bio lum

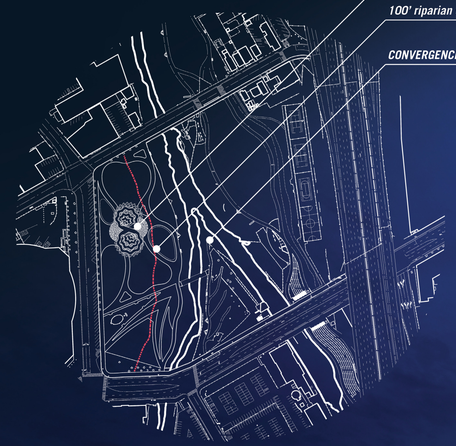
the world's first bioluminescent conservatory and icon of San Jose

Bioluminescence has an almost inexplicable way of capturing human attention and imagination. Countless childhood memories recall the magical dancing of fireflies during precious summer evenings. Tourists trek to the remotest areas of the earth to witness the spectacular illuminance of glow worms in the underground caves of New Zealand and the seasonal algal blooms on shorelines from China to California. Foxfire, a bioluminescent species of fungi, has fascinated forest-goers for nearly a millennium. Also called 'fairy fire,' it was often used in place of candles to provide a guiding light to navigate the dark.

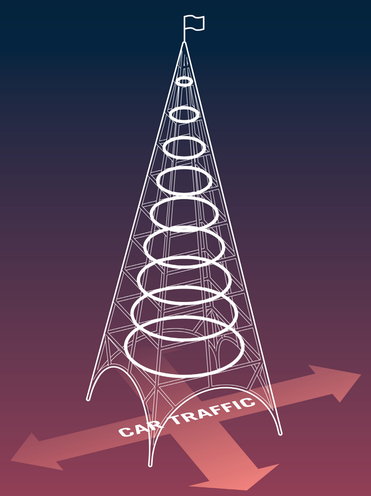
Beyond the compelling beauty of bioluminescent organisms, however, is their value as a latent resource for understanding and developing sustainable models of illuminance. There is a growing body of research dedicated to the engineering of bioluminescent flora through various means, from embedding nanoparticles in plant leaves to inserting specific fungal genes into plant DNA. This research suggests society is at the cusp of a lighting revolution - soon plants will illuminate our homes, businesses, and streets, a shift that has the potential to greatly reduce the energy demands of urban infrastructure around the world.

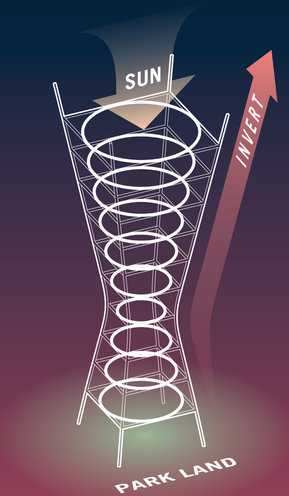
With these biotechnological advancements in mind, BIO LUM proposes to build upon San Jose's identity as a hub of innovation and ingenuity, while reconnecting to the city's agricultural roots and relationship to the surrounding natural ecosystems of Silicon Valley and the Bay Area. BIO LUM, the world's first bioluminescent conservatory, will serve as a center for biotechnology research, development and exhibition pertaining to the engineering of bioluminescent organisms. For research groups and academics, BIO LUM will act as a physical hub for observation, collaboration, information exchange, and experimentation. For the residents of San Jose, BIO LUM will serve as an educational, civic, and cultural center where visitors can immerse themselves in the enchantment of the natural world.

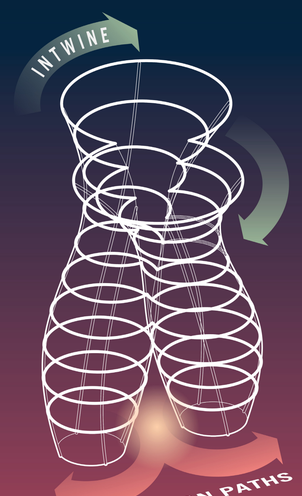
site plan
1" = 250'
N

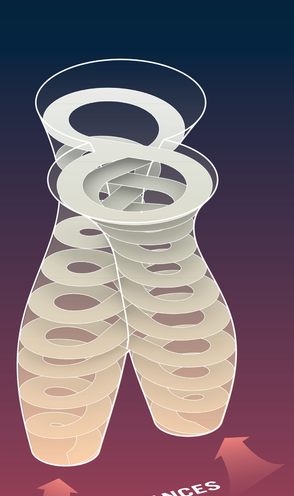


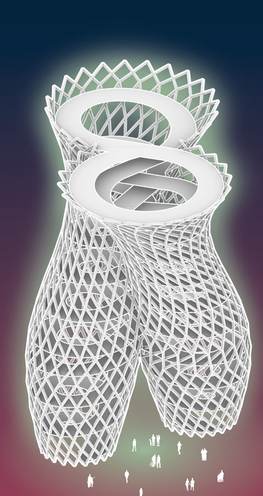
concept diagrams











INSPIRE

In 1881, the Owen's Electric Tower was erected in San Jose. Standing 237' tall, it was a visionary and technological feat—using electric lighting to illuminate the entire city for the first time in its history, and advancing the limits of iron construction to inspire the design of other iconic structures, such as the Statue of Liberty and the Eiffel Tower. BIO LUM proposes to emulate the same innovative spirit of the original light tower, while also creating an immersive public space that fosters community growth and interaction.

INVERT

As the new icon of San Jose, BIO LUM was conceived to illuminate the city in an equally revolutionary manner of the Owen's Electric Tower, using bioluminescent flora and fauna as its primary light source. The form of the original tower was inverted to evoke a blooming gesture, a move that allows the tower to efficiently receive sunlight and foster the growth of plant life within.

INTWINE

To develop an immersive experience at park level, the tower form splits to create pedestrian paths and sheltered space for community events. In the same way the Los Gatos Creek meets the Guadalupe River at the Arena Green site, these two forms converge as they grow upward, intwining to open together toward the sun.

INHABIT

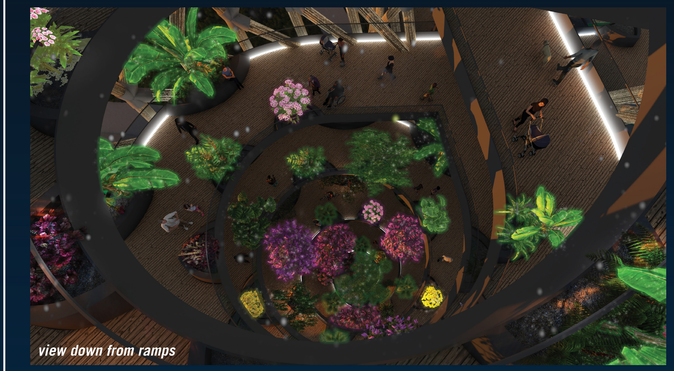
The light rings of the tower are reshaped to create a continuous path of accessible slope through the tower, touching down to the Arena Green site in two locations. The ramps act as hiking paths through a cultivated forest of bioluminescent flora. Bridges connecting the ramps in the tower act as flexible space for outdoor classes and community gatherings.

ILLUMINATE

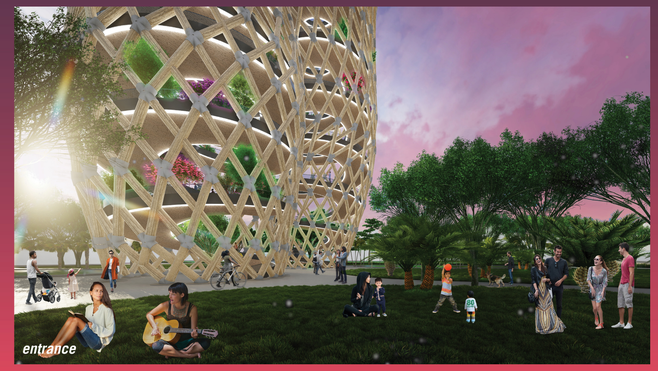
As a conservatory, BIO LUM fosters the development and growth of bioluminescent flora and fauna, that will glow in the evening and provide soft, natural luminance to the Arena Green park. Additionally, the mass timber structure of the tower will fluoresce with the controlled cultivation of 'foxfire' on its outer surface. The tower itself will serve as a scaffold for bioluminescent organisms.

perspective views


view from the peak


view down from ramps


view from ramps


entrance

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THE PEAK

The highest point of the BIO LUM tower is 200' above the Arena Green site below. From this height, visitors have a spectacular view of San Jose and the surrounding Silicon Valley horizon. Binocular stations will allow visitors to survey the bioluminescent scenery from above.

RAMP TRAILS

At 15' wide and an accessible slope, the ramps through the BIO LUM conservatory allow pedestrians to circulate through an urban forest consisting of experimental and bioluminescent flora. Raised planter beds contain plant species that vary with altitude, and provide seating anywhere along the journey to the peak. The trails are designed with a pedestal paver system to allow for rainwater capture and efficient water distribution.

BRIDGES

The BIO LUM bridges offer covered space in the tower for a variety of community activities to occur, such as courses in conservation research, restorative fitness classes like yoga and tai chi, plein air workshops, bird watching, gardening and picnicking.

PEDESTRIAN PATHS

New pedestrian paths are proposed at the Arena Green site to create several zones for a variety of recreational activities. The paths converge at the BIO LUM tower and guide pedestrians to the head of the ramp trails. The pedestrian paths are wide enough for walking, running and biking, and are lined with a diversity of flourescent trees to provide shade at night,and light in the evening.

THE THRESHOLD

The split of the BIO LUM tower at ground level creates a zone for special events to occur such as musical performances, farmer and artisan markets, 'movie in the park' nights and recreational sport events. The Threshold also acts as a contemporary triumphal arch, serving as an iconic civic landmark to congregate and pass through during parades, marathons, and community organized walks or marches.

THE CAVES

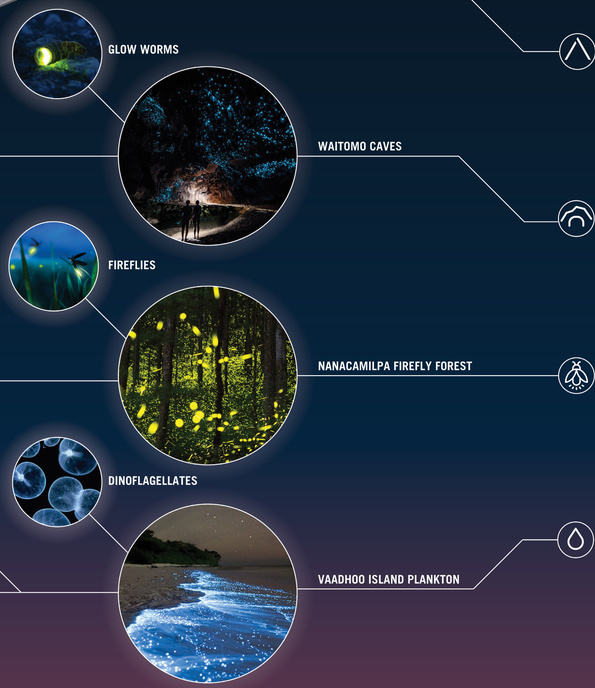
Below the BIO LUM conservatory tower are domed caves where researchers can propagate glow worms and their study their bioluminescent properties. BIO LUM visitors are able to participate in this research endeavor and observe the glow worms while enjoying a stroll through the facilities beneath grade. Laboratories and support space for the BIO LUM research teams will be located below grade as well.

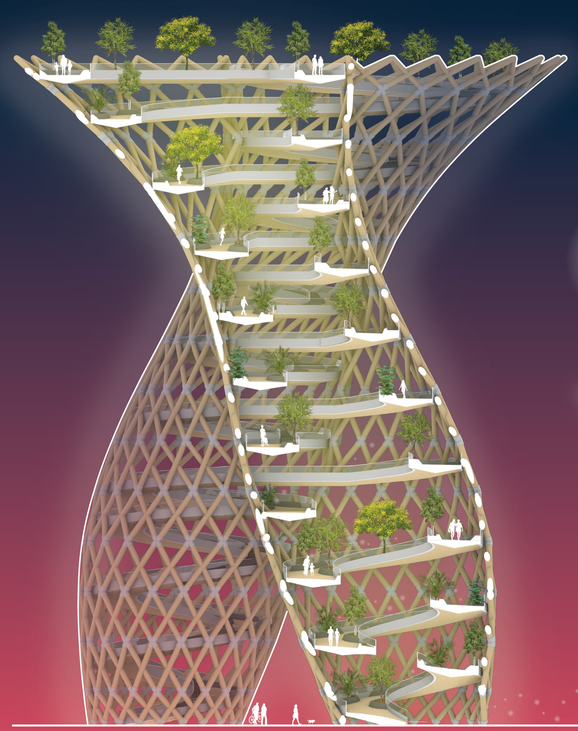
FIREFLY GROVE

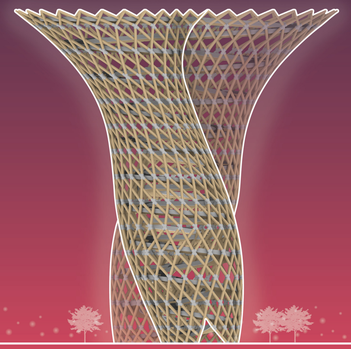
The BIO LUM site includes the design of firefly sanctuary near the west bank of the Guadalupe River. Fireflies are one of only a few species of bioluminescent terrestrial animals, and their populations are shrinking due to habitat loss, pesticide use, and light pollution. By providing grassy, forested space near fresh water, fireflies may find refuge at the Arena Green site provide joyful evening ambience to pedestrians.

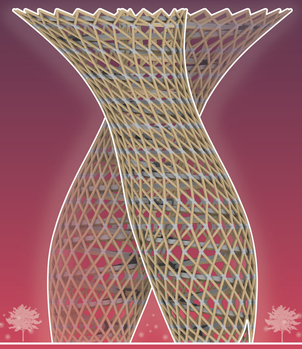
THE POOLS

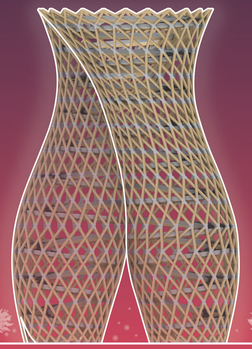
The BIO LUM site will provide pools for researchers and visitors to study and learn about the bioluminescent properties of aquatic organisms such as plankton, coral, and some species of fish. Algal blooms will create glowing ponds in the evening, and separately glowing fish will inhabit a fresh body of water near the bank of the Guadalupe River. The fish will also be used to grow plants through the use of aquaponic systems.











200'

northeast / southwest section

east / west elevation

northeast / southwest elevation

north / south elevation

IMAGE SOURCES

1. GLOWING TOBACCO PLANT: https://www.sciencetimes.com/articles/25493/20200428/-look-scientists-created-avatar-bioluminescent-plants.htm
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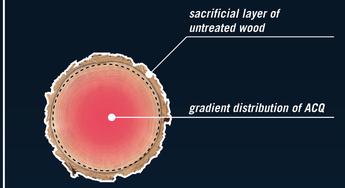
13. FOXFIRE: https://origami-book.com/column/course-en/10091

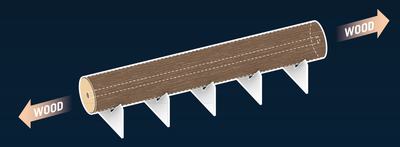
HOW TO GLOW

Typically, dimensional lumber is pressure treated in a depressurized holding tank that removes air from the cellular structure of the wood and replaces it with a preservative such as alkaline copper quat, or ACQ. After a vacuum is created in the tank, the wood is highly pressurized to ensure uniform adsorption of ACQ through the entire cross section of the wood.

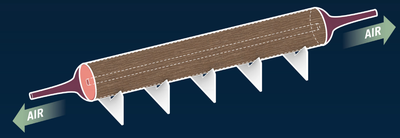
However, in a methodology similar to the way mass timber is designed for fire resistance, BIO LUM proposes to pressure treat its structural frame in a non-uniform manner to allow for the controlled decay of the outer rings. In the process illustrated below, the outer layers of the wood structure will be designed to retain moisture at a much higher rate than its inner layers. Fungi such as *Panellus stipticus* will be introduced to the wood, causing the outer layers to decompose and produce 'foxfire', a bioluminescent glow resulting from the oxidation of luciferins. New and advanced techniques in digital scanning and machining of wood will be employed to achieve this end.



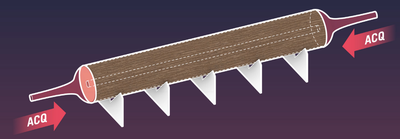
1. Core the tree trunk and cut grooves in the hollow interior to increase the internal absorption of ACQ.



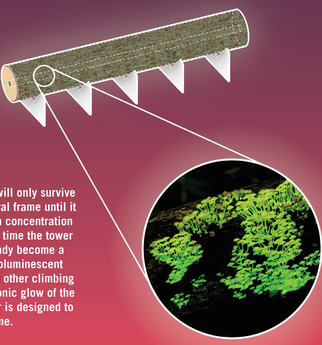
2. Create a vacuum chamber in the internal cavity of the structural wood member. Remove air from the interior layers of the wood.



3. Infuse the internal cavity of the structural wood member with ACQ. Pressurize the cavity enough to allow a gradient of ACQ absorption as diagrammed above.



4. Introduce *Panellus stipticus* to the wood members prior to construction to allow for the fungi to incubate in the optimal conditions required to fluoresce.



LONGEVITY

While foxfire will only survive on the structural frame until it reaches a high concentration of ACQ, at that time the tower will have already become a scaffold for bioluminescent ivy, vines, and other climbing plants. The iconic glow of the BIO LUM tower is designed to evolve over time.