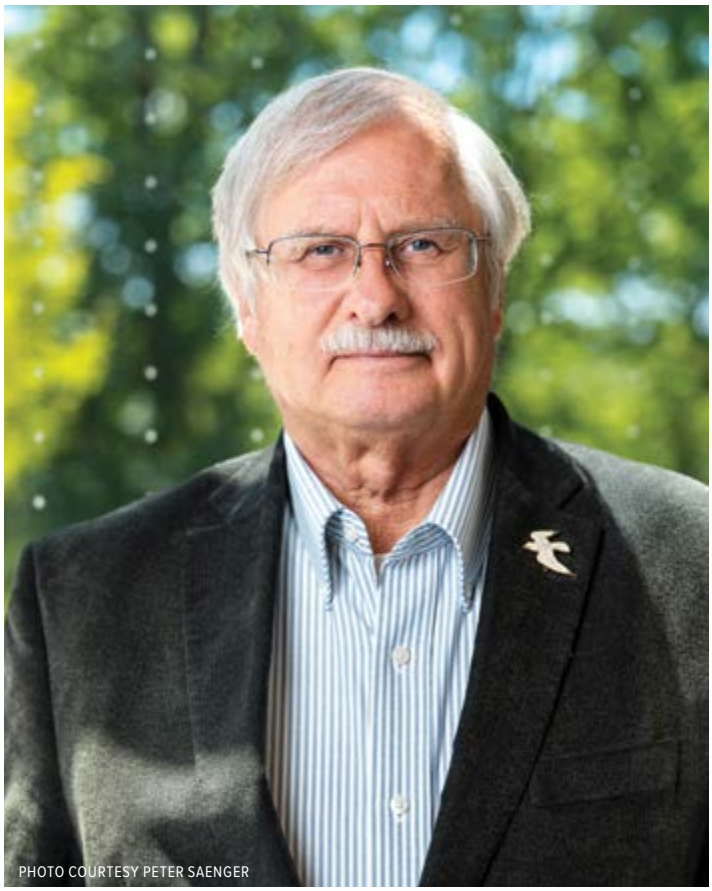

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# Pioneering Bird Mortality Research at Muhlenberg College

BY CYNTHIA MWENJA, PhD

Daniel Klem, Jr., Sarkis Acopian Professor of Ornithology and Conservation Biology at Muhlenberg College, is the seminal researcher on the issue of massive annual numbers of bird fatalities due to collisions with building glass. For more than fifty years, Klem has worked tirelessly to study the scope of the problem, educate others about the devastating and ongoing impacts on wild birds, and advocate for scalable solutions with a wide variety of community stakeholders.

## Pioneering Research into a Devastating Topic

Klem's path to the field of ornithology had a few twists and turns, but it stemmed from his childhood enjoyment of spending time in nature. The moment he began his doctoral research, however, he saw firsthand the numbers of birds that had been killed by building strikes on his own campus; this experience demonstrated to him the seriousness and importance of the topic. Little did he know that as he embarked on this research, he was establishing not only a new area of academic study but also a new focus for environmental activism.

Many people enjoy seeing and hearing birds in outdoor spaces. Klem notes that these beautiful and charismatic animals serve as cultural signifiers for peoples around the world. Bird watching provides an enjoyable pastime for many, and birdsong adds enjoyment to people's days. These positive connotations that birds have contrast with a stark reality: in our glass structures, we have developed efficient killing machines for the very animals we enjoy and try to protect. Klem's 1990 estimates of the annual death toll due to bird-building strikes were between 100 million and 1 billion birds each year; these numbers were later corroborated by other researchers who joined the field.

More recent research that Klem has co-authored pushes the number much higher; the estimates are now at 1.28 billion to 3.46 billion birds each year, and even those numbers could be too low. Previous estimates were based in bird-building strikes that left evidence at the scene. Later, researchers were able to expand their understanding of the problem by assessing what happens when injured birds are taken to rehabilitation centers. These results showed that 70% of birds who are knocked out in a strike ultimately perish. From this information about birds taken to rehab centers, the research team documented a 350 percent increase of estimated deaths over on-site specimen collection alone.

The cause of these deaths is that glass is invisible to birds. In many ways, birds have the best vision of any animal, but they do not perceive glass, and both clear and reflective glass pose problems. If the clear glass encloses a space with lavish foliage, like many atriums, birds try to fly through to the plants they see inside. In the case of reflective glass, birds think that they can access the natural space reflected in the glass, with the same result.

Most people know that birds collide with glass; this realization is not groundbreaking. What Klem, provided, however, was an awareness of the problem's magnitude. As Timothy J. O'Connell, associate professor of Natural Resource Ecology and Management at Oklahoma State University, points out, "Klem imagined the issue on a continental scale." Klem determined how many birds were affected by single buildings, on average, then used census data to project the likely numbers across the U.S. O'Connell states that "carrying that inference through put his work on the map."

After Klem joined the Muhlenberg faculty in 1979, he sought publication outlets for his

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doctoral research. He had trouble getting it accepted at first because people did not believe that the subject was worth considering, so they didn't take his work seriously. After 10 years of submitting papers, Klem did finally begin to have his research accepted in ornithology journals, which began to understand that he was doing worthwhile work. Additionally, a citizen science research program called Feeder Watch corroborated his estimates, at least for residences that had bird feeders in the yard. Then O'Connell conducted research on buildings in a corporate office park; his numbers suggested that the issue was even bigger than Klem had estimated.

Throughout the 1980s, though, major bird conservation organizations did not see bird window strikes as a problem. Cornell Lab of Ornithology, which ran Feeder Watch, did not do anything with the findings they had collected on this subject. The National Audubon Society was not interested, and the U.S. Fish and Wildlife Service was unconcerned. But the American Bird Conservancy—established in 1994—took this issue seriously from the beginning, O'Connell reports. They embraced the matter of bird strikes as important, and they sponsored research, education, and outreach on the topic.

Klem has become not only a researcher but an advocate for addressing the challenges he studies. Through his efforts—research, talks, papers, and activity in bird conservation communities—he has raised awareness of this devastating issue to become a leader in the expanding field. Klem now holds several U.S. patents relating to window design. He continues his academic research, along with a robust schedule of speaking engagements. Over the course of his career, Klem has published more than 70 peer-reviewed papers and worked with more than 100 student researchers. He also serves as a technical consultant for a wide variety of organizations, including glass manufacturers, conservation organizations, and local, regional, and national government agencies worldwide.

One example of Klem's work outside of academia is a new building at Niagara Falls

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State Park which used Klem's bird-safe design. While the park did not credit Klem's contribution at first, they later held a ceremony and gave him official credit on the informational signage. Muhlenberg's president at the time said that this project was an excellent example of how people in the liberal arts can apply their knowledge in both meaningful and concrete ways. Another design project that Klem has been involved with was spearheaded by architect Jeanne Gang's Studio Gang. Gang has designed many famous Earth-conscious buildings, notably the bird-friendly Aqua Tower. Studio Gang asked Klem to collaborate on a visitor's center in Calumet. The Ford Calumet Environmental Center now stands on a reclaimed brownfield in this south-Chicago suburb; Klem has a chapter about this project in Studio Gang's book, *Architecture*.

**Growing Momentum**

O'Connell highlights the idea that Klem is "not just a guy who published. Once his ideas caught, they became huge globally in conservation circles." O'Connell points to the many bird-safe initiatives and practices directly attributable to Klem's work, including bird-safe products, lights out campaigns, and even the sharing of local radar showing bird migrations. O'Connell also notes that new careers and companies now exist based on Klem's work; for example, many non-profit organizations have been created in order to consult with building managers and product manufacturers on bird-strike mitigation.

Paul Groleau is president of Feather Friendly Technologies, which Klem calls "the most prominent producer/manufacturer of bird-safe products, specifically external films." Groleau definitely credits Klem, saying that "if it weren't for him, we wouldn't have a business." Groleau appreciates Klem's mentorship and consistent availability for consultation.

Klem points out that, as with many other environmental concerns, lasting progress needs to be made through legislation. He notes that the US already has that legislation in place; the Migratory Bird Treaty Act of 1918 outlaws the killing of migratory birds. The problem, he states, is that the law is simply not invoked for this issue; enforcing a law when everyone is guilty is near impossible. Klem does argue that enforcement could focus on bigger offenders, such as convention centers, but enforcement agencies have not yet been persuaded to do so.

Some legislative progress has been made at the local level. In 2007, Toronto became the first city to adopt bird-friendly standards. New York City and Washington, DC, have followed suit, and other municipalities and states across the U.S. are getting on board.

In a wonderful win for birds, Madison, Wisconsin passed bird-safe building legislation, and developers sued to stop it—but the bird people won, and the legislation stands. Groleau says that awareness of the issue now extends far beyond North America; bird-building strikes have been documented in over 90 countries, involving 2,000 species of birds. Groleau was part of the team that developed bird-safe standards for Dubai.

Michael Mesure is the executive director of Fatal Light Awareness Program (FLAP) Canada, which Klem calls "a leading advocate of documenting and promoting bird-safe practices worldwide." Mesure reports that many more stakeholders around the world are now focusing seriously on the issue of bird-building collisions, including researchers, advocacy organizations, and businesses. Mesure stresses the importance of remembering that "this movement has depended so often on [Klem's] work; he is

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the godfather of bird-building collisions," and new research continues to affirm Klem's results. Demand for solutions is growing, and glass fabricators in particular have relied heavily on Klem's expertise in developing their bird-safe products.

**Actions to Take**

Klem states that the biggest challenge of his career has been getting people to understand the immensity of the threat to birds, then getting people to act on that understanding once they have it. To reach a broader audience, Klem authored the first book about bird strikes for the general public: *Solid Air—Invisible Killer: Saving Billions of Birds from Windows* was published in 2021. In the prologue, he says, "We humans have the power to stop the senseless death of billions of birds, and your help is needed to do so." Campuses can take part in this important work by retrofitting current buildings with bird-safe products and making sure that new construction employs bird-safe design. As Klem interacts with students at conferences and on speaking tours, he finds that they are very interested in working with campus administrators to make campuses safe for birds; administrators can be key players in organizing collaborative efforts to address these concerns.

Groleau points out that the issue of bird-building fatalities will not simply go away; we are losing species to these collisions, but simple, long-term solutions to the problem do exist. As O'Connell puts it, every death due to bird-building collision is "completely unnecessary mortality." Klem is focused on getting a critical mass of citizens and influential people to move the needle further in making all buildings safe for birds; as he remarks, "We're the only voice they have."

Some conservation groups push for "lights out" campaigns in skyscrapers as a way to address the issue of bird strikes, particularly for migratory birds during their migrations. Klem sayes that these campaigns can be helpful, but other mitigation strategies are more important because birds are killed by buildings at all times of day and throughout the year. Researcher Scott Loss has found that about 44 percent of annual bird-building collision mortality occurs in structures of one to four stories, such as single-family dwellings. More soberingly, Loss estimates that only about one percent of bird strike fatalities happen in cities at all.

O'Connell notes that, even with all the new stakeholders and worldwide momentum, challenges remain in addressing bird-building fatalities. One of these issues is that no one program exists to give grants for work in this area. Most funders are more focused on habitat protection and invasive species, which are also critical concerns. Birds hitting windows is not a problem of habitat loss per se, and no dedicated funds have been earmarked for building refurbishment—even though bird strikes account for a highly conservative estimate of well over a billion unnecessary bird deaths per year. O'Connell states that the challenge feels intractable because the issue so pervasive, even though we do have the answers; they just need to be implemented at scale.

Despite all that has been accomplished in bird-building collision research and mitigation throughout his long and distinguished career, Klem says that a great deal of work remains to be done to address this catastrophic threat to birds. His goal is to work with as many stakeholders as possible to save bird lives. Readers who are interested in remediating buildings on their campuses can begin to explore solutions at FLAP Canada (flap.org) and Feather Friendly (FeatherFriendly.com).

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