

Voyages of Discovery: novel information from old herbarium specimens

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Herbaria are, in essence, caches of biodiversity over space and time. The UNC Herbarium's collection of plants is worldwide in scope and includes specimens collected over three centuries. While taxonomists have used morphological characters—the shape and size of leaves, flowers, seeds—for centuries, one of the newest tools scientists can use to study organisms is to compare the DNA of one specimen to that of another individual of the same or related species. Plant biologists frequently return to older material when new techniques are developed. I recently asked UNC Herbarium Associate Dr. Paul Gabrielson just how old was the oldest herbarium specimen from which he had successfully isolated DNA. The answer surprised me: he has sequenced DNA from algae collected in 1791!

Where did this algae come from and why was he interested in such an old specimen? From the 1600s to the 1800s, many “voyages of discovery” sailed from European nations to claim territory and seek mineral, animal, and botanical riches. One such expedition led by Alessandro Malaspina, an Italian in the employ of the Spanish crown, sailed from Cadiz, Spain, in April 1789 and headed for the Pacific. **Tadeas Haenke** (pictured here), one of two botanists assigned to the expedition, literally missed the boat: he arrived in Cadiz two hours after the *Descubierta* (“Discovery”) and *Atrevida* (“Daring”) had sailed. Haenke took another boat, but that ship sank off the coast of Argentina! Haenke swam for his life and managed to save only one item—his most precious possession—a copy of Linnaeus's 1753 *Species Plantarum*, a compendium of all the world's plants known at that time. Haenke arrived in Montevideo eight days after the Malaspina expedition had departed—again missing the boat. Undeterred, he trekked across the pampas of Argentina and crossed the Andes to join the expedition in 1790 in Chile. From there the expedition sailed northward, exploring the coasts of the Americas. Malaspina's ships reached their northernmost point, Prince William Sound, Alaska, in 1791. In the period 1792 to 1793, the ships crossed the Pacific to the Philippines, Australia, and Tonga before returning to Peru and, finally, to Cadiz, Spain, in 1794. The expedition's two botanists had collected about 16,000 botanical specimens.

Unfortunately, the expedition's scientific accomplishments were neglected due to Alessandro Malaspina's arrest and imprisonment on charges of plotting against the Spanish government. Malaspina was exiled from Spain in 1802, and the expedition's accomplishments were not published for decades. Haenke's

botanical collections languished in a warehouse in Cadiz. Finally, they were transported to Prague, where they were salvaged by Count Kaspar von Sternberg (founder of the Czech National Museum), who sent Haenke's algal specimens to Carl Agardh in Sweden. We know that in 1822, Agardh named *Prionitis sternbergii* based on one of Haenke's specimens, and this specimen still resides in the Botanical Museum in Lund, Sweden.

Fast-forward 200 years to Paul Gabrielson studying the red seaweeds that inhabit rocky tidepools from southeast Alaska to Baja California. “In 1975 I became acquainted with *Prionitis lyallii*, which had been named in 1862 by Irish botanist Harvey from specimens sent to him from Vancouver Island, Canada.

Thirty years later, I realized that there are two other species that look extremely similar to *P. lyallii*—namely, *Prionitis jubata*, named in 1851 by a Swedish botanist based on a specimen from Sitka, Alaska, and *Prionitis sternbergii*, named in 1822” (as just described, above). It seems that this alga, whatever its name, is morphologically highly variable. Gabrielson decided to borrow the original specimens upon which each of the three “species” had been named, to grind up a small fragment of each and compare the DNA sequences. He concluded that “this one species had been

named three different times, each name published by a different famous botanist, and each name based on a different specimen!” In the realm of botanical nomenclature, the oldest published name has priority, so *Prionitis sternbergii*, named by Agardh in 1822 based on Haenke's 1791 specimen, is the winner!

It is fortunate that herbaria in Sweden, Ireland, the United Kingdom, the Czech Republic, and the United States have preserved material from so many places, for so long, enabling scientists to use old specimens in new ways to document the biodiversity of rocky tidepools—and all the other wonderful habitats of the Earth.

Sources

- Silva, Paul C. 1996. California seaweeds collected by the Malaspina Expedition, especially *Pelvetia* (Fucales, Phaeophyceae). *Madroño* 45(3): 345-354.
- Gabrielson, Paul W. 2008. Molecular sequencing of Northeast Pacific type material reveals two earlier names for *Prionitis lyallii*, *Prionitis jubata* and *Prionitis sternbergii*, with brief comments on *Grateloupia versicolor* (Hyalmeniaceae, Rhodophyta). *Phycologia* 45(1): 89-97.
- Malaspina, A. 2003. The Malaspina expedition 1789–1794. Journal of the voyage by Alejandro Malaspina. Vol. I Cadiz to Panama. Ed. by A. David, F. Fernandez-Armesto, C. Novi & G. Williams. The Hakluyt Society, London.

