

***THISMIA AMERICANA:*
A CHICAGO ENDEMIC OR AN ELABORATE HOAX?**

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ABSTRACT

Named in 1912, *Thismia americana* Pfeiff. was reportedly collected in a wet prairie in Chicago, Illinois, by Norma Pfeiffer, a student at the University of Chicago. For decades, few botanists questioned the authenticity of the find. With advances in biogeography over the last few decades and with rare but significant experience with fraudulent science, some scientists have raised questions about the veracity of Pfeiffer's work. While some have speculated on biogeographic mechanisms that account for a species to have spread from the Asian-Pacific region to a north-temperate one, such as the southwestern Great Lakes, some have toyed with the idea that Pfeiffer's work represents an outright hoax. This article describes an example of botanical fraud, specifically the Rum affair. Pfeiffer's work is recounted, compared with those in science who have masterminded hoaxes, and analyzed with regard to the question whether her work was fraudulent.

KEYWORDS: Biogeography, fraud, hoax, Pfeiffer, *Thismia*

INTRODUCTION

According to her own account, Norma Pfeiffer, a 23-year-old student at the University of Chicago, set out to gather liverworts in a prairie on the south side of Chicago, specifically at 119th Street and Torrence Avenue (Pfeiffer 1914a). During this foray, she encountered a tiny, nearly subterranean, flowering plant, the identity of which was a mystery to her and her advisors. Upon concluding that it was a species of the burmanniaceous genus *Thismia*, the congeners of which are both cryptic and in widely dispersed populations (Merckx & Smets 2014), she gave up a teaching job she had secured out west and remained at the University of Chicago, where she pursued doctoral research on the anatomy, morphology, and taxonomy of the Chicago *Thismia* population. Two years later, she published her findings in the *Botanical Gazette* (Pfeiffer 1914a), having concluded that, while it was indeed a species of *Thismia*, it was undescribed. She gave it the name *Thismia americana*.

At the time, no one questioned either the identity of the plant or the circumstances of its discovery. Thirteen years later, in his flora of the Chicago region, Herman S. Pepon (1927) included the plant with the annotation: "Sedgy swamp associated with *Selaginella apus*, near Lake Calumet. (Miss Pfeiffer, Dr. Cowles)." He added a quotation from Henry C. Cowles: "A remarkable discovery, no related plants within hundreds of miles; the Genus never before found in North America."

Fernald (1950) described the genus and species, noting its singular occurrence and its relationship to the Tasmanian species, *Thismia rodwayi* F. Muell. Gleason & Cronquist (1963) sustained previous assertions, noting that the plant had not been seen since 1913, they being evidently unaware she had collected specimens in 1914 as well. No floras or treatises that have published on the matter of *Thismia americana* have intimated fraud or cast any aspersions on Norma Pfeiffer or her advisors. Since Pfeiffer's death in 1989, the authors have been asked by several thoughtful botanists, often during visits to herbaria, if we believed Pfeiffer's "story."

Although no one has found forensic evidence that would challenge her work, some scientists have suggested that the north-temperate Chicago endemic *Thismia americana* Pfeiff., a plant in the largely south-temperate to tropical family Burmanniaceae, is a legend based upon a hoax. If one begins with the premise that the discovery of *Thismia americana* is a hoax, then there must be some evidence with which to start—other than that the story seems improbable because of rather serious disjunction issues. There is no evidence, but the rumors persist. For the rumors to have merit, one would also have to conclude that John M. Coulter, Pfeiffer's principal committee member, colluded in the hoax along with her other committee members, Drs. Charles J. Chamberlain and William J. G. Land, of the University of Chicago. One also would need to discover a motive for a hoax. Compounding the improbability of a largely tropical genus inhabiting northeastern Illinois is the fact that Chicago was glaciated during the most recent ice age, along with the circumstance of its already antipodal disjunction from the region inhabited by its sister species.

DISCUSSION

Pfeiffer completed her bachelor's degree at the University of Chicago in 1912 and went on to graduate school there. After having secured a position teaching at a college in North Dakota, she went with a colleague to a favorite place for students at the University of Chicago to study local flora. They were to collect liverworts to have on hand for her prospective teaching position (Masters 1995), since commercially available study specimens were not easily obtainable in those days. It was on that occasion that she discovered *Thismia americana*. Her companion, gathering in the same area, had not noticed *Thismia* until Norma pointed it out. Neither she nor her colleague had any clue as to what it was, and her advisors could not identify it, so she took a deep dive into its morphology. This led to her dissertation research, which she published in the *Botanical Gazette* (Pfeiffer 1914a). Her description of *Thismia americana* is about as complete as one can imagine, with detailed descriptions of both anatomy and morphology. Having discovered the plant in 1912, she visited the population each week for the rest of the summer and for at least two additional years gathering specimens in all stages of development. She expressed chagrin, however, that she was unable to observe seed germination.

Pfeiffer compared her specimens with the descriptions of all other species of



FIGURE 1. Reproduction of Plate VII in Pfeiffer (1914a) with captions provided by Pfeiffer. 1. Side view of plant of *Thysmia americana*. 2. View of flower from above; petals cut apart at apex and folded back. View from above of group of flowers undisturbed in natural situation; the oldest flower appears at the right. 4. View from above of plants from which the soil has been removed; the white root portions are evident with their buds. In the public domain.

Thismia known at the time and concluded that its closest relatives occurred in the region of southeastern Asia rather than Africa and South America, which would have been perhaps more logical phytogeographically. Plate VII, in Pfeiffer (1914a) (reproduced here as Figure 1), shows photographs of the undisturbed perianths, *in situ*, buried to the lobes in a black sandy Mollisol, a soil that is characteristic of the moist prairie habitat in which the plant once occurred. She felt rather decidedly that no other known species matched the Chicago plants, so she described them as a new species and gave them the name *Thismia americana*. Her dissertation was careful to describe the morphology and anatomy in detail, but there was little discussion of its remarkable disjunction other than to note that it was indeed remarkable.

If she and her mentors had received specimens from elsewhere as part of a botanical caper, she would have had to receive specimens in an array of developmental conditions in several seasonally staggered shipments, all of which survived the voyage from the western Pacific Ocean to Chicago. Even more unlikely, the transshipped specimens would have to have been themselves a new species, because *Thismia americana* remains morphologically and genetically distinct from all other known species (Merckx & Smets 2014). There was a notable botanist, Elmer Drew Merrill, who was collecting actively in the Asia-Pacific region at the time, but it is likely that any correspondence with the University of Chicago would have been through J. M. Coulter or one of his colleagues—rather than through a callow, unknown, brand new graduate student. Merrill did send specimens of algae, lichens, bryophytes, and vascular plants to the Field Museum during this period, but the few *Thismia* specimens at the Field Museum are all from the New World. In addition, the preserved specimens may contain pollen that might link the collection to a region, which we do not think has been done but which would be an interesting exercise (A. A. Reznicek pers. comm.).

We presume that Pfeiffer spent the remainder of the growing season of 1912 trying to figure out the mystery plant's identity. The holotype, which was not collected until 1913, consists of three plants in a packet on a herbarium sheet and a vial with other specimens preserved in formalin–acetic acid–alcohol, which are housed at the Field Museum of Natural History in Chicago. She made another collection in 1914. The specimens are not found in the regular herbarium collection at the Field Museum but are locked in a cabinet to which access is available through the collections manager.

Norma graduated in 1914, the youngest Ph.D. ever from the University of Chicago at that time—and a woman at that—but continued her studies sufficiently to produce another treatise on *Thismia americana*, also published in the *Botanical Gazette*, entitled “The Sporangia of *Thismia americana*” (Pfeiffer 1918). That would have been a time-consuming amount of brilliant energy to put into a hoax considering everyone who must have been involved. Co-conspirators would have included the editors of the well-reviewed *Botanical Gazette* and the southeast-Asian botanist who, rather than do an expository study of the material himself, preferred to supply a student, with whom he had made a more than casual connection and who did not know the genus *Thismia*. With regard to a motive for such hoax, other than the one line in her dissertation (Pfeiffer 1914a) and

a general discussion about “undiscovered plants” (Pfeiffer 1914b), she spent no energy on the biogeographical aspects of *Thismia americana*.

Unfortunately, the area at 119th Street and Torrence Avenue, where Pfeiffer gathered her material, has several feet of fill over it and is in an area that is largely industrial. Indeed, the prairie habitat in which *Thismia americana* once occurred has been essentially destroyed, especially prairie within and on the margins of a major metropolitan area, the city of Chicago. Nevertheless, several noted attempts have been made to discover additional populations.

The first attempt was in 1948, when Floyd Swink (College of Pharmacy, University of Illinois, Chicago) obtained from Pfeiffer a map through the mail detailing the location of the original study population. At that time, Pfeiffer was employed at the Boyce Thompson Institute for Plant Research in Yonkers, New York, now part of Cornell University. Swink, along with Julian Steyermark and José Cuatrecasas, both of the Chicago Natural History Museum, and John Thieret, later of the University of Chicago, failed to locate the plant. In 1985, four years before her passing—at the age of 96—Pfeiffer wrote in a letter to Robert H. Mohlenbrock (Southern Illinois University, Carbondale), that she “looked for the plant beyond the first location, and once found a very few, about a third of a mile away, in the midst of *Typha* . . . between beach ridges” (Mohlenbrock 1985).

In a telephone conversation with bryologist Bill N. McKnight (Illinois Natural History Survey) that same year, she elaborated on some of the cryptogamic associates of *Thismia americana*—which made sense for an interdunal lake plain habitat in Cook County, Illinois, narrated 70 years after the fact (McKnight, pers. comm.; see also the treatment of *Thismia americana* in Wilhelm & Rericha 2017). McKnight asked her if she had collected all the specimens she saw, and she said no, since her interest was not in sending out sets for exchange but in discerning the identity, morphology, and life history of the plants. Having spent the remainder of her career in the study of lily hybrids, she confessed to McKnight that she regretted not having done more field work.

Several “*Thismia* hunts” have occurred since the one by Swink et al. in the Calumet region south of Chicago, but to no avail (Bowles et al. 1994; Rodkin 1994; Chew 2004). It is worth mentioning that in 2017, *Thismia neptunis* Becc. was rediscovered in western Sarawak, Malaysia, not having been seen since the type collection was made in 1866 by an Italian botanist who, it is said, just “stumbled upon it” more or less the way Norma Pfeiffer did with respect to *Thismia americana* in 1912 (Sochor et al. 2018). Like *Thismia americana*, *T. neptunis* is also buried to near the perianth lobes and cryptic in hue, so it is difficult to spot. The new discoverers noted that “its inconspicuous appearance may potentially contribute to our limited knowledge on its distribution as it may be easily overlooked in the field . . .” The same easily can be said for *Thismia americana*.

In fact, Pfeiffer (1914b) described the cryptic, immersed nature of *Thismia* habit. In the early 1990’s, during one “*Thismia* hunt,” the organizers cast 100 small white beads into the vegetation of each of three remnant prairie sites known to have black sandy Mollisols. All were curious to see how many beads would be retrieved by the hordes of searchers combing the area on hands and knees. None were found, even though the beads lay upon the soil.

Had *Thismia americana* been simply a species from Tasmania, then one would imagine that Merckx and Smets (2014), who reviewed the history of the discovery of *T. americana* and examined its relationships within the genus, would have given us more insight into the matter. Although their study, based upon nuclear 18S rDNA and mitochondrial *atp1* and *nad1 b-c* data, was inconclusive with regard to phylogeny, they have no hesitation in considering *T. americana* as a distinct taxonomic entity. They agree with Pfeiffer that *T. americana* has its closest relatives within the subgenus *Thismia*. Jonker (1938), who monographed the Burmanniaceae, had suggested that *T. americana* might be conspecific with *T. rodwayi*, but Merckx and Smets (2014), while they posit that both species belong in the same clade, emphasize that *T. americana* and *T. rodwayi* are specifically distinct morphologically and, in particular, that “*T. americana* shows considerable morphological differences with all of the currently known *Thismia* species.” They also point out that the fungal taxon found in the roots of *T. rodwayi* has thus far been detected in Argentina, Finland, and on a prairie in Kansas, which shows a potential for long-distance dispersal of mycoheterotrophic plants. As an alternative, they suggest the Beringia land bridge theory as the most likely explanation for the presence of *Thismia* in North America. It is a matter of some interest, from a timing standpoint at least, that the prairie at 119th and Torrence was probably under Lake Algoma, the last glacial lake stage of Lake Michigan, about 3000 years ago (Willman 1971).

This amphi-Pacific origin was discussed at length by Merckx *et al.* (2017). They write:

“... the deepest diversification events within the *Thismia* clade are estimated to precede these glaciations, while the more recent evolutionary splits [including *T. americana*] may have been influenced by global cooling events. The dispersal and subsequent spread of *Thismia* into Tasmania and New Zealand occurred in the Pleistocene or Holocene. During the Pleistocene, Tasmania was repeatedly glaciated and linked to mainland Australia . . . [O]ur analysis of the most comprehensive and detailed plant and fungal dataset for any mycoheterotrophic system so far, shows that *Thismia*, despite highly specific and phylogenetically conserved AM [arbuscular mycorrhizal] interactions which persist over evolutionary time, was able to diversify and radiate recently due to the wide geographical distribution of the host fungi . . . [A]lthough the mycorrhizal interactions of these mycoheterotrophs are strictly bound to a fungal lineage, host switches remain possible. This process may lead to new ecological opportunities for the plants, and demonstrate that taxa that are dependent on highly specific biotic interactions have ample opportunities to radiate and diversify over the geographical range of their hosts.”

In 1912, Norma Pfeiffer was a very young woman who found herself in an intimidating arena of some of botany's more renowned luminaries, all of whom were men. It would have been quite bold of her, almost unbelievable, to have somehow plotted to secure *Thismia* specimens from the far and distant lands of Tasmania or New Zealand and conceived a deceit that would require a lifetime of intense secrecy and dissembling—even from her older sister, Wanda May, who would marry in 1916 the phytogeographer Dr. Arthur G. Vestal, student of H. C. Cowles. Generally, neither then nor now were graduate students in desperate need of topics for their thesis studies. Certainly, Pfeiffer had no novel theories to promulgate or defend—she had wanted a teaching job. Professors are usually

happy to engage their students in subjects about which they themselves already have scholarly interests. The University of Chicago, esteemed institution that it was, had no faculty of which we are aware that could provide mentorship in the Burmanniaceae.

Also, the site along the railroad at 119th Street and Torrence Avenue was a favored spot for students of the local flora, so it likely was much visited by students of Dr. Cowles and Dr. Coulter as well as themselves and probably Norma's sister and her husband-to-be. She had pointed out the plants to her colleague during her liverwort foray in 1912, but at that time neither nascent botanist knew what she was looking at. We doubt that Pfeiffer was even aware of the Burmanniaceae, much less *Thismia*, which had no known North American representatives.

Some scientists who believe the legend a hoax have stressed that she never went back to look for it after she left the region or that she never reported having looked for it elsewhere: an obvious reason for suspicion in their minds. We are not daunted by that, since it really was not until the post-World War II era that botanists began to develop a strong interest in biosystematics and species threatened with extinction. Not appreciating the factors that one day would redound to her discovery, she would feel no need to record a chain of custody for her harvests and observations and likely did not feel the need to keep a journal of all who looked for it and did or did not see it. Although we cannot imagine that her committee, by 1914, had demurred on taking the train to see the plants in the field.

Comparisons between Pfeiffer's discovery and the dissembling assertions about plant disjunctions at Rum Island in the Hebrides of Scotland—a history that is recounted by Sabbagh (1999)—are inevitable. A noted and admired professor, John William Heslop Harrison of Newcastle University in England, proposed the theory that vegetation on the islands of the west coast of Scotland had survived through the Pleistocene. His reports of the presence of disjunct species, which he planted on the island to support his thesis, were determined to be fraudulent by English classics scholar and amateur botanist, John J. Raven. While it is hard for many of us to get into the mind of someone who would do such a thing, Heslop Harrison was a full professor with a doctrine to defend and who went to byzantine lengths to support his theory. Sabbagh's account of the fraud draws the character of a man and his mission so completely unlike Norma Pfeiffer's that it scarcely warrants ink to compare them. Sabbagh details the collegiate environment within which Heslop Harrison operated and the investigation into the authenticity of his assertions. Because the deceit was obvious to those who looked into it, Heslop Harrison's rather shoddy fraud was readily exposed.

CONCLUSION

If the *Thismia americana* legend is based upon a hoax, then it is a very elaborate, well thought through one, and one that is also dependent on the fortuitous fact that the putative Asian co-conspirator provided specimens that represented a

new species. The Rum affair was largely the effort of a single doctrinally driven individual without co-conspirators. There were, at the time Norma Pfeiffer discovered *T. americana*, no doctrinal theories concerning evolution or biogeography that the *Thismia* find in Chicago would enhance or disprove, certainly none of her own. Also, in 1912 such wide disjunctions of plants from around the world were not altogether to be unexpected, particularly in a genus such as *Thismia* in which many of the species are rather rare and specialized in their habitats. Moreover, one should ignore the fact that the type locality and much of the surrounding area has been destroyed and that the photographs of the plants in situ in a Mollisol such as that characteristic of remnants nearby would be very difficult to stage. As improbable as the discovery of *Thismia americana* in Chicago might be, we would suggest that a hoax that has survived critical thinking and examination this long is even more improbable—even if one could quantify improbability.

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