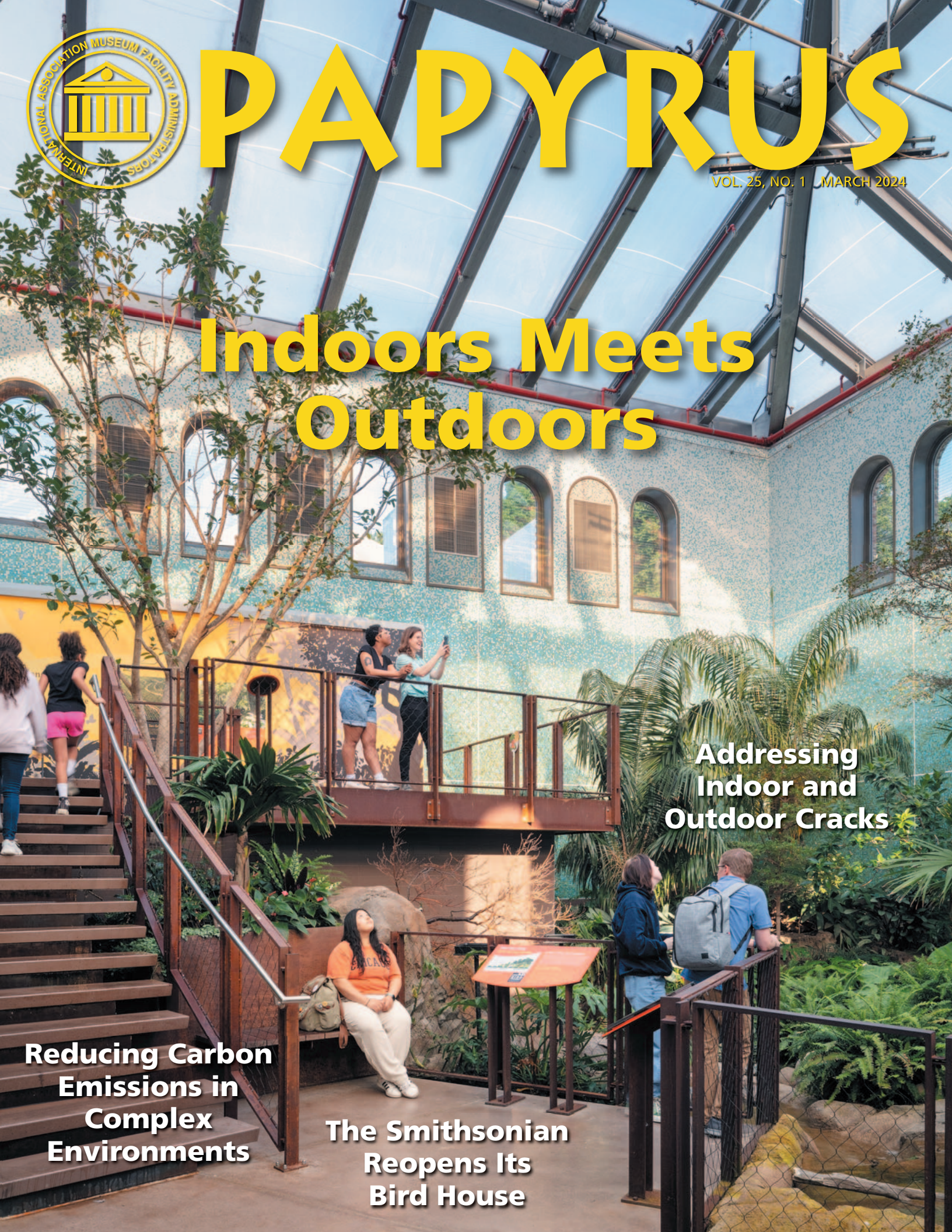

PAPYRUS

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The Smithsonian Reopens Its Bird House

Celebrating Flight: Smithsonian Reopens Historic Bird House at the National Zoo

By Daniel Carmine

The Smithsonian Institution's Bird House is one of the most popular exhibits at the National Zoo and Conservation Biology Institute (NZCBI) in Washington, D.C. It recently reopened, following a significant building renewal and the installation of all-new immersive aviaries. It is the first exhibit in the world to highlight the migratory journeys of North American songbirds, waterfowl, and shorebirds.

Built in 1928 and renovated in the 1960s, the Bird House required extensive upgrades to meet contemporary conservation needs, while also enhancing the educational experience for visitors. The Smithsonian's six-year, $69-million modernization has increased exhibition and education space and animal holding areas, following the U.S. Secretary of the Interior's Standards for Rehabilitation to maintain the building's historical character while providing a compatible but distinct addition.

The project's design team included Quinn Evans for architecture, and Mueller Associates for engineering the specialized mechanical, electrical, and plumbing systems. Additional consultants on the Bird House team included MIG/Portico for exhibit design and landscape architecture, and PCA Global for life-support systems engineering.

The renovation project achieved sustainability milestones by retaining more than 80% of the existing masonry walls, helping to position the building for LEED® Gold certification (pending final review). This preservation measure diverted potential waste from landfills, and significantly reduced the project's carbon footprint. The building also features highly efficient water systems—vital to the care and protection of the birds—along with an innovative HVAC design that conserves energy while ensuring the birds' comfort.

A Journey Through Avian Ecologies

The 30,405-square-foot building, which is set on a 4.5-acre elevated plain within the zoo's lush, landscaped grounds, includes three indoor aviaries and an outdoor "Bird Plateau." Visitors approach the building along a winding path, surrounded by gardens that feature bird- and pollinator-friendly plants. The Bird Plateau encircles the Bird House and showcases birds of the Western Hemisphere, such as barred owls, turkeys, whooping cranes, and American flamingos.

Inside the main entrance, visitors are greeted by an elegant blue, yellow, and green mosaic arch created by D.C. artisan John Joseph Earley, which is part of the build-

PHOTOS: © JOSEPH ROMEO

Renovation of the National Zoo's Bird House took place within the confines of its original structure, which dates back to 1928. The restoration adhered closely to the U.S. Secretary of the Interior's Standards for Rehabilitation, preserving the building's historical character while providing a compatible but distinct addition.

A stunning mosaic arch in shades of blue, yellow, and green—created by D.C. artisan John Joseph Earley—remains as a captivating element of the building's original historical design.

ing's original historical design. In the Bird Observatory, groups gather for guided walks, and watch as Smithsonian scientists with the Migratory Bird Center demonstrate bird banding and tracking measures that follow the movement of birds across the Western Hemisphere.

Next, visitors "migrate" into the three main indoor aviaries. These multi-sensory settings replicate habitats that migratory birds often visit during their journeys between Canada, the United States, and Central and South America. The trio of aviaries mimic natural ecosystems in the Delaware Bay region, the northern Great Plains, and a Central American coffee farm. Interpretive features explain the lifecycles of migratory birds and the importance of protecting native species, including many on the North American continent that are now at risk of extinction.

The Delaware Bay aviary consists of a beach setting with the sandy terrain, tidal pools, driftwood, and seagrass that sustain shorebirds such as plovers, sandpipers, and sanderlings. The indoor lighting changes to reflect the seasons, and transitions between sunrise and sunset.

Next, visitors enter the Prairie Pothole aviary, home to a variety of waterfowl. Two large pools support several duck species as they splash and swim, offering observers underwater views and information on the importance of wetlands. In the third aviary, which resembles a shade-grown-coffee farm, birds thrive in a lush, rainforest environment featuring fog production and a rain-bar system. Here, visitors learn of the ecological benefits of shade-grown-coffee farms in providing critical habitats for birds and other species.

Crafting Avian-Focused Solutions: Precise Requirements for Animal Care

From the outset of the project, the Smithsonian's conservationists and curators made it clear that the design of the aviaries was to be strictly "for the birds." The protection of the birds was paramount in every detail, from customized climate conditions and tempered water systems, to floor drains that were carefully specified to avoid injuries to the birds' fragile legs.

As Mueller's lead mechanical engineer on the project, Paul Czajkowski, PE, says, "The National Zoo's Bird House project stands out as a testament to Mueller's commitment to precision and innovation. Crafting a tailored HVAC system for this unique space was pivotal in replicating the diverse climate conditions of the three distinct regional habitats within the aviaries."

The dew point in the Delaware Bay aviary, for example, is higher than in the non-habitat areas, allowing for higher temperature and higher relative humidity to simulate a coastal area. The Prairie Pothole aviary is slightly warmer than that, and Central American Bird-Friendly Coffee Farm has a much warmer temperature, simulating a tropical environment.

Mueller's engineering team achieved these conditions by specifying two air-handling units: one for the non-habitat sections, tailored for a dew point of 55˚F, and one for the habitat areas, with a higher dew point of 61˚F.

The incubation room, sick-bird room, bird-holding areas, and Bird Observatory were designated as specialized zones for HVAC design. The sick-bird room, for example, operates under negative pressure, with air exhaust vented to the building's exterior. Air supplied to the sick-bird room is equipped with HEPA filters mounted in the ducts for enhanced filtration. These critical measures help contain and limit the spread of avian illnesses.

A sophisticated array of water systems was also vital to the design of the Bird House. NZCBI curators worked closely with Mueller's plumbing engineering team to set parameters that informed water pressure and temperature specifications, as well as the design of pools, drains, and other features.

The Delaware Bay aviary's coastal exhibit features sandy terrain, tidal pools, driftwood, and seagrass, providing a habitat for shorebirds such as plovers, sandpipers, and sanderlings.

The Central American Bird-Friendly Coffee Farm aviary emulates a tropical environment, and benefits from a plumbing system that incorporates carbon filtration and tempering.

PHOTOS: © JOSEPH ROMEO

Mueller's lead plumbing engineer on the project, Karen Schulte, says that the Bird House project "holds a special place in my heart. Designing the plumbing systems for this project challenged me to reorient my perspective completely." For the Bird House, the primary focus was not just on infrastructure, but also on ensuring the well-being and protection of birds. According to Schulte, this approach "emphasized the delicate balance of prioritizing the care and safety of the birds, while seamlessly catering to the needs of the building's staff and visitors."

In all, the engineering team created ten water-piping subsystems—significantly more than the average building. All water in the building is carbon-filtered to remove inorganic impurities, and is tempered to 65˚F. The water source is sent through a double-wall, plate-and-frame water-to-water heat exchanger, then through a booster pump to increase the pressure to 90 PSI to serve the hoses that are used to wash down the bird areas daily.

PHOTOS: © JOSEPH ROMEO

The Bird House employs ten water-piping subsystems to ensure the well-being of its avian residents.

Bird-holding enclosures were outfitted with a misting nozzle, hose bibb, and a shallow depression featuring a drain. Blocking the drain allows the shallow depression to be filled with water, converting it into a pool for the birds.

Another carbon-filtered, tempered distribution subsystem serves the animal-holding areas, where the pressure has been lowered to 60 PSI for sinks in the bird care areas, and misting sprays within the bird-holding cages. A dedicated water heater serves the hot, carbon-filtered water in these sinks.

The Central American Bird-Friendly Coffee Farm aviary is served by a third subsystem for the fog-production and rain-bar systems. Here, the water is also treated by a carefully specified water softener that features potassium chloride for the salt brine—rather than sodium chloride—to avoid contaminating the soil and harming the tropical plants in

To the left is a booster pump dedicated to the bird water systems, double-wall plate, and frame heat exchanger. In the center are pumps for the HVAC chilled water system. On the right is the fog-system skid and water softener.

The domestic water service entrance in the basement supplies various water systems for birds and support staff. The incoming domestic water service is located on the right, and features a reduced-pressure principle backflow preventer equipped with an automatic shut-off valve to prevent excessive water discharge during a backflow condition. In the rear lefthand corner, you can see the reverse osmosis system and storage tanks associated with the fog system for the Central American Bird-Friendly Coffee Farm.

the aviary. After being treated by the water softener, the fog-production water is routed through reverse osmosis filtration and a UV sterilizer, then to a high-pressure fog-pumping package.

Filtered water is also provided for all saltwater and freshwater exhibit pools, ranging in volume from 830 gallons to 2,864 gallons. The pool water is recirculated and filtered through bead or sand filters. A UV sterilizer is used on one of the pools, and a small wave machine is featured in the Delaware Bay aviary.

Additional water subsystems serve the public fixtures, HVAC heating water, backwash to serve the filters for the life-support system, and exterior irrigation. In all, the water-saving fixtures and irrigation system have reduced water use by 65% outdoors, and 43% indoors.

Although Mueller's electrical engineers often provide lighting-design services, the Bird House's design required a unique approach, bearing in mind how different lighting types affect the birds' health. Mueller's Senior Electrical Engineer Sherwayne Stoute says, "The bird habitats require UVA/UVB lighting fixtures, so we specified LED and ETFE fixtures to provide lighting with UVA/UVB rays."

For Stoute, a distinctive aspect of this project lies in the paramount importance of safeguarding the birds. He emphasizes, "While the coordination mirrored our standard practice, notable differences emerged, due to the inclusion of live animals. Significant emphasis was placed on choosing systems for emergency power, with a primary objective of prioritizing the well-being and comfort of the birds. The imperative for specific systems to operate on emergency power influenced the generator's size. Diligent efforts were made to thoroughly scrutinize the mechanical equipment, formulating a sequence of operation to prevent simultaneous operation, while dedicating several hours to this meticulous planning process."

A Sustainable Sanctuary

The modernized Bird House is a model of environmental sustainability, showcasing a conservation-friendly design while protecting the avian inhabitants. The facility supports advanced field and husbandry research toward ensuring the survival of North American songbird, shorebird, and waterfowl populations, while also exploring the wonders of seasonal migration.

Visitors can now enjoy an immersive journey through the varied ecosystems and climates that support these critical species. Informative activities include talks by animal keepers, feeding demonstrations, and guided tours. With migratory bird populations in rapid decline, the Bird House is an important place to observe, study, teach, and learn about our native bird populations.

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