

THE GINKGO

StandingNation-Human Alliance Bulletin

The Green Pharmacy

🌳 **TREES provide medicines.** We know from studies of indigenous cultures, that plants, including trees, have provided medicines to heal humans from disease since we have first evolved:

“Evidence exists that plants were used for medicinal purposes some 60,000 years ago. A burial site of a Neanderthal man was uncovered in 1960. Eight species of plants had been buried with him, some of which are still used for medicinal purposes today.”¹

From the ancient Egyptians to Hippocrates’ 300 to 400 species of medicinal plants, from Aristotle and Dioscorides five-volume pharmacopeia to the Ayurved texts of alternative medicine and Arabic botanist’s Abdulla Ben Ahmad Al Bitar’s glossary of 1400 drugs, from Dr. William Wither’s 1775 discovery of foxglove being successful at treating heart failure as digoxin. to morphine being isolated from a plant in 1803 to reduce pain, to the 1852 synthesis of salicin from willow bark, which gave us aspirin. Today, 40% of pharmaceutical drugs in the Western world come from plants, including the top 20 best-selling prescription drugs², one of which is quinine, extracted from the bark of the South American cinchona tree to treat malaria.

¹ U.S. Forest Service, “How Long Have People Been Using Medicinal Plants,” *Medicinal Botany*, <https://www.fs.fed.us/wildflowers/ethnobotany/medicinal/index.shtm> (accessed 2/16/21).

² Ibid.

🌳 **TREES boost human immune systems by increasing the count of the body's natural killer (NK) cells and increasing anti-cancer protein**

production. Specifically:

“ . . . the forest environment enhanced human natural killer (NK) cell activity, the number of NK cells, and intracellular anti-cancer proteins in lymphocytes, and that the increased NK activity lasted for more than 7 days after trips to forests both in male and female subjects.”³

Further studies demonstrated that it appears to be the phytoncides that trees emit, which causes this effect.⁴

🌳 **TREES increase human pain thresholds.** Recent theories of pain highlight the role that sensory stimuli from the environment can play in influencing the pain experience⁵. In one study:

“ . . . patients were randomly assigned to rooms providing exposure to images of nature, abstract art, a control blank panel, or nothing at all. Patients exposed to nature images were significantly more likely to switch from strong analgesics to weaker painkillers during their recovery than patients in the other conditions—indicating that the nature images influenced patients' postoperative pain.”⁶

In another study, the effect of combining nature images and sounds was tested in reducing pain in a randomized clinical trial of patients undergoing uncomfortable

³ Li Q, Kobayashi M, Wakaama Y, Inagaki H, Katsumata M, Hirata Y, Hirata K, Shimizu T, Kawada T, Park BJ, Ohira T, Kagawa T, Miyazaki Y, “Effect of phytoncide from trees on human natural killer cell function,” *International Journal of Immunopathology and Pharmacology*. 2009;22(4):951-9. doi: 10.1177/039463200902200410 (accessed 2/26/2).

⁴ Ibid.

⁵ Malenbaum S, Keefe F, Williams A, Ulrich R, Somers T, “Pain in its environmental context: Implications for designing environments to enhance pain control,” *Pain*. 2008;134(3):241-244. Doi: 10.1016/j.pain.2007.12.002 (accessed 2/26/21).

⁶ Ulrich RS, Lunden O, Etinge JL. “Effects of exposure to nature and abstract pictures on patients recovery from heart surgery,” *Psychophysiology*. 1993;S1:7 (accessed 2/26/21).

flexible bronchoscopies (where a tube is passed through the nose/mouth, down the throat, and into lungs):

“During the procedure patients were exposed to nature scenes and sounds or received treatment as usual. Patients who were exposed to nature views and sounds reported significantly higher levels of perceived control over pain.”⁷

In a third study, researchers induced pain in healthy participants when they were exposed to either a video of natural scenery or to a static blank screen.

“Participants exposed to the natural scenery reported increased pain threshold and tolerance.”⁸

The value of an actual or virtual forest environment or photos of such an environment on increasing the response of the human immune system and reducing our response to pain continue to be a popular research topic yielding encouraging results for human health and comfort.

⁷ Diette GB, Lechtzin N, Haponik E, Devrotes A, Rubin HR, “Distraction therapy with nature sights and sounds reduces pain during flexible bronchoscopy: a complementary approach to routine analgesia,” *Chest*. 2003 Mar; 123(3):941-8. (accessed abstract 2/26/21).

⁸ Tse MMY, Ng JKF, Chung JWY, Wong TKS, “The effect of visual stimuli on pain threshold and tolerance,” *Journal of Clinical Nursing*. 2002;11:264–69. (accessed abstract 2/26/21).

- ✦ The ginkgo has long been a symbol of longevity as the tree can live for more than 3,000 years.
- ✦ Ancient Chinese artists often depicted the Buddha's Dragon Tree as a ginkgo.
- ✦ Chinese monks brought the ginkgo to Japan, in 13th or 14th century, where it was widely planted in temple gardens.
- ✦ The ginkgo is a sacred tree believed to have been saved from extinction by Buddhist priests on temple grounds in China, Japan, and Korea. With its distinctive leaves and great longevity, ginkgo also took on symbolic meaning in Buddhism, Daoism, and Confucianism and later was incorporated into Japan's indigenous religion of Shintoism."⁹
- ✦ In Japanese decorative art, the ginkgo's distinctive fan-shaped leaf has carried such religious symbolism along with its singular beauty.
- ✦ The ginkgo shows up often in Asian art as well as the Art Nouveau movement of the late nineteenth century.
- ✦ The ginkgo leaf is also a symbol of peace, hope and endurance.
- ✦ The ginkgo nut is traditionally served at Chinese weddings, as they are believed to have healthful as well as, perhaps, aphrodisiac qualities.
- ✦ The ginkgo has been referred to as herbal medicine's favorite tree as extract from the dried green leaves of the plant is believed to strengthen/enhance

⁹ Peter Crane, "Chelsea Flower Show: The Resilience of the Ginkgo," *Financial Times*, May 17, 2013 <https://www.ft.com/content/21ffa6f0-b1b6-11e2-9315-00144feabdc0> (accessed 9/14/20).

memory, to improve concentration, and to prevent dementia, as well as being used as a blood thinner and to treat some circulatory diseases.

✘ Ginkgo is often planted in urban areas as the tree is resistant to wind, heat, drought, ice, salt, poor soil, smoke, dust, air pollution, insect, pests and disease and does well in confined spaces.

✘ Ginkgo leaves are currently being used to study climate change:

“Having survived three mass extinctions, including the one that killed the dinosaurs, ginkgo has retained a remarkably similar appearance throughout its time on Earth. This characteristic makes it possible for scientists to easily compare modern specimens with fossils dating to the distant past—a practice that could help researchers assess how the planet’s atmosphere has changed over time, as well as predict what effect future climate shifts will have on Earth’s living creatures.”¹⁰

✘ Surprisingly, despite its longevity as a species, the *Ginkgo biloba* is included on the IUCN Red List of Threatened Species in 1998 as endangered because:

- Ginkgo has only two populations growing in the wild, both in the Tian Mu Shan Reserve in the Zhejiang province of eastern China.
- Ginkgo is slow-growing and slow to produce seeds.
- Ginkgo habitat is being destroyed by human activity.
- Ginkgo is subject to overharvesting for its use in traditional medicine.

¹⁰ Meilan Solly, “Smithsonian Scientists Are Using Ginkgo Leaves to Study Climate Change—They Need Your Help,” *Smithsonian*. Aug. 6, 2019, <https://www.smithsonianmag.com/smithsonian-institution/smithsonian-scientists-use-ginkgo-leaves-study-climate-change-they-need-your-help-180972806/> (11/13/20).

- Although planted and cultivated by humans, the ginkgo is “at risk for loss of biodiversity because of propagation by cuttings rather than by seed, due to human preference for male trees.”¹¹

A Tourist’s Testimonial

[Recent] research published in the Proceedings of the National Academy of Sciences provides the first hard genetic evidence that shows as the ginkgo tree ages it gains strength. What’s more, while the annual rings of 600-year-old ginkgos grow thinner, they omit as many defensive and immune-supporting chemicals as their younger relatives. This last observation confirms a long-standing suspicion, in the botanical community, that the default condition in plants “is immortality.”¹²

—Dr. Howard Thomas

¹¹ Cor Kwant, *The Ginkgo Pages*, <https://kwanten.home.xs4all.nl/propagation.htm> (accessed 11/13/20).

¹² Dr. Howard Thomas, a plant biologist from Aberystwyth University, as quoted by Erin Malsbury in the journal *Science*, Jan. 13, 2020.

- Can you locate a ginkgo tree in your community?
- If you cannot locate a ginkgo in our community (or even if you can) you have an excellent impetus for making a visit to an arboretum or a botanical garden. You can search the Internet using “arboretum near me” as a search phrase. Or for a wider search, insert the name of your state and “arboretum” and/or “botanical gardens.” (If you like such field trips, you can add travel destinations to your itinerary by adding the phrase “public gardens” to your search.)

If you live in Michigan, a dozen of the botanical gardens or arboretums that will appear as a result of your search are:

- **Matthaei Botanical Gardens** and **Nichols Arboretum** at the University of Michigan in Ann Arbor
- **W.J. Beal Botanical Gardens** at Michigan State University on the East Lansing campus. Its corresponding **arboretum** consists of almost the entire campus of 2100 acres. (Also: the **MSU Horticulture Gardens**)
- **Hidden Lake Gardens**, owned and operated by Michigan State University in Tipton in the Irish Hills, a public botanical garden, arboretum, and conservatory
- **Anna Scripps Whitcomb Conservatory** on Belle Isle in Detroit
- **Frederik Meijer Gardens and Sculpture** in Grand Rapids
- **Leila Arboretum** in Battle Creek
- **Dow Gardens** in Midland
- **Taylor Conservatory and Botanical Gardens** in Taylor

- **Fernwood Botanical Garden and Nature Preserve** in Niles
- **Historic Barns Park Botanical Gardens** in Traverse City
- **DeTour Village Botanical Gardens** in DeTour Village in the Upper Peninsula

Of course, you will not find a ginkgo tree in every arboretum or botanical garden you visit. Here are two places you'll meet with success for sure:

- In the Matthaei Botanical Gardens and Nichols Arboretum in Ann Arbor, a ginkgo is growing in the Medicinal Garden.
- Another large ginkgo tree is located next to the Beaumont Tower on the Michigan State University campus, all of which is considered an arboretum.

Tree Dreams

🔗 What can you imagine about a tree that shared the earth with dinosaurs?

*Tree's Big Idea: **ABSCISSION***

My big idea was to explain the evolution of leaves in this space. To explain how plants began as vascular straws growing in water, and then developed a sort of leaf and moved to land. But then the earth's climate changed, and needles were needed. And then, somehow, trees, like the ginkgo, developed leaves that led to the evolution of the deciduous leaves we know and love today. The same leaves that we observe emerging pointillistically from branches in the spring, suspended in stillness in summer humidity, restlessly spinning from branches in fall winds, and rustling underfoot in early winter.

But it is the midweek the second week of November, and before noon, the outdoor thermometer registers 73 degrees, with the temperature expected to reach 77 today. The ginkgo's leaves fell on Halloween this year, but the rest of the trees encircling it, except for the two honey locusts, still have some leaves on them. What is mostly happening today involves leaves drifting down in earnest, even from the neighboring oaks, who generally await the swelling of buds on their twigs in spring to let their leaves go.

While meditating this morning, focusing on breathing in the oxygen, gifted from the trees all around me, and expelling carbon dioxide from my lungs, which will help feed those same trees . . . following my breath in and out, in and out . . . the shadows of drifting leaves, kissed the inside of my closed eyelids, and suddenly I am here now: leaves falling.

What is it that makes a tree's leaves fall in fall? Turns out, the cause is not wind, rain, or even gravity.

As the days grow shorter and colder, each individual tree has a serious decision to make, one of timing. How long will it hang onto its leaves? Remember, the leaves, creating the tree's food via photosynthesis, are responsible for making the tree grow and thrive. So, holding on to one's leaves means that more food is produced, which makes the tree grow larger and stronger.

The problem is that if a tree, say the sycamore outside my study window, were to hold onto its leaves over the winter, a January thaw would initiate the process of photosynthesis again as water rose up the tree's mottled trunk. Then when the temperature dropped back to a more normal January temperature—below freezing—the

leaves would be caught with water in their veins. This water would freeze, and the leaves would die. Subsequently, when spring came, these dead leaves would be unable to photosynthesize, and the tree, without food, would die. A tree's safer, better plan is to avoid the possibility, the potential threat, of ending up with branches full of frozen leaves and instead, get rid of one's leaves before they can freeze. And, then grow new leaves in the spring.

So how does a tree shed its leaves?

Young leaves produce auxin, one of at least nine plant hormones that regulate growth. Auxin is produced in stems and buds, as well as the root tips, and promotes cell division and stem and root growth. In the tip of the leaf stem, auxin promotes the cell elongation. When the level of auxin declines--caused by autumn's reduced sunlight--the tree first scavenges materials from the leaves, especially nitrogen and organic carbon, storing them in its cells of wood and bark. Once this movement of the leaves' material ends, an abscission zone (AZ), a specialized layer of cells forms at the base of the petiole (leaf's stem), the point of the future leaf separation. The abscission zone (AZ) is composed of a top layer that has cells with weak walls, and a bottom layer that ultimately expands, allowing the weak walls of the cells in the top layer to break.

More specifically, the decreasing level of auxin also makes the AZ sensitive to ethylene, another growth-regulating plant hormone. The theory is that when the AZ is exposed to ethylene, cell wall-degrading enzymes are activated, allowing that top layer

to break¹³ . . . and voila! . . . the leaf is released¹⁴ to drift, its shadow kissing the inside of my closed eyelids, my face tipped toward the weakening sunlight.

¹³ Trees growing close to the 19th century gas lamps using ethylene as a fuel had an increase in leaf drop. “Abscission in Plants” by Vilde Olsson and Melinka A. Buenko in *Current Biology*, Vol. 28, Issue 8, April 23, 2018 at [https://www.cell.com/current-biology/comments/S0960-9822\(18\)30289-6](https://www.cell.com/current-biology/comments/S0960-9822(18)30289-6) (accessed 11/13/20).

¹⁴ The process of leaf abscission is similar to a tree dropping flowers after fertilization, ripened seed pods, or mature fruit.