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Giant Stinking Flower Is, Alas, From a Proper Family

By CAROL KAESUK YOON

After more than 180 years of puzzling, scientists say they have solved the mystery of the evolutionary origins of the plant that produces the biggest flower on earth.

Researchers now say the bizarre rafflesia — whose blossoms can measure a yard across and were described by the Swedish explorer Eric Mjoberg as having "a penetrating smell more repulsive than any buffalo carcass in an advanced state of decomposition" — actually sprang from the gentle group of plants that includes poinsettias, violets and passionflowers.

"It was a total surprise," said Dr. Todd Barkman, a botanist at Western Michigan University who was the lead author of the paper, published online this month in The Proceedings of the National Academy of Sciences. "Some people have thought it was related to some other big smelly flowers, but no one has really known what to do with it."

Dr. John Beaman, a botanist and professor emeritus at Michigan State University, said that in the 20 years he has studied rafflesia, he had been "most perplexed" about its evolutionary affiliations. He praised the new work, saying, "I think Barkman has made an excellent case."

Rafflesia (pronounced ra-FLEE-zhuh) are nothing if not strange. These plants not only make large and rank-smelling flowers, but they are also parasites. So unlike nearly every other plant, they have no leaves and no green tissue for capturing sunlight to make their own food through photosynthesis.

Instead, in their home in the deep forests of Southeast Asia, rafflesia make their living by threading their delicate tissues through those of another plant, a relative of the grapevine, and stealing whatever nutrients they need from it.

And, as Dr. Beaman and Dr. Reed Beaman of Yale, his son, discovered in the 1980's, the flowers are pollinated by carrion flies in search of nice pieces of rotting meat — hence the stench.

But it is the same oddness that has so intrigued biologists that has made comparing rafflesia with other plants, and thereby deciphering its close relatives, so hard.

Even modern molecular science at first seemed to provide little help. When biologists looked at rafflesia's genome, even there they found little they could compare with typical plants. Because rafflesia does not photosynthesize, the genes for photosynthesis found in other plants had either been lost or were so drastically changed that they were useless for comparison.

Dr. Barkman and colleagues persisted, however, and found a gene in the mitochondrial DNA of rafflesia that was still intact and in a state suitable for comparison with other species. So rafflesia was placed, along with violets, poinsettias, passionflowers and willows, in the group known as the Malpighiales.

In their study of more than 90 species of plants, the scientists also found no close relationship between rafflesia and one of its proposed relatives, another curious parasitic (but tiny and not bad smelling) species from the forests of Southeast Asia. This plant, known as mitrastema, has turned out instead to be a close relative of blueberries.

Dr. Barkman said the evolution of rafflesia's large flowers was particularly interesting, given that the next largest flower in the Malpighiales is some four inches across, a far cry from rafflesia's astounding gape.

While rafflesia flowers are highly conspicuous and much has been learned about them, the body of the plant, twining like a fungus through the tissues of its host, is highly cryptic, and so much about these famed plants remains unknown.

Meanwhile, as the forests bearing rafflesia are being quickly destroyed, these superlative plants of such interest to scientists — as well as tourists — are rapidly declining in numbers. Some rafflesia species, which number nearly 20, are already "extinct for all intents and purposes," Dr. Barkman said.

To make matters worse, the flowers, while gargantuan, are not good at reproducing.

Dr. Barkman says that of 10 buds that may start growing, only one or two will actually make it to flowering, and not until a year or more later. There are also male flowers and female flowers and one of each type must be open in the same vicinity at the same time to produce seeds, a confluence of events that Dr. Barkman has never witnessed in the five years he has studied them.

Dr. Barkman noted that the grand rafflesia were not to be confused with another plant sometimes mistakenly said to produce the world's largest flower. This plant, often called the corpse flower, is not in fact a large single flower but is instead a large structure made of many tiny blossoms. So while the corpse flower — as its name suggests — can compete with the stench of a rafflesia, Dr. Barkman said, it cannot unseat it as the world's biggest bloom.