

*Critic's Choice Essay*

## A CONVERSATION WITH A SMALL BEETLE

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**Paul Buck, deceased**  
**Professor Emeritus**  
**Department of Biological Science**  
**University of Tulsa**  
**Tulsa, OK 74104**

Today we find our lives filled with technological innovations such as personal computers, the internet and email, supersonic aircraft, space probes, interspecies gene transfers, and on and on. Yet, you think *we* lead an unusual life! Let me tell you what happened recently to an insect acquaintance. She related her tale of woe as I sat out back watching the tall phlox Pat Folley gave me grow taller.

First, a number of gardeners in the neighborhood grow *Arum italicum* Mill., an arum lily, for its large, attractive, light veined leaves and clusters of beautiful, bright red berries which appear late in the growing season. Introduced to North America, the species is native to southern Europe and in some areas of Italy is considered a common weed.

In Oklahoma, flowering takes place in May, and in arum the reproductive structure is actually not the typical flower but an inflorescence surrounded by a large leaf. On our Oklahoma Native Plant Society field trips we have seen numerous Jack-in-the-Pulpit plants, and the floral system is quite similar. The erect flowering stalk (spadix) is enclosed in an enveloping bract (spathe). The flowers are unisexual with the pistillate (female) at the base of the spadix and the staminate (male) above. Over those two sets of fertile flowers is a whorl of sterile flowers which, when inflated, form a barrier between the floral

chamber within the spathe and the open area above.

My friend, a small, dark beetle, said her recent experience started one warm afternoon while foraging when she sensed what she felt was the aroma of food (you and I would probably say it smelled like a combination of carrion and urine).

She followed her "nose" to a large plant (we later identified it as *Arum italicum*) and landed on the open throat of the spathe. A large number of beetles, gnats, and blowflies had already gathered.

She sensed the aroma was welling up from the tubular spathe and, again following her "nose," walked to the opening. She reported slipping at the edge on tiny oil droplets and falling through some bristles into the depths of the chamber. There she found the stigmas of the pistillate flowers covered with a sweet, slimy fluid. She noted the inflated bristles that so readily permitted her fall were keeping large insects out. They were forced to fly off, seeking food elsewhere.

Once at the bottom of the pit, her first thought was of escape. However, she discovered the walls of the lower chamber were just as slippery as the upper spathe surface, and climbing out was impossible until she realized she could climb over the lower female flowers. As she did, she noticed others with pollen on their backs losing those grains to the sticky surfaces of the female flowers as

they labored upward. Unfortunately when the group reached the base of the bristles, they encountered downward pointing hairs which prevented further progress.

She lamented, “What to do?”, but only briefly. The chamber was warm and out of the rain, abundant food was being produced by the flowers, and about half the crowd was male. There was but one thing to do — PARTY!

With the setting of the sun, my friend and the others settled down. I do not know if it was the darkness, full bellies and party fatigue, or simply bedtime for little beetles. However, during the night the staminate flowers matured and rained pollen from above.

With dawn and the rising sun, everyone awoke to find themselves coated with pollen adhering to the sticky exudate from the stigmas. Once again, how to escape? Lo and behold, the downward pointing hairs had wilted along with the bristles, and it was possible to climb up and over their wrinkled surfaces to the throat of the spathe and freedom.

Interestingly, the upper portion of the spathe (appendix) had lost the carrion aroma, and my friend with her pollen-laden companions, previously prisoners of the night, flew away. However, the escaping insects picked up the aroma of another arum inflorescence and agreed to drop by for a visit, only to be trapped in a new prison chamber.

This time, one where the pollen on their backs would be transferred to the flowers, and pollination would take place. When I last saw my friend, she was joining a group headed toward yet another arum plant.

There is an additional feature of arum I would like to mention before closing. The terminal portion of the spadix, the appendix, is the source of the aroma, unpleasant to you and me but attractive to my beetle friend. While the chemical producing the aroma is being released, the appendix tissue generates heat to the point that it may be as much as 36 degrees warmer than the surrounding air. Research suggests the temperature elevation serves to volatilize the smelly compound, increasing the speed with which it is spread into the atmosphere. For most of us, that is an interesting aspect of the overall process, and we quickly see the reason behind it. For you chemists, it raises another question. What metabolic pathways are utilized by the plant to produce such significant energy release? How do the plants do it?

What an interesting story and introduction to pollination ecology right in the back yard. You see there is a benefit to taking a few minutes to chat with a small beetle.

*OMPS*