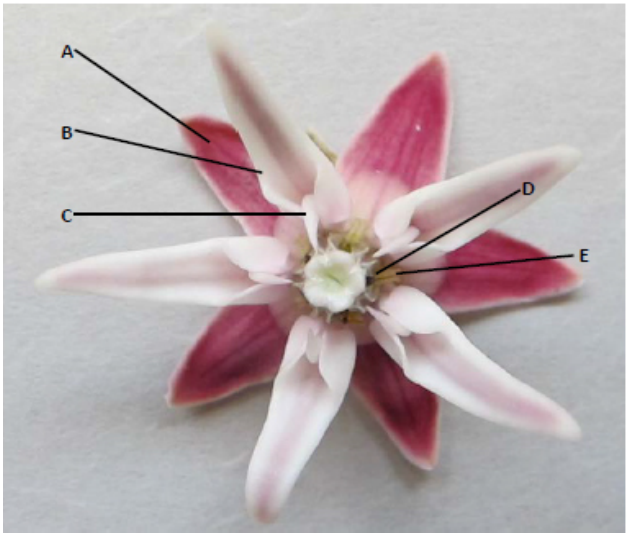
The Mystery of Milkweed Pollination

by Dana Visalli

A swallowtail nectaring on milkweed

Several species of milkweed are common, somewhat weedy but native species throughout much of North America. I can remember glancing at the flowers of our local species a number of times in passing and noticing that they looked odd, but was never moved to try to understand why they have the shape they do until I stumbled upon a written explanation of their biology. It turns out I have been walking past a minor miracle all of these years and failing to recognize it.

A typical milkweed flower is shown below. The petals are the outer whorl, labeled 'A' in the image. 'B' is the *corona*--there are five of them--each curves upward to form a *hood*. At the base of each corona is 'C', the *horn*. 'D' is a dark spot in the image called a *corposculum*, which turns out to be an 'insect leg grabber'; it is attached to the flower's pollen sacs, which are hidden away inside a slit (there are five slits and five corposcula total) labeled 'E.'



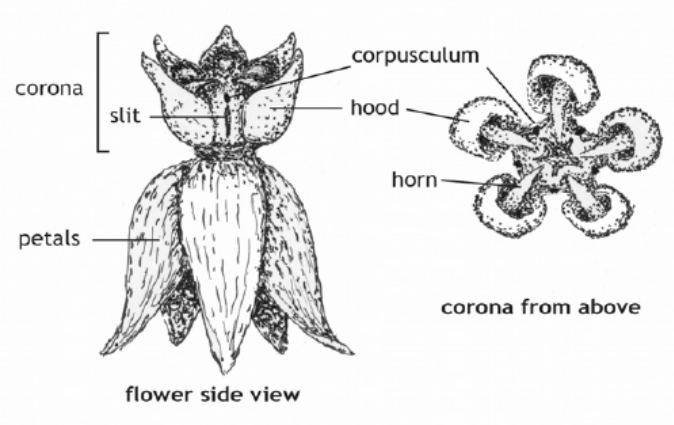
A milkweed flower from above, A= petals, B= coronas, C= horn, D= corposculum, E= slits. See text for explanation.

Side view of flower, with petals folding themselves downward

As with any insect-pollinated flowers, the milkweed flowers' goal in life is to have insects pick up their pollen and carry it to another flower on another plant. Because milkweed grows many stems from one rhizomatous root system, all plants in one clump are genetic clones, which are self-incompatible (self-pollination is impossible). Thus for pollination success the insect must carry the pollen some distance to a genetically distinct plant.

Pollen in milkweeds is not released as individual grains as it is in most flowers, but in a package of about 100 grains bound together in a sac called a *pollinium*. There are two of these *pollinia* resting inside each of the five slits in the flower, and they are connected together by wispy threads connected to the 'insect leg catcher,' the corpusculum.

Milkweed is popular with insects because it produces copious amounts of very concentrated nectar, which collects at the base of each corona. From the image on the previous page and the drawing above it

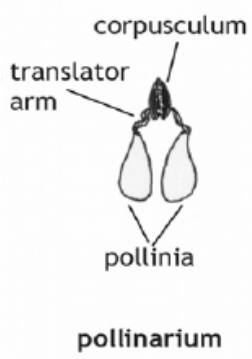


Parts of a milkweed flower in side and top views

can be seen that when an insect dips its head and tongue into the base of the corona for a draught of nectar, its legs will be positioned on or next to the slits on either side.

In fact the insect's legs regularly slip into the slits, at which point they immediately come into contact with those wispy threads that tie the pollinia together. Thus when the insect pulls its leg out of the slit, the pollinia are dangling from it.

For pollination to occur, the pollina have to be inserted back into the slit of a different milkweed flower in a genetically unique clump. Having obligingly flown to such a clump, the insect again positions itself to drink from the corona, and its foot again slips into a slit, delivering the pollinia to the female portion of the flower, the stigma.



Why do the pollinia come off the foot at this time, when re-inserted in the slit? When the insect pushes its head into the base of the corona, it presses on the horn, which pivots downward and narrows the opening through which the insect foot has slipped. After some tugging, the foot emerges without the pollinia. It's that simple! Rube Goldberg himself could not have created a more improbable design.

The mysteries of milkweed pollination do not end here. A milkweed flower head contains approximately 100 flowers, but on average only one flower per head is pollinated. Each pollinium contains about 100 pollen grains, which when delivered to a stigma then fertilizes the 100 or so ovules in the adjacent ovary. After fertilization occurs, a milkweed 'pod' (botanically known as a *follicle*) develops, containing about 100 seeds arranged symmetrically within. At maturity the follicle cracks open and each seed, supplied with air-catching filaments, flies off in the wind.

Only the larger pollinators can successfully complete this gantlet of maneuvers; smaller insects may get tangled up with the pollinarium but not be able to pull it out of the slit; they will die while trying to do so. Even the larger insects sometimes pull a leg off when struggling to extract it.

On the other hand, milkweed produces far more nectar that is needed to attract pollinators; it is a fountain of energy for a multitude of visiting insects, many of which are incapable of performing the pollination operation.

In addition, milkweed produces a toxic chemical known as a cardiac glycoside. Rather than poisoning or deterring herbivory by insects, a number of insect species, notably the caterpillar stage of the monarch butterfly, incorporate and concentrate the glycoside into their own bodies, making the insects more toxic than the plant itself, and protecting these insects from predators. This poison is often passed on to adult form of the insect, as in the case of the monarch butterfly.

Thus milkweed not only provides food for both larval and adult forms of a number of insect species, but it also protects them from their enemies, which will theoretically increase predation on the milkweed. In fact while there are a number of insects that consume milkweed, the plants themselves rarely seem to be impaired by such herbivory.

All living things have to evolve a balanced relationship between the demands of biological survival--which include at a minimum 'eat, don't get eaten, reproduce,' and the need to enter into a symbiotic relationship with the community of life around it. One possible explanation for the odd dynamics of milkweed is that it has evolved a strategy of enhancing the vitality of the community of life in its ecosystem, which then proves to be beneficial to its own reproductive success.

Resource: *The Story of an Organism: Common Milkweed*, by Craig Holdredge, a 25 page pdf (google the title)


A seed pod opening, revealing fluffy seeds within