



Shigeru Ban
BAMBOO ROOF



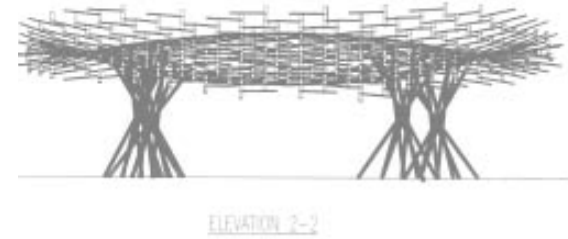
Rice University Art Gallery

Shigeru Ban

BAMBOO ROOF

Rice Gallery
HOUSTON, TEXAS





FOREWORD

BAMBOO ROOF

I FIRST SAW SHIGERU BAN'S WORK IN THE FEBRUARY 2001 ISSUE OF *ID magazine*. Its theme was "socially conscious design" and an article entitled "Cardboard Crusade" described Ban's efforts with the United Nations High Commission on Refugees to create temporary shelters from cardboard tubes. Ban's structures were much more effective

than the tarpaulin tents that were normally distributed, and their beauty conferred a sense of dignity and respect upon the people who used them. It was these shelters as well as Ban's commitment to the inherently human aspects of architecture that led me to invite him to create an installation for Rice Gallery. During his site visit in April 2002, he gravitated immediately toward the gallery plaza.



A serene space enclosed by the lush green of live oaks, the plaza is a mirror image of the Rice Gallery, and can be seen through the gallery's front glass wall. After several minutes of walking around the plaza and looking out from it, Ban said simply, "I will design something for this space."

Several weeks after the site visit, Shigeru faxed us his vision — an open-weave roof made from bamboo flooring boards. Designed in

cooperation with a team from Ove Arup & Partners, Intl., Ltd. London, the plan consisted of a 40' x 40' canopy supported by columns of bundled poles. The roof was composed of two variations of a square made from four intersecting 2' 9" x 3' x 5/8" boards; in one variation the boards were overlapped clockwise while in the other the boards were underlapped. When combined, these minor variations allowed for the concave and convex curves that gave the roof its gentle organic shape.

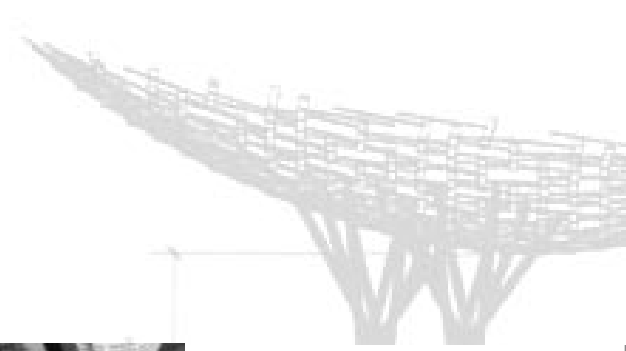
Throughout the building process, "Ban Team Houston" followed Shigeru's lead; it did not use virtual models and technology to solve problems, but rather it used physical mock-ups as well as trial-and-error methods. The team included faculty from the Rice University School of Architecture, faculty from the Gerald D. Hines College of Architecture at the University of Houston, and the Rice Gallery staff. Throughout the installation process, the team met for lunch and lively discussion each Friday at the Rice Faculty Club where the project came together. These conversations extended far beyond campus, as e-mail and telephone correspondences bounced among the architects and Rice Gallery in Houston, Shigeru and his assistant Grant Suzuki in Tokyo, and Ove Arup & Partners Intl., Ltd., London. In the end, the project was truly a product of international partnership.

Prior to construction, Rice architecture professor Nonya Grenader and her husband Jonathan, an engineer, built a prototype of the roof, while architecture students from the University of Houston created a mock-up to simulate the intersection of the support columns with the roof. Both models allowed the students to test the measurements and connections in advance and provided visual aids to guide the process. At this stage, the original plan was amended, confirming what Ban had anticipated, that the students would play a central role in the evolution of the project.

Formal construction of the roof began on October 28, 2002 in Rice Gallery. Under the supervision of Grant Suzuki, students from the Rice Architecture 101 class assembled the bamboo boards, which



Ban Team meets at Rice Faculty Club.



Danny Samuels, Nonya Grenader, Jonathan Grenader and Kimberly Davenport discuss the prototype.



had been shipped from California and then cut, drilled, and treated by Brochsteins Inc., Houston. As the sections grew in length and started to produce a curve, they were identified with tags, carried out of the gallery, and laid on the plaza. Meanwhile at the University of Houston workshop, the steel poles and connector plates were cut, painted, and welded. When assembled to form the five support columns, eight bundled poles would cross one another at 45-degree angles to form a series of loose hourglass shapes.

On November 7, a crane lifted the fully assembled roof onto the fifteen-foot high support columns. Further creativity was necessary, however, when the crew realized the lightweight structure would require additional weight to keep it stable in high winds. Working with Grant Suzuki, University of Houston students placed bowling balls in the valley formed by the intersection of the poles and suspended sand-filled burlap bags from the center of each bundle of poles. When Shigeru Ban arrived for the opening of *Bamboo Roof*, he expressed delight that through their use of simple, inexpensive materials the students had stayed true to his original design and intent.

Kimberly Davenport
Director

ACKNOWLEDGEMENTS

I WOULD LIKE TO EXPRESS MY DEEPEST THANKS TO SHIGERU BAN, ARCHITECT, artist, and exceptional human being. I remain grateful that he was willing to work with a small museum and a limited budget. By providing the resources of his firm, Shigeru Ban Architects, he allowed us to complete in six months a project that would normally require two or more years to realize. Shigeru's vision of possibilities inspired all of us — those who were well acquainted with his work and international stature as well as those who were not.

Each person who worked on *Bamboo Roof* would have his or her own word to describe Grant Suzuki of Shigeru Ban Architects; mine would be "lifesaver." Given the 14-hour time difference between Houston and Tokyo, he would remain at his desk until midnight or later to contact us. Grant was our constant source of information and always a beacon of hope in technically challenging matters. Assigned to Houston to oversee construction, Grant endeared himself to all with his patient and flawless supervision of the project. He was never flustered and he *always* devised a solution. Everyone, especially the students, found it hard to say good-bye to him. I am grateful also to Anne Scheou, Shigeru Ban Architects, for her help in facilitating communication during the early stages of the project.

Having the prestigious firm Ove Arup & Partners Intl., Ltd., London provide engineering support added to the excitement of the project. I would like to thank ARUP's Advanced Geometry Unit, Cecil Balmond, Charles Walker, Martin Self, Tristan Simmonds, and especially Benedikt Schleicher who came to Houston to oversee the final stage of construction.

Bamboo Roof could not have been built without the commitment of Rice Gallery Patron Raymond Brochstein. An architect who believes that art and architecture belong together on the Rice campus, Raymond guided and supported us throughout the planning stage. He located the bamboo boards and his company, Brochsteins Inc., one of the nation's leading manufacturers of fine custom woodwork and furniture, prepared them for use in our roof. It is fitting that not long after *Bamboo Roof's* construction, the gallery plaza where it stood was designated the "Raymond and Susan Brochstein Plaza." I am grateful to Deborah Brochstein, President of Brochsteins Inc., for her patience and good humor in communicating our numerous e-mails, questions, and cries for help to her father. I would also like to express our gratitude to the craftsmen and support staff at Brochsteins Inc. for all they contributed to the project's realization.

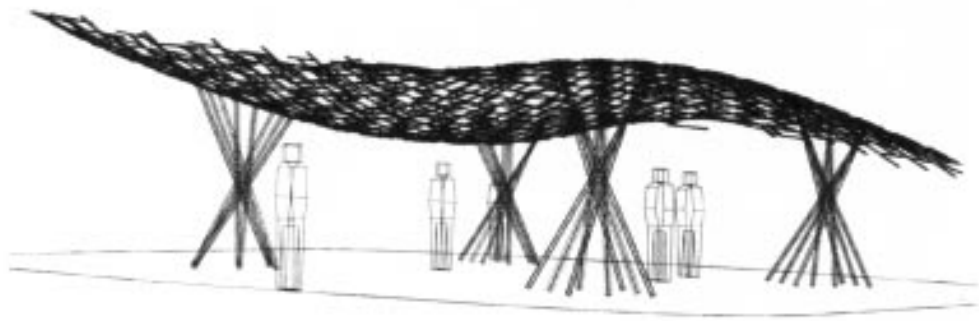
Since Ban stipulated that students must build his project, in May 2002 I contacted professor Nonya Grenader at the Rice School of Architecture to explore the feasibility of having architecture students work on a site-specific architectural installation by Shigeru Ban. In that brief first meeting, Nonya expressed the enthusiasm that proved to be a driving force throughout the project. Through Nonya's initiative, an extraordinary team was assembled, one that included fellow School of Architecture professors Danny Samuels and Mark Oberholzer, as well as her husband Jonathan, an engineer who took an active role in every step of *Bamboo Roof's* construction. Nonya initiated the collaboration with the Gerald D. Hines College of Architecture at the University of Houston, and it is impossible to imagine this project reaching its successful completion without the expertise and dedication of

University of Houston professors Donna Kacmar and Bill Price. Over fifty students from both schools of architecture worked under the leadership of these professionals and I thank each of them from the bottom of my heart.

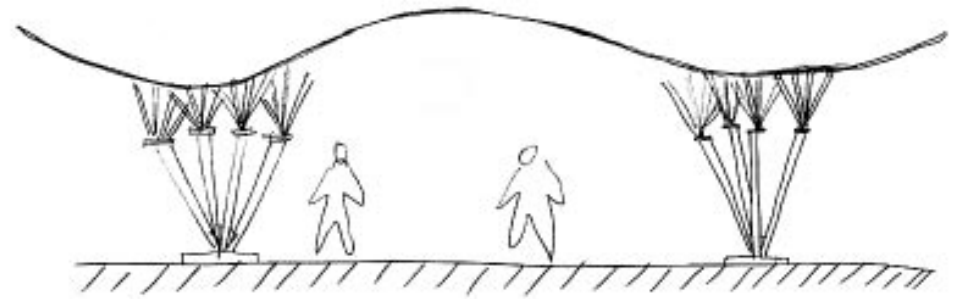
I am grateful to Nonya, Donna, and artist Fraser Stables for co-curating *Bamboo Roof: Process*, the Rice Gallery exhibition that accompanied the installation. Fraser created the photo-timeline that served as the centerpiece of the exhibition. It is reproduced in its entirety in this catalogue, and stands as an artful and enduring document of the *Bamboo Roof* experience. I would like to thank steel fabricator Greg Bruegger for his creative problem solving, and Tommy Joe, Shop Manager, University of Houston. Lastly, I would especially like to thank Jeanne and Mickey Klein for hosting the elegant and festive celebratory dinner at their home.

Kimberly Davenport
Director





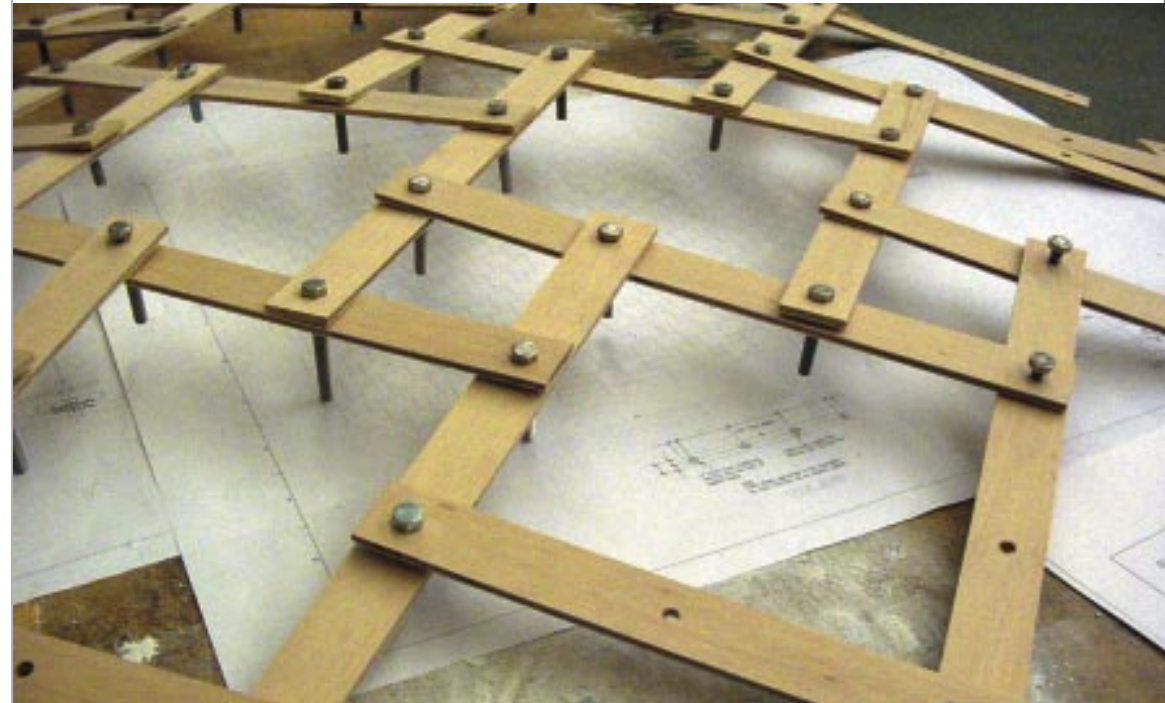
Rendering by Shigeru Ban Architects



Sketch by Grant Suzuki, Shigeru Ban Architects



David Krueger and Jonathan Grenader





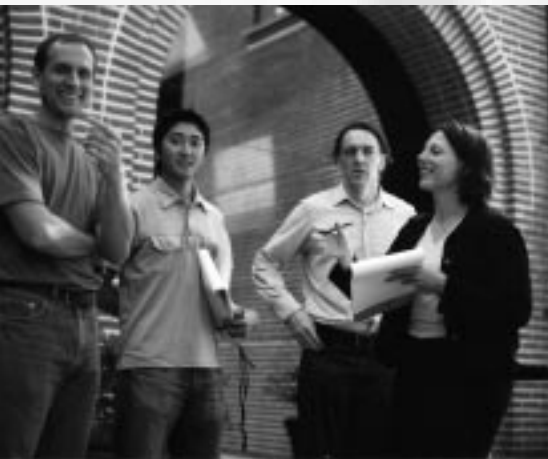




Bill Price (top right) and University of Houston architecture students develop the metal pole support system.







Greg Bruegger, Grant Suzuki Mark Oberholzer,
and Donna Kacmar

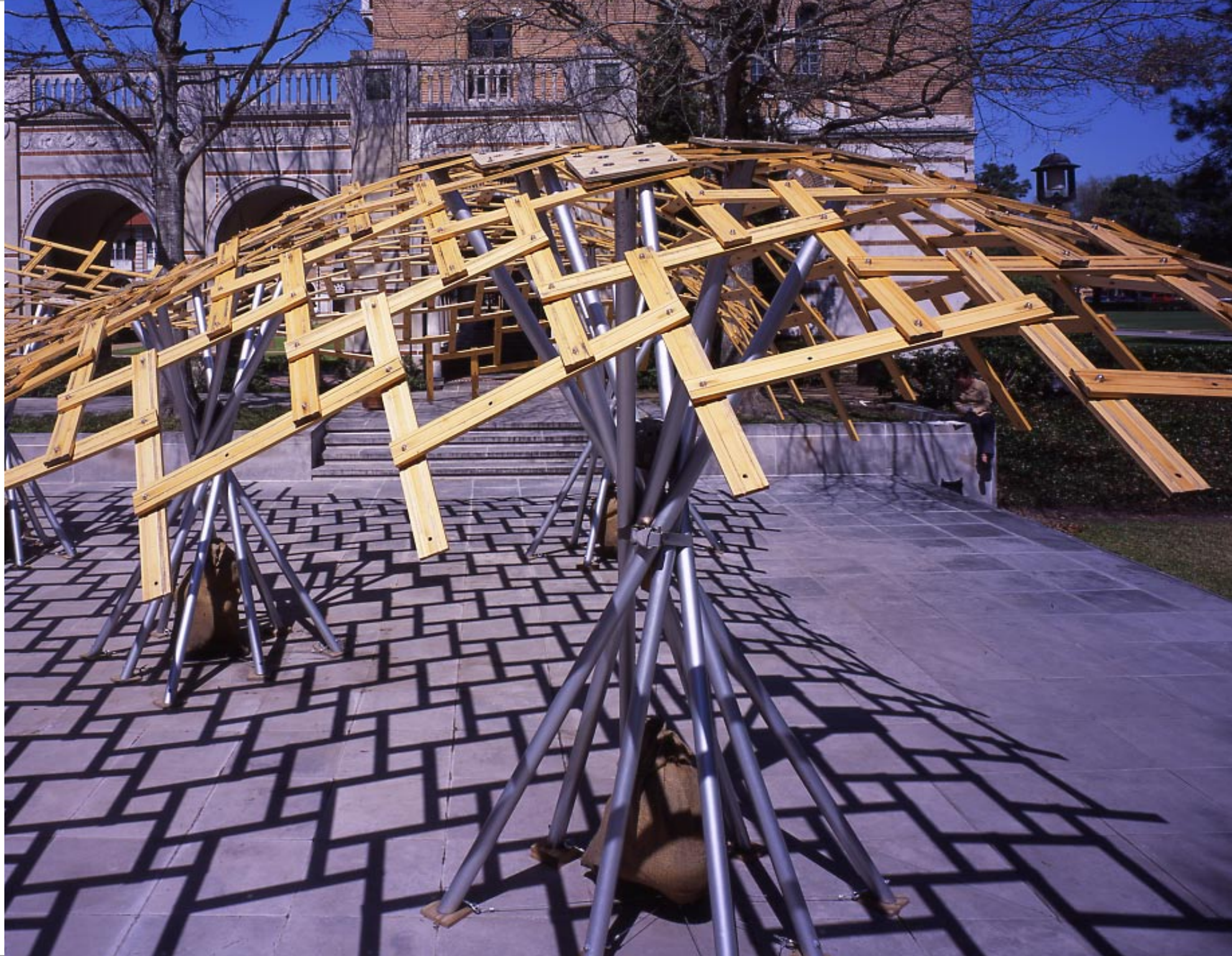








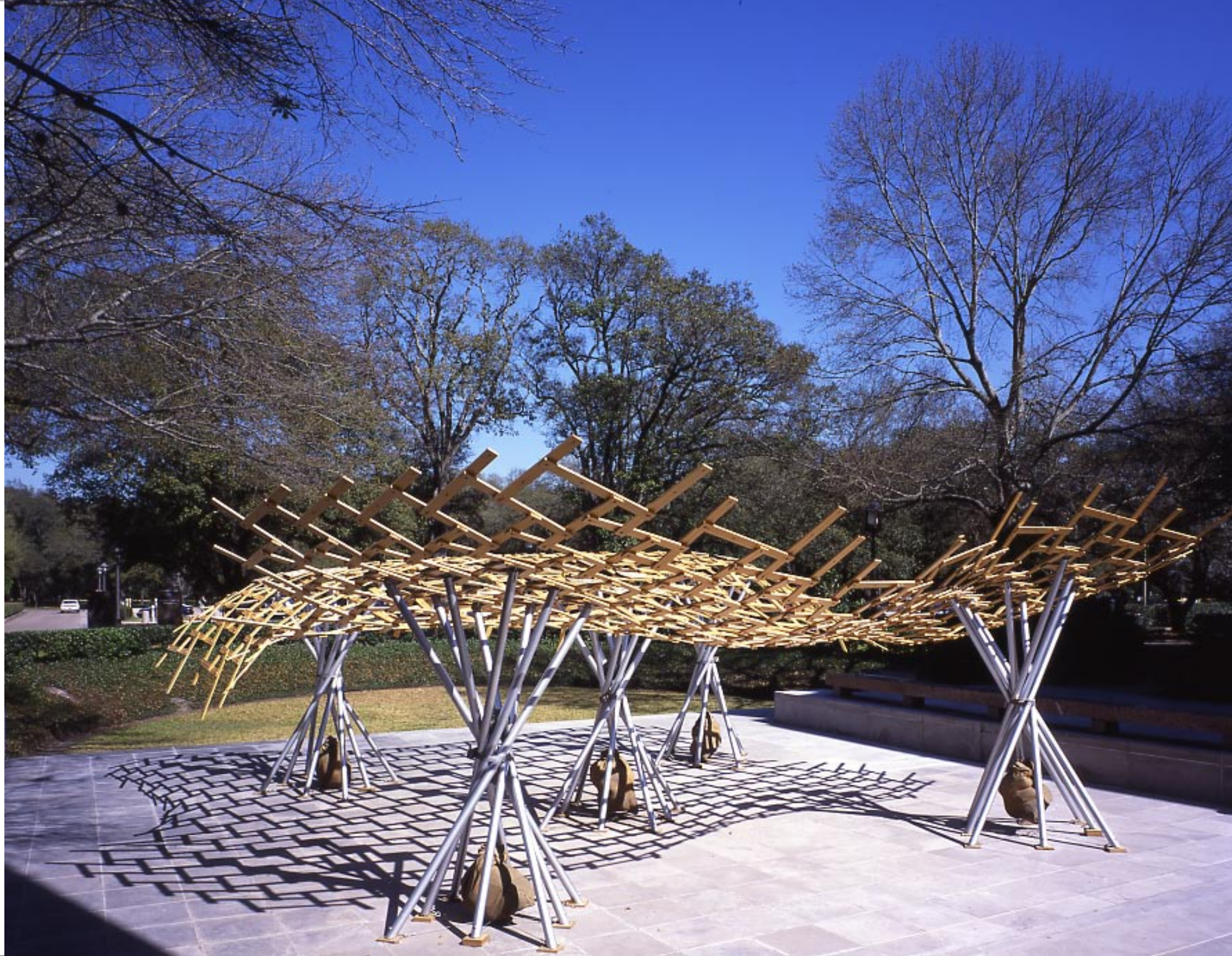






University Art Gallery





PERSONAL STATEMENTS

Shigeru Ban, Shigeru Ban Architects

After *Bamboo Roof* was completed at Rice Gallery, I discovered something new about the structure. It was easier to build than I thought. Time wise, it was very quick to assemble. When I arrived for the opening on November 9, 2002, I saw that the students had made some changes to the initial plans. This is the usual process for prototypical work. The roof was something that had never been built before, so everything was a new study and everything was in development. The Bamboo Grid Shell Structure was my newest idea, and I wanted to test the idea as an experimental installation. It was a great success!

Public participation is very important to an architect. I am most interested in studying architecture that anyone can build. Rice University was a wonderful opportunity to do that. I always involve students because I have been building temporary houses for the victims in disaster areas. The cooperation of students always keeps the project going ahead and ultimately makes it a better achievement. That's why I would like to continue this sort of project and I am so happy that I had that opportunity here. Thank you so much to the people who participated in this project.



Grant Suzuki and Shigeru Ban

Grant Suzuki, Shigeru Ban Architects

When I first joined the team in Houston, the atmosphere was mixed with a bit of anxiety. Participants were concerned that there wasn't enough time to complete the installation, but the level of preparation exceeded all of my expectations. As it turned out, the important thing for me to do was to make decisions. As decisions were made, action followed immediately. The staff had everything organized so well that problems were solved quickly and the network of professors and students from

both Rice and the University of Houston was outstanding. Students were even willing to give up time to study for exams in order to keep the project on schedule.

The most rewarding aspect of the project was that the effort put into it was evident in the final product. This was true of all aspects of the project: the planning and organization, the construction, the documentation, and the opening day celebration. In the end, the dedication of all involved was what really made the project great.

Benedikt Schleicher, Structural Engineer, Ove Arup & Partners Intl., Ltd., London

Developing a structure like *Bamboo Roof* requires that the engineer and the architect work together very closely, as there is no strict line between the architectural and the structural design. For this process we used software that allowed us to generate a non-linear 3D mesh, which was the starting point for the development of the structural system. It is necessary to understand the geometric principles — the way the boards are attached to each other and how these elements, when attached to other elements, can form a geometry. With our software we were able to generate different models, then take these models and run a structural analysis. Once the geometry was finalized, properties were provided for the elements, and the structure was rendered.

Rendering, Ove Arup
& Partners Intl., Ltd., London



Bamboo Roof is a grid shell structure with a non-linear geometry and double curvature. The principle of this reticulated gridshell is that the discreet bamboo boards are overlapped at the joint. This simple spiraling overlap of the board imparts curvature to the surface of the shell. As a result the geometry of *Bamboo Roof* was very elegant and free-formed.

ABOUT THE ARCHITECT

Shigeru Ban was born in Tokyo in 1957. He studied at the Southern California Institute of Architecture (SCI-ARC) and received a Bachelor of Architecture degree from The Cooper Union, New York. He has won numerous awards including the Kansai Architect Grand Prize (1996) and Best Young Architect of the Year (1997) from the Japan Institute of Architecture. He received widespread attention in 2002 when his proposal was selected as one of two finalists in the competition to design the World Trade Center Memorial. In 2004 he received the Grand Medaille d'Or from the French Academie d'Architecture, and was named an Honorary Fellow, The American Institute of Architects. In 2005 Ban won the design competition to build the new Euro Pompidou Centre in the city of Metz, France, scheduled to open in 2007.



ABOUT THE ENGINEERS

Ove Arup & Partners Intl., Ltd. is one of the leading architectural engineering firms in the world with over 70 offices in 32 countries employing 7,000 engineering specialists. The firm is recognized for projects abroad such as the Sydney Opera House in Australia and the Tate Modern, London. Projects in the United States include the Institute of Contemporary Art, Boston, the John F. Kennedy International Arrivals Terminal, New York, and The Menil Collection, Houston.

FACULTY AND STUDENT PARTICIPANTS

Rice Building Workshop
School of Architecture, Rice University
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Associate Director: Nonya Grenader

Architecture 101
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Nonya Grenader and Danny Samuels

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Matt Crnkovich, Beatrice Eleazar, Christian Ervin, Izabel Gass, Justin Holdahl,
Mary Ann Holliday, Lyndsay Krodel, Chad Leahy, Brian Love, Brian Meinrath,
Divya Pande, Claire Pritchett, Etien Santiago, Kristen Smith, Jay Townsend,
Kaiba White, Kaileen Yen

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Matthew Radune, Xochil Rodriguez

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University of Houston
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Richard Buxbaum, Mayura Gandhi,
Christopher Hale, Evan Harlan,
Chihcheng Hsu, Jean Kang, Shirat Mavligit,
Charlton Meyers, Rashmi Murthy,
Laura Nesbit, Craig Smith

Arts 206
Intermediate Black and White Photography
Department of Visual Arts, Rice University
Fraser Stables

Stephanie Adrianse, Meredith Bossin,
Les Bryson, Alison Griffith, Julia Schwent,
Heidi Sherman, Elizabeth Supley



Credits

Shigeru Ban, *Bamboo Roof*, 2002
Commission, Rice University Art Gallery

Rice University Art Gallery is located in Sewall Hall on the campus of Rice University, 6100 Main Street, Houston, Texas 77005, and on the web at www.ricegallery.org.

Major support for *Shigeru Ban: Bamboo Roof* was provided by Raymond Brochstein of Brochsteins Inc. and Mr. and Mrs. Michael L. Klein.

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Bamboo Roof: Process, the Rice Gallery exhibition documenting *Bamboo Roof's* construction, was organized by Nonya Grenader, Fraser Stables, Donna Kacmar, and Kimberly Davenport. Thanks to all the students who provided documentary material.

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Jaye Anderton, Manager
Katherine Kuster, Curatorial Assistant
David Krueger, Preparator

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