Larrea tridentata—

Long live the creosote bush!

Creosote ring in Johnson Valley

Creosote ring in China Lake

For many years the oldest living organisms on earth were thought to be the bristlecone pines *(Pinus longaeva)* of western North America. These continue to be the oldest known living organisms that are not clones but retain continuity from the living bark to a still-existing core.

But most of the records for long-lived organisms have been attributed to clones. Clones are organisms that have spread or multiplied without cross-fertilizing with others of their species. In plants, clones reproduce primarily through a process of continuous outgrowth from the original place of growth. In plant clonal reproduction, an individual continues to reproduce by one of several methods: by continuously growing outward from an original main stem (creosote, Palmer's oak), from underground shoots, roots, or rhizomes that continuously send shoots outward and up from the original stem (quaking aspen, Norway spruce), or by budding from the base of the original stem (King's holly).

Growth in all organisms takes place through cell division, or the genetic replication of DNA and its resulting cellular production. The same genetic material continues to be replicated in order to continue producing growth. Although not all clonal species lack sexual reproduction, most long-lived species—and particularly the longest-lived organisms—are genetic copies of an original, sometimes missing main stem that resulted from a seedling that was originally a result of sexual reproduction.

Creosote stem growth, San Bernardino County Museum

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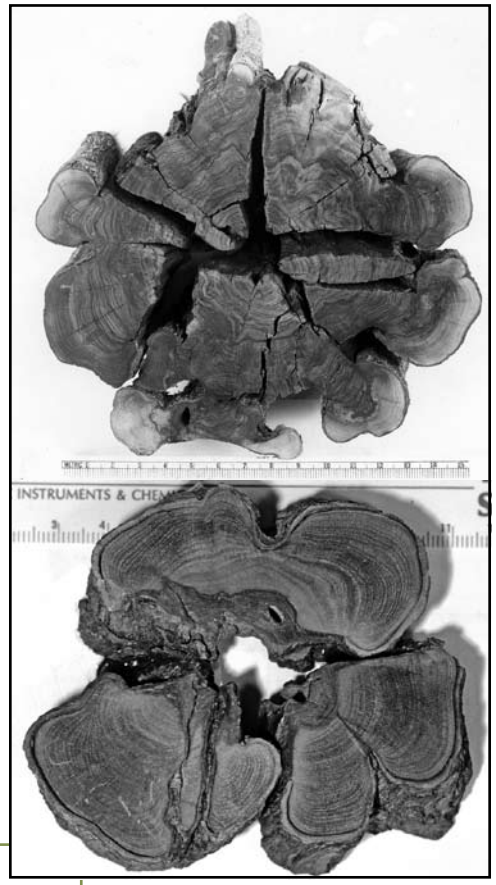
Joshua trees are an icon of the Mojave Desert, but another plant right under your nose deserves your attention.

Creosote is the common name of *Larrea tridentata*, the most promiment shrub in almost every desert in North America—often forming evenly spaced colonies that span as far as the eye can see. American Indians used the plant for medicinal purposes and, if you live in the high desert, the undeveloped open spaces surrounding your neighborhood are probably dotted with these hardy, long-lived shrubs.

The shrub is called "creosote" because of its strong, resinous odor, reminiscent of the chemical used to preserve wood from decay. In fact, creosote bush resin was used for this purpose before the widespread use of cheaper and more readily available petrochemical substitutes. The plant odor is especially noticeable in the spring or immediately after rainfall.

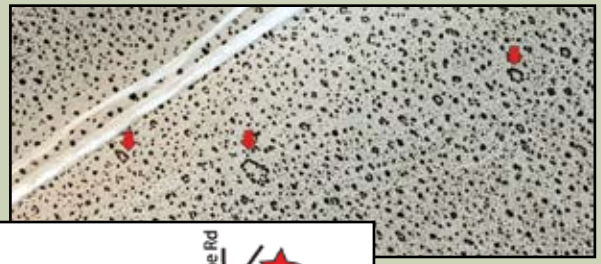
Creosote bush is one of the longest-living plants on earth. Research by Dr. Frank C. Vasek of UC Riverside confirmed this finding. He estimated growth rates by counting and measuring the width of annual growth rings in horizontal slabs cut from creosote. The clone thought to be the oldest creosote individual is conservatively estimated to be 9,400 years since seedling establishment. This date coincides with the end of the last Ice Age, about 10,000 years ago in the northern hemisphere. This ancient plant, in nearby Lucerne Valley, is among the original colonists of an area today known as the Mojave Desert.

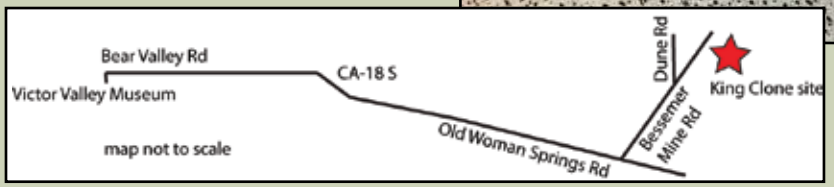
Figure 1 shows creosote that that was grown in the UC Riverside botanical garden and is known to be 12 years old. Note how this plant, which was not subjected to desert heat and drought conditions, shows 12 annual "rings." Note also that signs of segmentation are already appearing.



Figures 2 and 3 illustrate older creosote sampled from the Mojave Desert, estimated by their ring count to be around 60 years old. Note the increased segmentation that results from differential growth at the edge of the stems. Growth continues in these various directions, away from the living outer stem, and tends to form elliptical patterns over time. All along the edges of these living ellipses, genetic testing proves that all tissues are of the same genetic material—the same individual plant. The growth rates can be estimated by the width of the annual rings. Once this is accomplished, a conservative estimate of the age of the clone can be made by measuring to the center of the ellipse from the edge of the living stem, and comparison to ages gathered from radiocarbon-dating creosote wood fragments found inside the ellipses.

Visit the King Clone site to see creosote rings—about 33 miles from the Victor Valley Museum.





Head north on Apple Valley Road toward Bear Valley Road. Turn right at Bear Valley Road; turn right at CA-18 South and continue onto Old Woman Springs Road. Turn left at Bessemer Mine Road; the King Clone site is to the right off Bessemer Mine Road past the intersection of Dune Road.

The rise of the science of **dendrochronology** largely coincided with the study of the long-lived bristlecone pine. Dendrochronology analyzes a plant's annual growth rings. Counting yearly growth rings and comparing with other samples can yield information about current and past weather conditions, time spans of long-term droughts, major climactic disruptions such as volcanic eruptions that cause cooling—even earthquakes that disrupt the ground surface and the growth of the tree. The ring patterns from various species and locations will match up with known periods of drought, cooling, and warming. These rings also contain chemical signatures of changes in our atmosphere. The rings indicate representing annual cycles of fast and slow growth and how many years the plant has been alive. One ring usually represents one year in the life of a tree or shrub.