

An Open Secret — The Calyx of *Ipomoea purpurea*

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Five are brethren
Two are bearded
Two are born without beard
One of the five
Is not bearded on both sides.

Quinque sunt fratres
Duo sunt barbati
Duo sine barba nati
Unus e quinque
Non habet barbam utrimque.

Attributed to Albertus Magnus



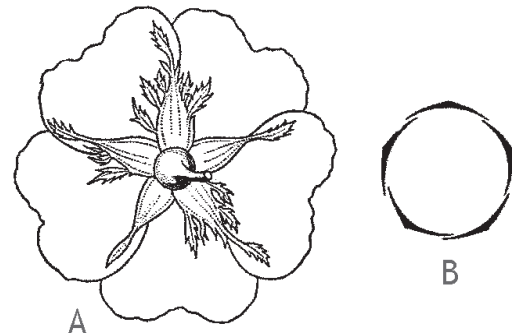
Some readers of *In Context* may know a special feature of most roses (especially those related to the dog rose, *Rosa canina*) with respect to their calyx leaves. The calyx consists of five green sepals, which are the leaves that encase the flower before it opens and then fold back as the bud opens (see Figure 1). Figure 2A shows a sketch of the differently shaped sepals. The shape difference is due to little leaf-like extensions (which I will call “fringes”) that grow out of the sides of some of the sepals. In the above verse, the medieval scholar Albertus Magnus (1193-1280) calls the sepals five “brethren” and the fringes their “beards.” What’s interesting is that the sepals do not all have fringes and those that do are fringed differently: Two of them have fringes on both margins (“are bearded”); two have no beard whatsoever; and one sepal has a beard at only one side.

What may appear to be a random arrangement regarding the fringes reveals by closer inspection a pattern: going from one calyx leaf to an adjacent one, a fringed edge always alternates with a smooth edge and vice versa. In this way the space between any two sepals always has one fringed and one smooth side. Due to the way the sepals are spatially arranged (Figure 2B), when the calyx is still closed, a smooth margin is always overlapped by the fringed margin of its neighbor. This can also be seen in the closed bud in Figure 1.

Until recently I thought that this surprising pattern was unique to roses, since typically the sepals in the calyx of a flower have similar forms.

Figure 1. Left: Rose flower bud showing three of the five sepals. Right: A different rose flower opening with sepals folding back.

Figure 2. A: Sketch of the rose calyx with its five sepals, seen from below. B: Diagram of the spatial configuration of the sepals when the bud is partially closed. (From Troll 1959, p. 62.)



Last fall, we enjoyed in our garden in The Netherlands the flowering of a tropical morning glory (*Ipomoea purpurea*). The species originates from Central America, but now is widespread throughout the United States and Southern Canada. This climber also blooms most beautifully in Dutch gardens in late summer, with funnel-like purple flowers. Each flower consists of five fused petals called a corolla and has a diameter of about four to five centimeters. Before the corolla opens you can see the green



Figure 3. Left photo: *Ipomoea purpurea* flower in unopened bud stage and, next to it, a flower that is beginning to wilt. Right photo: *Ipomoea* with fully open flower.

bud with its spiraling, furled tip (Figure 3). It starts to open very early in the morning, long before sunrise. The corolla is open during the morning and already, a couple of hours after noon of the same day, it starts to wilt and soon falls off. In contrast to the very short-lived corolla, the sepals remain attached to the stem. The fruit swells and matures in their midst.

I noticed that the sepals are unequally formed, and suddenly it became clear to me that the sepals of *Ipomoea purpurea* do what Albertus Magnus described for the rose calyx—but a bit differently! *Ipomoea* also has two different types of sepal margins that alternate. But instead of conspicuous leaf-like fringes, it has more inconspicuous hairy, rough sepal margins, and the smooth margins are paper-thin and pale in color. Figure 4 shows five views of the same calyx surrounding the maturing fruit, with a different

sepal at the front in each view. This order of the sepals, seen from below, is shown in Figure 5. What becomes clear is that the five sepals are ordered as in the rose! A smooth margin in one sepal is opposite a hairy margin in its neighbor. And, as in the rose, the smooth margins are partially overlapped by their hairy-margined neighbor.

It is fascinating how such a pattern repeats itself in these two very different plants. But you have to look closely to see this “open secret.” Little wonders in a Dutch garden!

Reinout Amons, a friend of The Nature Institute, participated in our 2006 eleven-week course on Goethean science. An avid observer of plants, he is a retired associate professor of biochemistry.

REFERENCE

Troll, W. (1959). *Allgemeine Botanik*. Stuttgart: Ferdinand Enke Verlag.



Figure 4. *Ipomoea* sepals enclosing a ripe ovary. Each panel shows a different sepal in front.



Figure 5. *Ipomoea* calyx seen from below, from two slightly different points of view. Note how the pale smooth margins are overlapped at their base by the rough margins of their neighboring sepals.