

# A Very Glabrate Form!: How a Diminutive Plant Enthralled Botanists on Both Sides of the Atlantic

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## Introduction

Kate's Mountain in Greenbrier County, West Virginia was the scene of botanical inquiries in the 19<sup>th</sup> and 20<sup>th</sup> centuries represented by the discovery of new species and the overturn and re-overturn of established taxonomy for at least one genus. Today Kate's Mountain holds fame amongst wildflower enthusiasts for the eponymous Kate's Mountain Clover (*Trifolium Virginicum*). However, at about the same time of the discovery of Kate's Mountain Clover, another botanical drama was playing out on the slopes and summit of Kate's Mountain.

This paper will trace the development of a taxonomy that begins with *Clematis ovata* Pursh and stretches over 150 years. The paper will conclude by providing reasons for these taxonomic mutations. The story of this development will provide highlights which act as a companion to the history and philosophy of taxonomy.

This history may suggest solutions to some problems in the philosophy of taxonomy. This story showcases the tendency toward a kind of taxonomic fracturing, and I will treat some of the mechanics of such fracturing. The story of *Clematis ovata* Pursh is not special in this respect as botany has been full of just such fracturing. Another point of emphasis in what follows is how Kate's Mountain was well suited to become a center for botanical research out of all the shale barrens and reasons will be given why this was the case. This paper takes an information approach to the story. This is the history of an information retrieval system. The biologist Ernst Mayr writes that, "In more recent times the practical purpose that is most often stressed is that a classification should serve as an index to an information storage and retrieval system."<sup>1</sup> This approach will be supported in the second half of the paper.

These general comments are useful in situating the following history within the historiography of botany, but I want to leave the general behind now and state explicitly what will be demonstrated by the following history and analysis. There are five theses that this paper will give strong evidence in favor of:

1. The botany practiced throughout this story eventually required an attention to the geology of shale-barrens from botanists beginning with Edward Steele.
2. This story suggests a few amendments to Weldon Boone's three causes for the botanical celebrity of Kate's Mountain.
3. Kate's Mountain acted as a proto-repository for shale barren endemics.
4. The botanists in this story were mostly practicing evolutionary classification as described by Ernst Mayr.
5. This story supports Theodosius Dhobansky's "shades of naturalness" view of taxonomy by providing examples that range this entire range from natural to artificial classification.

We need one last comment on naming conventions. I will be referring to individual specimens in a straight forward way such as "the Harvard *Clematis*" or "the *Clematis* at Harvard." I will also refer often to a confluence of place and plant by giving the genus followed by the location in square brackets. For example, *Clematis* [Kate's Mountain] was the *Clematis* on Kate's Mountain specimens of which were collected by Anna Murray Vail and Nathaniel Lord Britton and later by John Kunkel Small. *Clematis* [Roanoke] was the *Clematis* in the vicinity of Roanoke, Virginia, specimens of which were collected by Vail and Britton who designated it as the species *Clematis Addisonii*. The plants

referred to in this way are constant, what will change is their taxonomic designation. Species are referred to in the regular way with genus then species in italics followed by variety, subspecies or author citation if relevant.

## Early Years of *Clematis ovata* Pursh

This story of taxonomy began in print in the supplement to volume two of *Flora Americae Septentrionalis*, published in 1814.<sup>3</sup> It was upon the pages of the supplement to volume two of *Flora Americae Septentrionalis* that the German-American botanist Frederick Pursh (1774-1820) listed *Clematis ovata*.<sup>4</sup> Pursh had studied a specimen at the Sherard Herbarium at Oxford University that was collected long before by Mark Catesby.<sup>5,6</sup> With *Flora Americae Septentrionalis*, *Clematis ovata* entered the arsenal of botany. However, it was not long before Botanists in America began to question whether the plants they were determining as *Clematis ovata* Pursh were in fact members of one species. Here we must go to the early career of another *Clematis*.

We begin with *Clematis sericea* which was listed by the French Botanist Andre Michaux in volume 1 of *Flora Boreali-Americana* (1803), he suspected that *Clematis sericea* was identical to *Clematis ochroleuca*.<sup>7</sup> In the middle of his listing for *Clematis sericea* he wrote "C. Ochroleuca? Ait."<sup>7</sup> This passage suggests that Michaux was himself uncertain whether his *Clematis sericea* was a new species or not. Nonetheless, the species name *sericea* stuck around in the literature. Frederick Pursh, for example, listed *Clematis sericea* in the *Flora Septentrionalis Americae*.<sup>3</sup> The "Ait" in Michaux's note referred to the botanist William Aiton. Aiton listed *Clematis ochroleuca* in *Hortus Kewensis* (1789), his catalog of the plants held by the Kew Gardens in England.<sup>8</sup>

In the listing for *Clematis ochroleuca* Aiton cited Leonard Plukenet. Plukenet, in turn, described *Clematis ochroleuca* in his *Almagesti Botanici Mantissa* of 1700 although Aiton's was the more rigorous botanical treatment of *Clematis ochroleuca* and it was Aiton who was the earliest author cited by the botanists in this story.<sup>9</sup> *Clematis ochroleuca* and *Clematis ovata* Pursh would be principles in a series of taxonomic crashes, the first involving the botanist Asa Gray.

In *A Flora of North America* (1838-1840)<sup>13</sup> the botanists John Torrey and Asa Gray listed *Clematis ovata* Pursh and *Clematis ochroleuca* as separate species. Asa Gray changed his mind after *A Flora of North America*. In his *Synoptic Flora of North America* (1878-1884) Gray wrote that *Clematis ovata* Pursh was merely a "very glabrate form!" of *Clematis ochroleuca*.<sup>11</sup> In this work Gray made another major move to revive and reassign an old genus. Gray placed *Clematis ochroleuca* under a section called *Viorna*. This was a distinction that existed between *Clematis* and *Ochroleuca*. *Viorna* was originally its own genus created by Edouard Spach in 1839.<sup>12</sup> Spach originally created the genus *Viorna* with two sections under it, *Euviorna* and *Viornium*.<sup>12</sup> A sidelight on this story is the way *Clematis* has been divided over the years. *Viorna* would bounce between the statuses of section and genus.

*Clematis ochroleuca* and *Clematis ovata* Pursh were again equated in an article in *The Journal of the Cincinnati Society of Natural History*.<sup>15</sup> Here Joseph James agreed with Gray that *Clematis ochroleuca* and *Clematis ovata* Pursh are probably the same.<sup>15</sup> James wrote that, "Between *C. Ovata*, Pursh, and *C. Ochroleuca*, Aiton, I cannot find sufficient difference to justify a separation."<sup>15</sup> James wrote that he had only ever seen one specimen labeled *Clematis ovata* Pursh and in his opinion this specimen was actually *Clematis ochroleuca*. The fates of *Clematis ovata* Pursh and *Clematis ochroleuca* had become intertwined

and *Clematis ovata* Pursh would continually have to face accusations of not being a legitimate species.

The classification of *Clematis ovata* Pursh would become further muddled leading up to the close of the 19th century. In two ways the German botanist Otto Kuntze would further complicate matters for *Clematis ovata* Pursh. In 1885 Kuntze listed *Clematis ochroleuca* and *Clematis ovata* Pursh as varieties of the species *Clematis integrifolia*. Kuntze folded several species of *Clematis* into *Integrifolia*. These species became subspecies of *Clematis integrifolia*. This was one of the few examples in our story of species moving vertically in the taxonomy. Kuntze also listed a variety of *Clematis ovata* Pursh, named *subglabra*, and said it occurred in Eagle Pass near the Mexican-American border. This was a taxonomic move that would puzzle later botanists. At this point in our story the taxonomic status of *Clematis ovata* Pursh had become unstable enough to warrant an overhaul of its taxonomic status.

## Reformation and the Emergence of Kate's Mountain

In an 1890 paper in the journal *Memoirs of the Torrey Botanical Club* Nathaniel Lord Britton and Anna Murray Vail made a serious attempt to resolve the taxonomy of *Clematis ovata* Pursh.<sup>4</sup> Britton and Vail argued that a *Clematis* they had collected from the vicinity of Roanoke had been mistakenly labeled in floras as *Clematis ovata* Pursh. They said that elsewhere it had also been incorrectly listed as *Clematis ochroleuca* by Asa Gray. Vail and Britton decided that *Clematis* [Roanoke] was in fact a separate species from both *Clematis ovata* Pursh and *Clematis ochroleuca*. They sent their samples of *Clematis* [Roanoke] along with samples of *Clematis ochroleuca* to the Sherard Herbarium at Oxford University which housed the specimen of *Clematis ovata* Pursh that Pursh used for his listing in *Flora Americae Septentrionalis*. There Oxford botanists determined that *Clematis* [Roanoke] was not *Clematis ovata* Pursh. The Sherard Herbarium said that *Clematis* [Roanoke] was more like *Clematis ochroleuca* than *Clematis ovata* Pursh but was not identical to either. Britton and Vail declared that *Clematis* [Roanoke] was a separate species from both *Clematis ovata* Pursh and *Clematis ochroleuca*. They called it by a new name, *Clematis addisonii*, after the then president of the Torrey Botanical Club. Britton also said that the *Clematis ovata* Pursh in Torrey and Gray's *A Flora of North America* was not *Clematis ovata* Pursh, but rather was *Clematis addisonii*. This begged the question then: What was *Clematis ovata* Pursh?

Oxford had said that the specimen that Pursh described in the Sherard Herbarium more nearly resembled Britton's Specimens of *Clematis ochroleuca* which were indeed identical to their specimens of *Clematis ochroleuca*. However, Britton notes that Frederick Pursh himself separated *Clematis ovata* Pursh and *Clematis ochroleuca*. Another problem with designating *Clematis ovata* Pursh as *Clematis ochroleuca*, Britton said, was that *Clematis ochroleuca* characteristically grew in sandy soil and distant from the mountains and this was not where *Clematis ovata* Pursh was believed to have been collected. We have already seen an uncomfortable botanical geography with Kuntze's *subglabra*, this theme will recur throughout this story.

It is here that our drama turns to Kate's Mountain in Greenbrier County, West Virginia. Britton had found a second *Clematis* in fruit on Kate's Mountain. Britton sent this specimen to the Sherard Herbarium. The Oxford botanists ruled that *Clematis* [Kate's Mountain] was identical to *Clematis ovata* Pursh. *Clematis ovata* Pursh then was, in Britton's words, a "good species."<sup>17</sup> Vail and Britton conceived of *Clematis ochroleuca*, *Clematis ovata* Pursh, and *Clematis addisonii* as three separate species.<sup>2</sup> *Clematis* [Kate's Mountain] was collected again in 1892 by John K. Small, who reported in his 1893 article on the expedition, that he had collected the specimen in flower on Kate's Mountain.<sup>2</sup>

Small also reported in the same article that he had collected both *Clematis addisonii* and *Clematis ochroleuca* in the vicinity of Roanoke.<sup>2</sup> Small apparently didn't take the existence of *Clematis ochroleuca* in the mountains of Virginia to be a refutation of *Clematis ovata* Pursh. One of Britton's justifications for *Clematis ovata* Pursh had been that *Clematis ochroleuca* was not native to the mountains of West Virginia. At this point, for Small at least, the support for *Clematis ovata* Pursh as a

separate species from *Clematis ochroleuca* was not purely biogeographical. Four years after the appearance of the Small article a facsimile edition of Asa Gray's *Synoptic Flora of North America* was published.<sup>11</sup> In this edition the editor Benjamin Robinson, commenting on Gray's equating of *Clematis ovata* Pursh with *Clematis ochroleuca*, wrote that *Clematis ovata* Pursh had been "reinstated" to species-hood, but on "insufficient grounds."<sup>11</sup> We are not told by Robinson why the reinstatement of *Clematis ovata* Pursh was on "insufficient grounds."

Taxonomic instability continued when in 1903 John Kunkel Small wrote *Flora of the Southeastern United States*.<sup>18</sup> In his *Flora* Small writes that *Clematis addisonii*, *Clematis ochroleuca*, and *Clematis ovata* Pursh all fall under *Viorna*. Small returned *Viorna* to its status as a genus, in Gray's *Synoptic Flora* it was a section. When speaking of *Viorna ovata* Pursh Small says that it was collected at Kate's Mountain and Negro's Head. Britton had said that Negro's Head was in the "southern Blue Ridge."<sup>17</sup> Small accepts the uncomfortable biogeography that comes from considering *Clematis* [Kate's Mountain] to be *Viorna ovata* Pursh. In 1911 the botanist Edward Steele announced the existence of *Clematis viticaulis*.<sup>19</sup> Steele said that *Clematis viticaulis* was erroneously considered the same as *Clematis* [Kate's Mountain] and so at the time it would have had the questionable status of *Clematis ovata* Pursh. Steele here fractures *Clematis viticaulis* off from *Clematis ovata* Pursh. Steele expresses a little doubt that *Clematis ovata* Pursh was actually a good species, suspecting that it may have been *Clematis ochroleuca*.<sup>19</sup> If this was to be so then *Clematis* [Kate's Mountain] would have to be reclassified as *Clematis ochroleuca*. The doubts of Steele and Robinson were not immediately taken up and in the 1913 *Geological Survey of West Virginia (Living Flora)* *Clematis ovata* Pursh was listed as occurring in "rocky soil high up on Kate's Mountain near White Sulphur Springs."<sup>20</sup> Steele's and Robinson's doubts, founded or not, were an ill omen for *Clematis ovata* Pursh on Kate's Mountain.

In a 1930 article University of Pennsylvania botanist Edgar Wherry doubted Britton's assertion that *Clematis* [Kate's Mountain] was *Clematis ovata* Pursh.<sup>4,21</sup> Wherry wrote that Britton's description was, "too incomplete to justify considering this as established."<sup>22</sup> The 1930 article only raised a doubt, but it did portend a change. In 1931 Edgar Wherry published a full exposé on *Clematis ovata* Pursh.<sup>6</sup> In this article he gave *Clematis ovata* Pursh a new name that reflected its troubled history, *Clematis ochroleuca ovata* Pursh.<sup>6</sup> *Clematis ovata* Pursh was now considered a variation of *Clematis ochroleuca*. Wherry then said that *Clematis* [Kate's Mountain] was not *Clematis ochroleuca ovata* Pursh, but rather was itself a separate species that he named *Clematis albicoma*.<sup>6</sup>

Wherry said that *Clematis ovata* Pursh possibly came from Virginia.<sup>6</sup> Wherry argued that since Catesby tended not to label his specimens with locality and because he had traveled to Virginia the term "Negro's Head" which appears on the Oxford specimen could be a colloquialism. In a footnote Wherry added that a specimen of *Clematis ochroleuca ovata* Pursh from Henrico County in Virginia was similar to the Oxford *Clematis* and so it was likely that the Oxford *Clematis* was collected near there. Wherry goes on to argue, historically, that Catesby likely did not collect in the vicinity of Kate's Mountain. While *Clematis ovata* Pursh may have come from Virginia it did not seem likely that it was identical to *Clematis* [Kate's Mountain]. On the strength of these considerations Wherry argued for the *Novum Status* for *Clematis* [Kate's Mountain]. At this point *Clematis* [Kate's Mountain] changes histories. *Clematis albicoma* had a new lineage. It was first collected on Kate's Mountain in 1877 by Gustav Guttenberg (1844-1896).<sup>6,4</sup> Guttenberg was an Austrian living in the United States, first in Wheeling, WV and then Pennsylvania. He collected from 1877 to 1888 and his collections are held at West Virginia University and the Carnegie Museum in Pittsburgh. The 1877 specimen of *Clematis albicoma* is held at the Carnegie Museum of Natural History.<sup>24</sup> It is interesting to note that Gustav Guttenberg has not shown up in this history up to now, it suggests that making *Clematis* [Kate's Mountain] a separate species required a new history to arise out of the history of botany that is quite distant from the history of *Clematis ovata* Pursh.

## The Whirling Clematises

A year later John K. Small returned to the story line with his 1933 *Manual of Southeastern Flora*.<sup>25</sup> In this work Small still included *Clematis addisonii* and *Clematis ochroleuca* under the genus *Viorna*, which continued as a genus from Small's 1903 work.

Small got rid of *Viorna ovata* Pursh and said that it "is believed to be identical"<sup>25</sup> with *Viorna ochroleuca*.<sup>25</sup> Small re-designated *Viorna ovata* Pursh from the 1903 *Flora* as *Viorna ochroleuca* in the *Manual*. This meant that Clematis [Kate's Mountain] would become *Viorna ochroleuca* since Small used the designation from Britton and Vail's 1890 paper for his *Viorna ovata* Pursh in the *Flora*. Small did not use Wherry's designation of Clematis [Kate's Mountain], *Clematis albicoma*, from two years earlier. Despite Small's book the status of the species name *albicoma* was solidified in the years following Wherry's 1931 paper and *Viorna* would not last as a genus. In 1932 Earl Core listed *Clematis albicoma* in an article in *Torrey*.<sup>27</sup>

In a 1943 article Ralph Erickson continued Wherry's designation of Clematis [Kate's Mountain] as *Clematis albicoma*.<sup>28</sup> Erickson equated *Clematis albicoma* with Vail and Britton's *Clematis ovata* Pursh along with the *Clematis ochroleuca* in Joseph James' article and *Viorna ovata* Pursh in Small's *Flora*. Erickson's *Clematis ochroleuca* was also Small's *Viorna ochroleuca* and Wherry's *Clematis ochroleuca ovata* Pursh and also Michaux's *Clematis sericea*.<sup>28</sup> Erickson said that *Clematis addisonii* was Torrey and Gray's *Clematis ovata* Pursh.<sup>28</sup> Wherry had argued that *Clematis albicoma* and *Clematis ochroleuca* were species but that *Clematis ovata* Pursh was a variety of *Clematis ochroleuca*.<sup>28</sup> Erickson went a long way to cementing Wherry's treatment of *Clematis albicoma* and *Clematis ochroleuca* even adding the variety *Sericea* to *Clematis ochroleuca*.<sup>28</sup> In Erickson's guide we see a distancing taxonomically of *Clematis addisonii* from *Clematis ochroleuca* and *Clematis albicoma*.<sup>28</sup> Erickson returned *Viorna* to the status of a section of Clematis.<sup>28</sup> *Clematis addisonii* would be placed in a subsection of *Viorna* called *Euviorna* and *Clematis ochroleuca* and *Clematis albicoma* would, harking back to Otto Kuntze, be placed into the subsection *Integrifolia*.<sup>28</sup> Erickson agreed with Wherry that *Clematis ovata* Pursh was *Clematis ochroleuca*, although he did not list it as a variation as Wherry did. He said that neither the *Clematis ovata* Pursh in Torrey and Gray's book nor the *Clematis ovata* Pursh in Vail and Britton's paper was identical to *Clematis ochroleuca ovata* Pursh. It is at this point that we will leave *Clematis addisonii* to its own devices in *Euviornae* and focus on *Clematis albicoma* and *Clematis ochroleuca* in *Viorna*, in the subsection *Integrifolia*.

This is a good place to go over the perambulations of our story to this point: remember that Britton and Vail said that the *Clematis ovata* Pursh of Torrey and Gray was the new *Clematis addisonii*. It was Edgar Wherry who said that the *Clematis ovata* Pursh of Britton and Vail, Clematis [Kate's Mountain], was a new species; *Clematis albicoma*. There were then three species that at times went under the designation *Clematis ovata* Pursh, the *Clematis ovata* Pursh which Erickson said was *Clematis ochroleuca ovata* Pursh of Wherry and *Viorna ochroleuca* of Small (1933); the *Clematis ovata* Pursh of Torrey and Gray which was the *Clematis addisonii* of Britton and Vail; and finally the *Clematis ovata* Pursh of Britton and Vail which was the *Clematis albicoma* of Wherry.

## Splitting

*Clematis albicoma* and *Clematis ochroleuca* underwent another revision in M.L. Fernald's 1943 paper, "Virginian Botanizing under Restrictions."<sup>29</sup> In this paper Fernald criticized Wherry (1931) and Erickson (1943) for their treatments of *Clematis albicoma*, *Clematis ochroleuca*, and Steele's *Clematis viticaulis*.<sup>29</sup> Fernald said that from the recent treatment of the three species it was not clear that *Clematis albicoma*, *Clematis ochroleuca*, and *Clematis viticaulis* were separate species at all.<sup>29</sup> Fernald pointed out that Steele had said that Clematis [Kate's Mountain] was *Clematis viticaulis* and Wherry designated Clematis [Kate's Mountain] as *Clematis albicoma*. This suggested that *Clematis viticaulis* and *Clematis albicoma* were a single species.

Fernald set out to more clearly divide these three species. Fernald said that there were two varieties of *Clematis albicoma*; *Clematis albicoma albicoma* was the variety atop Kate's Mountain, while *Clematis albicoma coactilis* occurred east of Kate's Mountain. In 1944 Carrol Wood used Fernald's variety *Clematis albicoma coactilis*.<sup>30</sup> Other than Wood's use Fernald's varieties met with limited success in the following years. Earl Core, writing, *Vegetation of West Virginia*, between 1952 and 1964, refers to *Clematis albicoma* without differentiating between *Clematis albicoma albicoma* and *Clematis albicoma coactilis*.<sup>31</sup> Core was still following Wherry's description of *Clematis albicoma*

At this point we meet the last investigator in our story. In his 1967 article Carl Keener treated the subsection *Integrifoliae*.<sup>32</sup> One of the changes to the taxonomy Keener made was to form a species out of Fernald's *Clematis albicoma coactilis*. Carl Keener was largely working off a specimen of Clematis at Harvard. The Harvard Clematis was first collected near Roanoke and originally housed at the University of Pennsylvania, it was collected by Carroll Wood in 1943. There was an annotation note reading "clematis albicoma wherry var coactilis (fernald) n. var."<sup>40</sup> The note also reads "biosystematic studies in clematis subsection integrifoliae: NCSU Herbarium, Clematis Coactilis (Fernald) Keener: Carl Keener May 1966" this sample was ultimately named by Keener's conventions.<sup>40</sup> Regarding the status of Fernald's *Clematis albicoma coactilis*, Keener reported a private conversation he had with Edgar Wherry in which: "(Wherry) told me his opinion was that var. *coactilis* was either a separate species or closely related to *C. ochroleuca* (perhaps as a variety), but certainly not closest to *C. Albicoma*."<sup>32</sup> Eight years later, in a 1975 paper, Keener suggested that *Clematis coactilis* may be a hybrid of *Clematis ochroleuca* and *Clematis albicoma*.<sup>33</sup>

Returning now to his 1967 article Keener wrote that Robert Platt, had indicated that he and Erickson believed that Steele's *Clematis viticaulis* was "an extreme variation of *C. Albicoma*."<sup>32</sup> However, despite Platt's and Erickson's views Keener kept *Clematis viticaulis*, remarking, "the species is as well demarked as any of the other shale-barren endemics."<sup>32</sup> In his 1975 paper Keener said that *Clematis albicoma* was closest to *Clematis viticaulis*.<sup>33</sup> Keener agreed with Asa Gray that *Clematis ovata* Pursh and *Clematis ochroleuca* were identical. Summing up the history of *Clematis ovata* Pursh Keener said that the designation had been used to refer to three species: *Clematis ochroleuca*, *Clematis albicoma*, and *Clematis addisonii*.<sup>32</sup> Writing on *Clematis albicoma*, Keener said *Clematis albicoma* occurs from Petersburg, WV to Kate's Mountain.<sup>32</sup> Keener also placed his *novum status* of *Clematis coactilis* into a historical context. He argued that *Clematis ochroleuca sericea*, one of two varieties of *Clematis ochroleuca* in Edgar Wherry's 1931 paper (*Clematis ochroleuca ovata* Pursh was the other), was actually *Clematis coactilis*. We see here a switch from the species name *Sericea* being identical with *Clematis ochroleuca*, to both *ovata* Pursh and *Sericea* falling under *Clematis ochroleuca*, and finally *ovata* Pursh was identical with *Clematis ochroleuca* and it was *Sericea* that was a separate species. This transition took place from Michaux to Keener. What this amounted to was a process of making *Clematis ovata* Pursh into *Clematis ochroleuca*. We will end our history here with Carl Keener and move into more philosophical waters. We have, like a pathologist, excised over 150 years of time and now must observe it lest we take more years than we can competently analyze. Also, as we will see below this stopping point coincides with the end of an era in taxonomic practice.

## Kate's Mountain

The central role of the shale barrens in the taxonomic development of these species required an attention to geology from the botanist. Earl Core was more at home in geology than most botanists. This comfort with geology perhaps came from the fact that in West Virginia, where he primarily botanized, geology was not shrouded under a blanket of topsoil but rather explodes out of the ground. The shale barrens, Core said, are considered part of the middle Devonian Romney formation.<sup>31</sup> He wrote that shale barrens can be found in West Virginia from Mercer to Morgan to Mineral counties.<sup>31</sup> Core was not alone, he was standing upon a tradition between geology and botany when it came to the

variants we have been discussing. Describing the Shale Barren in his 1911 work Edward Steele writes, “This land is made up of exposures of shale in different stages of disintegration, these at the point chiefly investigated consisting of the Romney formation of the Lower Devonian. In the valleys these are reduced to a heavy clay, originally covered with good forest and when cleared susceptible of tillage. But the declivities and uplands bear at most a low and open growth of oak and pine or frequently a still lower growth of scrub oak, kalmia, and other shrubs, in either case with admixture of herbaceous plants.”<sup>19</sup> Steele was the earliest botanist in our story to recognize the rare environment that these *Clematis* were found in. In summation Steele said, “The variety of plant life is very considerable, and together with many plants well known on other sub strata, these barrens possess a number of species peculiar to themselves.”<sup>19</sup> Edgar Wherry described the Shale Barrens thus:

These barrens are developed on shale-slopes,--- places where hard shaly rocks of the Romney (middle Devonian) and Jennings (early upper Devonian) formations outcrop on steep hillsides, the surface being strewn with frost-broken fragments. They are typically occupied by a sparse, scrubby growth of pine, oak, mountain-laurel, and other woody plants, with herbaceous ones scattered between, grading into normal woodland wherever conditions permit the accumulation of sufficient soil. A number of endemic species and varieties have been observed to characterize this shale-barren plant-association, and others no doubt remain to be discovered.<sup>22</sup>

Carl Keener described the shale-barrens as “low hills (elevation 1000-2000ft) forming these barrens range from southwestern Virginia near Blacksburg to south central Pennsylvania.”<sup>32</sup>

He gave 5 characteristics of the habitat of *Clematis coactilis*, *Clematis albicoma*, and *Clematis viticaulis*, *Clematis* that he considered endemic to Shale-barrens. He wrote,“(1) a general southern exposure; (2) normally a steep slope (greater than 20°); (3) a stream often undercutting the base, thus increasing the slope; (4) sparse vegetation growing on the mantle of thin rock flakes; and (5) presence of a unique endemic flora.”<sup>32</sup> These botanists since Steele have had to contend with the shale-barrens’ geology and climate for that matter. The botanist Maurice Brooks characterized the climate of the shale-barrens as “Rain Shadows” which receive no consistent rain and are of such a grade that any rain quickly runs off the slope.<sup>34</sup> Of the Shale Barrens Kate’s Mountain gained special prominence and the reason why is historical in nature.

Weldon Boone in his *History of Botany in West Virginia* argues that Kate’s Mountain became a center for botanical research for three reasons: First was the arrival of the Chesapeake and Ohio Railroad to the region; second was the rise in notoriety of the White Sulphur Springs as a world class resort; and third was the founding of the New York Botanical Garden (NYBG) particularly that Nathaniel Britton was its first director. As we have seen already Britton had an interest in Kate’s Mountain and its flora to bring to the NYBG. To these three causes we can add the prominence of White Sulphur Springs in botanical studies prior to the Chesapeake and Ohio (C&O) railroad coming through White Sulphur Springs. The C&O railroad came through White Sulphur Springs in 1869.<sup>35</sup> Boone’s first cause postdated the second since prominent botanical studies were taking place in White Sulphur Springs prior to the arrival of the C&O, perhaps because the White Sulphur Springs drew botanists. Both Frederick Pursh and Asa Gray made trips to White Sulphur Springs prior to 1869.<sup>4,14</sup> On the other end of the chronology, we may add the creation of the Greenbrier State Forest. The state forest encapsulated Kate’s Mountain in public land and spurred the creation of a robust trail system after 1938,<sup>36</sup> and so Kate’s Mountain was now a very accessible locality. The establishment of Greenbrier State Forest meant also that Kate’s Mountain was within a managed area. This is of particular importance when we consider that in his 1893 paper John Kunkel Small writes about the conservation issues facing *Clematis addisonii*. Small writes, “The locality discovered in 1890 was again visited and found to have been nearly obliterated by the quarrying down of the hill in the process of building new streets.”<sup>32</sup> Greenbrier State Forest may have also been a detriment to *Clematis* [Kate’s

Mountain] exactly because of the accessibility that the trail system provided. Maurice Brooks, in his book *The Appalachians*, mentioned the rarity of finding Kates Mountain Clover on Kate’s Mountain because of over collection.<sup>34</sup> While safe from the steam roller’s press it was victim to the pestilence of collection. Lesser botanical celebrities like *Clematis albicoma* were probably harvested less and so the creation of the Greenbrier State Forest was likely a positive for them. Another cause of Kate’s Mountain’s celebrity was the discoveries of *Clematis albicoma* and *Trifolium virginicum* themselves. Both of these plants have Kate’s Mountain as their type location.<sup>34</sup> This suggests a kind of taxonomic momentum was at work on Kate’s Mountain. Once Kate’s Mountain became the type location for one plant the tendency was for other discoveries to be made on Kate’s Mountain. John Kunkel Small’s account of his 1892 expedition, in which he discovered *Trifolium virginicum*, included an account of *Clematis ovata* Pursh atop Kate’s Mountain. This suggests the significant role of the earlier account from N.L. Britton and Anna Vail of *Clematis ovata* Pursh in the discovery of *Trifolium virginicum*. Succeeding botanists would travel to Kate’s Mountain to a newly discovered endemic and quite naturally other flora as well.

At this point we must seek the role of Kate’s Mountain in our story in a decidedly different way from the above treatment. On this point, a short statement will be made in a philosophical vein. Kate’s Mountain acted as a proto-repository for shale-barren endemics. Some of the reasons for the botanical celebrity of this region have analogs in archival science; for example, the discovery of documents in an archive. I want to take this idea seriously and trace only in a general way how Kate’s Mountain approached repository-hood. Arlene Taylor, in *The Organization of Information*, puts forward the following as major activities of the organization of information

1. Identifying the existence of all types of information-bearing entities as they are made available.
2. Identifying the works contained within those information-bearing entities or as parts of them.
3. Systematically pulling together these information-bearing entities into collections in libraries, archives, museums, Internet communication files, and other such depositories.
4. Producing lists of these information-bearing entities prepared according to standard rules for citation.
5. Providing name, title, subject, and other useful access to these information-bearing entities.
6. Providing the means of locating each information-bearing entity or a copy of it.<sup>37</sup>

It is likely that Kate’s Mountain does not perform any one of these activities entirely. But it seems that part or even much of these activities was done by the mere circumstances of Kate’s Mountain. Consider number five. There may not be “useful access” naturally, but Kate’s Mountain, with its trail system, does provide superior access. There are four ways that Kate’s Mountain fills the role of the proto-repository; preservation, findability, suitably limited geographic area, and searchability within that geographic area. Britton and Wood both mention preservation issues in localities. Kate’s Mountain was well suited to preserve these species because it was within Greenbrier State Forest. Another way that Kate’s Mountain was a proto-repository of shale-barren endemics has been in the case of fugitive species. There are quite a few cases where plants have been lost to science only to be rediscovered with the aid of the Kate’s Mountain proto-repository. Kate’s Mountain in these cases fulfills a key role of a repository, that of findability. Evolutionary Biologist Ernst Mayr touches on this at the end of “Toward a Synthesis in Biological Classification” when he argues that one objective of classification was “to serve as the key to an information storage system.”<sup>38</sup> It is not clear in “Toward a Synthesis in Biological Classification” if the herbarium or the field is to be the storage system. I will take the latter for instances like Kate’s Mountain that approach repository hood. Thus, Mayr’s view seems to be in line with Kate’s Mountain as a proto-repository with classification serving as something

of a catalog. Kate's Mountain and Greenbrier State Forest worked as a proto-repository also because it was a limited Geographic area of such a size that it could be traversed and searched in a day or two. Related to the preceding criteria is that Kate's Mountain was even searchable within the Greenbrier State Forest; remember that Steele listed as one of his five descriptors of shale-barren Clematises "a general southern exposure." A botanist could determine not only that she should look on Kate's mountain but that she should look on southern slopes. These are four further criteria that the Kate's Mountain proto-repository meets particularly well. Kate's Mountain was made a proto-repository also due to the fact that there were species endemic to its geological formation.

I do not wish to say that Kate's Mountain was an archive of spur and draw and talus. But we must not believe in the divorce of localities and herbaria, that one does not encroach upon the other. This especially was true of Kate's Mountain. I will end this section with a story taken from Maurice Brooks about botanists arriving in White Sulphur Springs:

"(they were) vacationing botanists, doing their duty to institution and profession, started up the nearest convenient mountain by the best available trail. As the first one took this path, he presently discovered a plant new to science. In great excitement he came down, took it back to New York, described it, and thus perpetuated his name in the annals of botany. The next visitor climbed higher on the trail, again found a new species, and repeated the performance. It took the plant hunters years to get to the top of Kate's Mountain; nearly every trip yielded a new plant, and thus was the sponsoring institution repaid."<sup>34</sup>

## Concluding Remarks

The question arises: Why did *Clematis ovata* Pursh go through the taxonomic permutations that it did? One answer must be that the plants existed. That is, we have seen it lamented in two places that type locations were being ransacked and degraded. If the degradation of the type location of *Clematis addisonii* had been complete earlier that plant would have had to wait for another type location to be discovered. This would have changed the development of the taxonomy. This point is also made on a deeper level, the main determinant of this story was facts on the ground. This may seem an obvious point, but it is one that is sometimes overlooked. Whatever their faults, these botanists were ardently trying to describe the world. This does not mean that there was one way the taxonomy could have developed given facts on the ground. The facts on the ground, however, do limit how this history could have looked. Another answer is that our story is in places punctuated by reusing old designations. There is, so to speak, a stickiness to taxa. We saw this with Britton's equating *Clematis* [Kate's Mountain] with *Clematis ovata* Pursh. As *Clematis ovata* Pursh was under attack from Robinson and Steele it gained temporary shelter in *Clematis* [Kate's Mountain]. The vacillations that the species names *Sericea* and *ovata* Pursh undertook in the twentieth century with Wherry and then Keener was a vacillation between two very old designations formed by Frederick Pursh and Andre Michaux. Yet another answer is that biogeography came into play. The map these botanists used was overlay with boundaries of possibility over which plants could not cross. Wherry mentioned in his 1931 paper the possibility that Catesby collected in Virginia. This was a thorny problem because Wherry didn't believe that *Clematis* [Kate's Mountain] was *Clematis ovata* Pursh. So why does he have this piece about Catesby possibly collecting *Clematis ovata* Pursh in Virginia? If Wherry didn't think it was identical with *Clematis* [Kate's Mountain] then what was the impetus for moving the locality out of "Negro's Head" to Virginia? Wherry here was equating *Clematis ovata* Pursh with *Clematis ochroleuca* which he said was native to the Virginia and North Carolina Piedmont. Wherry was trying to place *Clematis ovata* Pursh within the Piedmont in order to re-designate it. We run into biogeography again with Kuntze's *Subglabra*, a variety of *Clematis ovata* Pursh. Remember that Kuntze had said this occurred at Eagle Pass near the Mexican/American border. Later botanists, most notably Carl Keener, dismissed *Subglabra*. It was not that botanists were reluctant to split *Clematis ovata* Pursh, in fact botanists were quite ready to split species off of *Clematis ovata* Pursh, as Steele did with *Clematis*

*viticaulis*. Part of the reason was no doubt due to my first answer. There was no *Clematis ovata subglabra* that any botanist could find. But *subglabra* must have been disadvantaged from the outset because of the distance of the locality from that of *Clematis ovata* Pursh. Some designations were steps in a larger, multi-generational movement. As we have seen Wherry's 1931 treatment of *Clematis ochroleuca* was a taxonomic bridge between *Clematis ovata* Pursh and *Clematis ochroleuca*. Wherry's 1931 paper was a kind of paraphrastic environment where the switch could happen. Finally, there were changes in the characters of plants that were taken as diagnostic for taxonomy, and these changes created and destroyed species. The best example of this in our story was M.L. Fernald's 1943 paper. His changing of diagnostic characters led to the splitting of *Clematis albicoma* into two varieties.

Throughout this paper I have tried to stay away from the actual justifications for this or that taxonomic turn; that is, the actual practice of botany. I believe that this history can largely avoid this subject. I have instead tried to treat this matter from the standpoint of the history of science and organization of information. I am now going to break this sequester at least as it pertains to making a general statement about the taxonomic practice of these botanists. The work of these botanists was mostly in line with what Ernst Mayr calls Evolutionary Classification. In his article "Toward a Synthesis in Biological Classification," Mayr describes Evolutionary Classification thus: "The evolutionary school includes in the analysis all available attributes of these organisms, their correlations, ecological stations, and patterns of distributions and attempts to reflect both of the major evolutionary processes, branching and the subsequent diverging of the branches (clades)."<sup>38</sup> Mayr tells us that evolutionary systematics was dominant from Darwin to the mid-1900's.<sup>38</sup> Some examples of evolutionary classification are Carl Keener's suggestion that *Clematis coactilis* was a hybrid of *Clematis ochroleuca* and *Clematis albicoma*. Another example is the use, particularly in Keener, of the concept of *closeness*. *Closeness* came up in Keener's discussion with Edgar Wherry about the relationship between *Clematis coactilis* and *Clematis ochroleuca*. It came up again in Keener's 1975 paper referring to the relationship between *Clematis albicoma* and *Clematis viticaulis*. The taxonomic work of the botanists in this story fit Mayr's definition of evolutionary classification and anachronism is avoided also.

In this story, we have dealt with physical objects, specimens; and intellectual objects, species. The connection between specimen and species is historical at least on the macro scale. That is, each specimen in our story has gone by several different species names. This was not just a circus of naming but an engagement with associations as well. When *Clematis* [Kate's Mountain] was named *Clematis ovata* Pursh by Nathaniel Lord Britton it entered into association with the plant at the Sherard Herbarium that was supposedly collected at "Negro's Head." When *Clematis* [Kate's Mountain] was re-designated *Clematis albicoma* those associations were broken. When *Clematis albicoma coactilis* became its own species *Clematis coactilis* associations with *Clematis albicoma* were broken. When we investigate these associations, we get the feeling that we are not thinking about plants only but a larger question of organization of objects that have characteristics and bear information. Theodosius Dobzhansky asked, "Is, then, the species a part of the 'order of nature,' or part of the order-loving mind?"<sup>39</sup> There is an "order of nature," Dobzhansky wrote, "A superficial as well as a most searching investigation reveals not continuums but discreet groups of forms, every member of each group being more similar to every other member of the same group than to any member of any other group."<sup>39</sup> Dobzhansky here echoes John Stuart Mill's quote, "The ends of scientific classification are best answered when the objects are formed into groups respecting which a greater number of general propositions can be made, and those propositions more important, than could be made respecting any other groups into which the same things could be distributed."<sup>41</sup> Mayr also agrees with Dobzhansky stating, "Such naming of kinds is made possible because the diversity of nature is not continuous but consists of discrete entities, separated from each other by discontinuities."<sup>41</sup> But we have seen instances in our story where changes in species-hood seemed to take place more in the ether of pure organization; one example was the practice of Otto Kuntze in folding several species into *Clematis integrifoliae* where they existed as

variations. Dobzhansky makes this same distinction between natural and artificial classification.<sup>39</sup> But as Dobzhansky points out there can be shades of naturalness amongst classifications, depending upon the discontinuities drawn between species. This was seen in M.L. Fernald's criticism of the guides of Wherry (1931) and Erickson (1943). Fernald's criticism was a redrawing of these discontinuities by changing the characters diagnostic to classification. What arose out of this redrawing was the splitting of *Clematis albicoma* into two varieties. The information dominant approach in this paper, as I have argued, does not strictly speak against a taxonomic realism. This story then supports Dohobansky's gradient between natural and artificial classification.

We have run a race it seems between *Clematis* and botanist. *Clematis ovata* Pursh spent over a century at the center of a botanical whirlwind that touched botanists on both sides of the Atlantic and the greatest botanical minds of several generations. It should occupy great minds of today at least for a little while. The settling out of *Clematis ovata* Pursh took over a century and because of the qualities in the story, it provides an observation of phenomenon that has become of great

importance to biology, information science, and philosophy of the last 50 years. What this story offers is the rare laboratory for the philosopher of biology who wants to know the importance of place and its influence on the practice of taxonomy.

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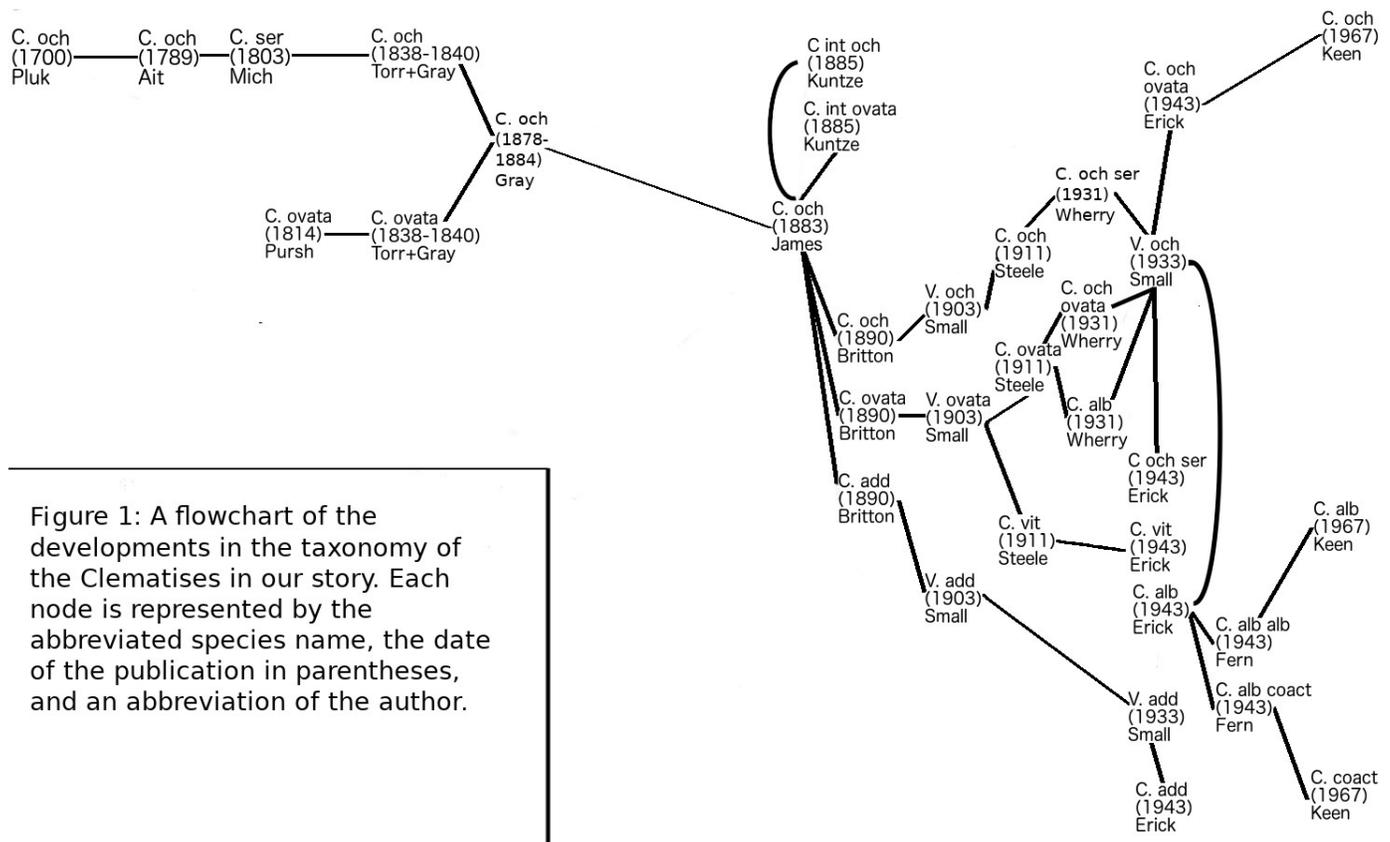


Figure 1: A flowchart of the developments in the taxonomy of the Clematises in our story. Each node is represented by the abbreviated species name, the date of the publication in parentheses, and an abbreviation of the author.

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