

SCI-TECH

“Part of the secret of success in life is to eat what you like and let the food fight it out inside.”
MARK TWAIN, AUTHOR

Yale study finds diverse microbial life thriving in trees

BY YAVIN FICKEL
CONTRIBUTING REPORTER

Trees have long been regarded as life-giving, and new research now adds another layer to the adage. According to a new study by Yale researchers published in Nature, trees host diverse and unique microbial communities, tallying up to a trillion bacteria in a single tree. These findings offer new insights for a variety of fields, including tree physiology, forest ecology and environmental microbiology. “The wood of trees is the biggest pool of biomass in the world,” Jonathan Gewirtzman ENV ’26, a doctoral candidate at Yale School of the Environment who co- led the study, said in an interview. “This work was on describing the microbiome living inside of trees.” Gewirtzman explained that while other plant microbiomes had been previously studied, no research had previously examined the microbiome of trees. Because of this, there was a lack of clarity on whether or not microbial life existed in trees. To investigate, Gewirtz-

man and his team took samples from living trees in Yale Forests. Gewirtzman said his team spent considerable time figuring out how to grind the wood while keeping everything sterile and frozen. After processing, microbial DNA was extracted from the wood in a lab to conduct analysis. Altogether, the researchers identified 40,000 different microbes across all wood samples. While some microbes found by the team are known to be beneficial for trees by providing nitrogen from the atmosphere, others could have dangerous or otherwise unknown impacts. The impact of microbial life on their tree hosts remains a topic of interest for some members of the team. “Understanding how different organisms have symbiotic or antagonistic relationships could mean a lot for understanding the lifetime of different species, why we have disturbances, or generally competitive dynamics in forests,” Marlyse Duguid, director of research for Yale Forests, said in an interview. The study also found that different species of trees have distinct

microbial communities, which could have implications on conservation efforts, Cerise Stanley ENV ’27 said. “There’s another biological component that needs to be considered when we think about how one species of trees can potentially impact other species,” Stanley said. Beyond its environmental implications, the study’s findings are also relevant for fields that rely on environmental principles, such as economic modeling. Etienne Berthet, a postdoctoral researcher at MIT and former director of the Global Commons Stewardship Index at Yale’s Center for Environmental Law & Policy, described the microbial communities in trees as shaped by a combination of soil and sources like atmospheric deposition. “In the production of a single product, two areas cleared of seemingly identical trees could trigger very different impacts on biodiversity,” Berthet wrote in an email. “Currently, our global environmental economic models do not capture this at all – and it



CONNOR HOGAN

The research offers new insights into trees, forests and the environment.

urgently needs deeper study. In reflecting on their work, both Gewirtzman and Duguid emphasized the interdisciplinary nature of their research by explaining how each researcher approached the project with their own distinct skillsets and interests. This, Gewirtzman said, was a key component for the study’s success. “This is a glimpse of what’s living inside the trees,” Gewirtzman said. “There’s lots and lots of work left to be done, but I think what this work does do is open up all of those questions.” The Yale School of Environment is located at 195 Prospect St.

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Spring is arriving later for New York City trees, study finds

BY MICHELLE SO
STAFF REPORTER

In a concrete jungle like New York City, urban trees offer refuge: they’re living cooling systems and shade for parked cars. But the seasons are changing for trees in the Big Apple. According to a new study published by Yale researchers in Environmental Research Letters, climate change is causing urban trees in New York City to turn green later in the year, potentially shifting pollen season and affecting seasonal allergies. “Our findings show that climate change and the urban heat island effect are shifting the timing of tree leaf-out in parks,” Juwon Kong, the lead author of the paper, said. Kong and her team utilized satellite images taken over a 19-year period to measure the start of the growing season, or the day of the year when the trees start “leafing out in spring.” The drastic temperature transition from winter to spring is a key trigger for springtime leaf growth. Because winters are getting warmer due to climate change, the significant temperature hike is dampened, and, thus, trees experience delayed leaf growth. According to Kong, medium-sized parks are especially vulnerable to climate change because they have both high edge-to-area ratios and smaller interiors. This means more of the park’s trees are exposed to surrounding heat from roads and buildings, but unlike larger parks, these medium-sized forests lack the cooling capacity of many trees.

Smaller “pocket parks” are already dominated by their surroundings, so their response to climate change in time is less distinct, while larger parks can better resist heat due to their cooling capacity. In addition to climate change, trees are under a constant barrage of invasive insects, pathogens, plants and animals due to the increase and expansion of development, said Mark Ashton ENV ’85 ’90, senior associate dean of The Forest School at the Yale School of the Environment. “Taken together, trees and forests have never before been under such dire compounded and interacting impacts as today,” Ashton said. In addition to affecting seasonal allergies, delayed seasons also means that trees will have less carbon intake, as a result of being less foliated. For trees, this reduces carbon uptake and growth. For people, it reduces early-spring cooling and shading benefits, and shifts pollen release, which can affect allergies. “For ecosystems, delayed leaf-out can disrupt the timing of pollinators, migratory birds, and other species that depend on trees, altering ecological balances,” Kong said. “These shifts could reshape biodiversity and ecosystem health within urban parks.” Kong said that successful future initiatives should include “careful consideration of park size, species selection, tree planting and long-term conservation planning.” New Haven’s drinking water runs through 26,000 acres of natural forest.

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BAALA SHAKYA / PHOTOGRAPHY EDITOR

According to a study by Yale researchers, city park trees are experiencing a delay in seasonal change.

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