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# news

## Iron Truss Bridges Are Works of Art, Engineering Student Says

By Mark Fitzgerald

More than 20 years ago, David P. Billington, P.E., an honorary member of ASCE and a professor of civil and environmental engineering at Princeton University, advanced the idea in *The Tower and the Bridge: The New Art of Structural Engineering*, a book that proved to be of seminal importance, that “the disciplines of structural art are efficiency and economy, and its freedom lies in the potential it offers the individual designer for the expression of a personal style motivated by the conscious aesthetic search for engineering elegance.” Since then, civil engineering departments at colleges and universities across the country have incorporated Billington’s concept of structural art in their curricula. At Johns Hopkins University, for example, civil engineering students can take a course entitled Perspectives on the Evolution of Structures, which uses Billington’s book as the primary text and examines the social, symbolic, and scientific significance of various structures.

“It was an awesome class,” recalls Christina Terpeluk, a senior in civil engineering at Johns Hopkins. “We learned how a structure’s function works together with its form, how to see the load paths and understand the designer’s vision, but also to appreciate the purpose it served and the impact it had on the community.” In the semester following the class, Terpeluk was awarded a research grant to pursue a project aimed at determining if Billington’s notion of structural art applied to three types of iron truss bridges common in the 19th century—the Whipple, the Fink, and the Bollman.

Using a computer program, Terpeluk conducted structural analyses of bridges in Hamden, New Jersey, and in the Maryland communities of Frederick and Savage and

considered economic, scientific, and aesthetic issues related to their construction. “I looked at the load paths of each structure,” she recalls. “I studied the structural behavior and performance and tried to determine if someone without a background in engineering standing next to the bridge would be able to figure out how it works or understand what the designer may have been thinking in the nineteenth century. Then I looked at the impact it had socially and how each bridge fits into its surroundings.”

Terpeluk concluded that all three styles of iron trusses conformed to Billington’s notion of structural art. “These bridges symbolize structural art because the designers tried to make the structures appear light, even though they’re these really heavy iron truss bridges,” explains Terpeluk. “They designed them to blend with their surroundings, but they also pushed the limits by creating new and efficient designs with the least materials and resources possible. The Fink truss stood out because it’s very light; it has three truss systems that are all dependent on one another, so it was the most efficient in terms of material—about three times more efficient than the Bollman and about two times more efficient than the Whipple.”

Terpeluk, who graduates this month, hopes to publish her findings in an academic journal and pursue a career related to the preservation of historically important structures. “I’ve just accepted a summer job with an engineering firm that specializes in restoration,” she says exultantly. “So hopefully this experience will tie things together and I’ll have a chance to apply what I’ve learned.”