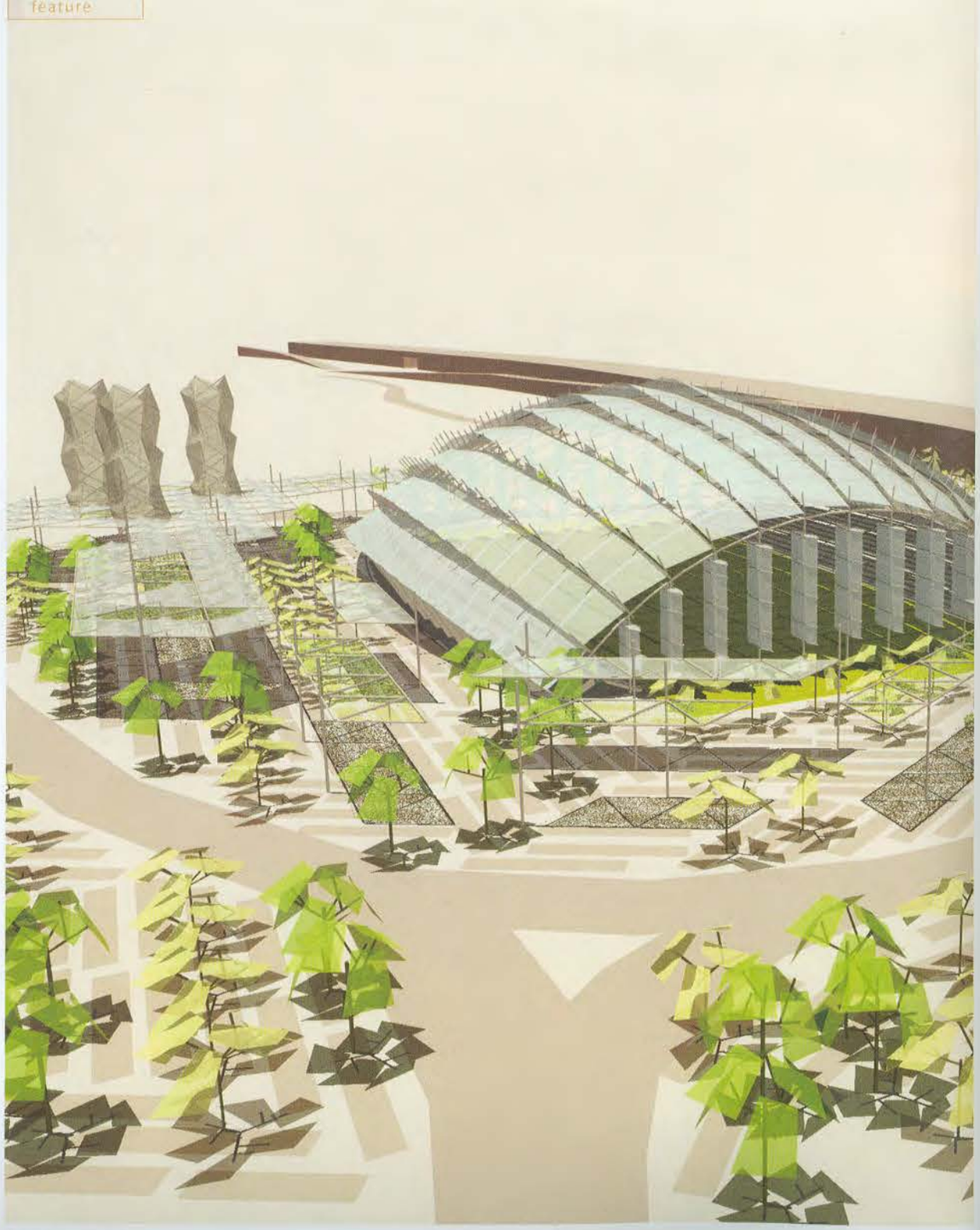
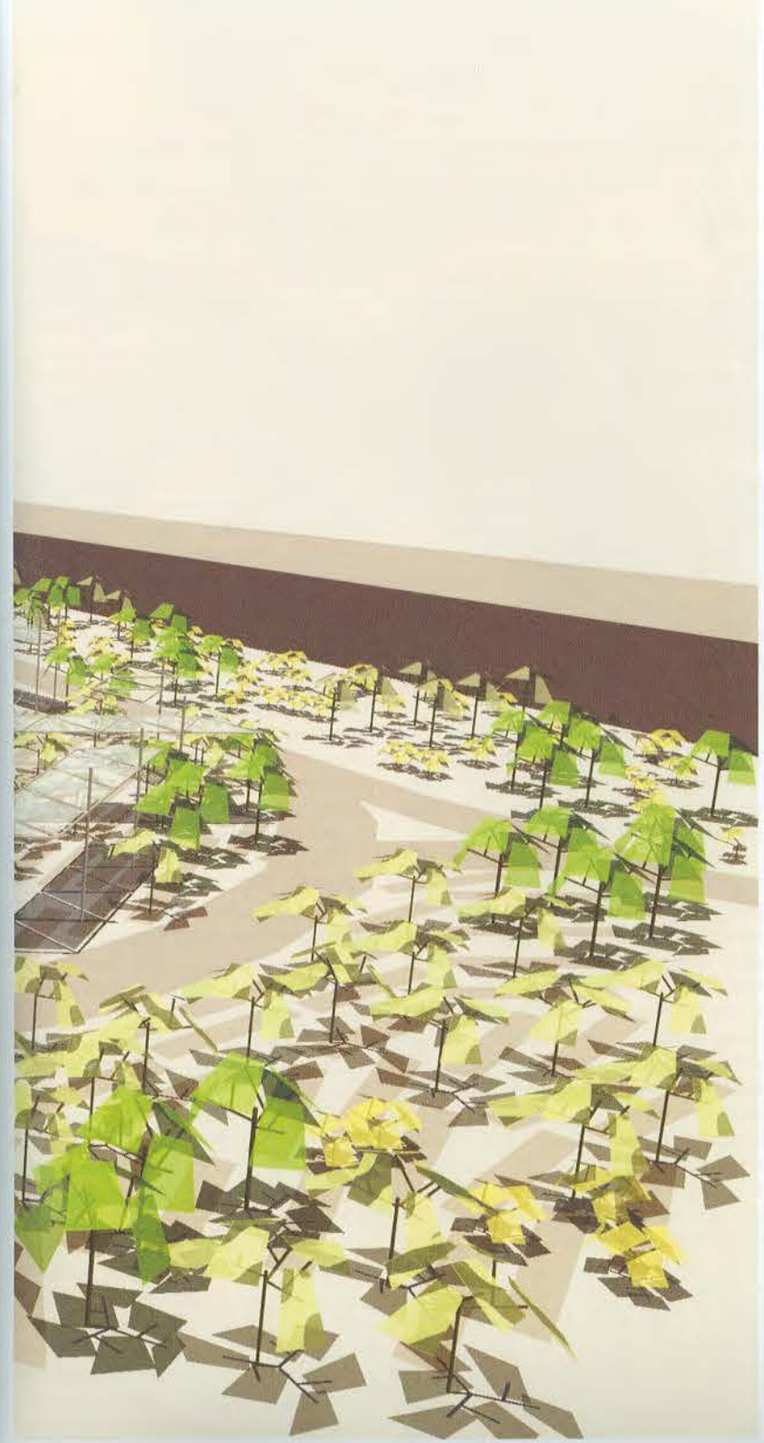


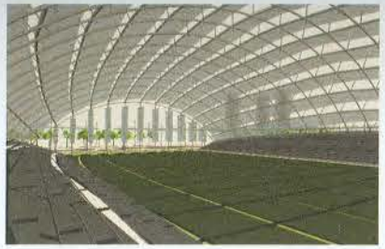


SHADE SUTURES RETROFITTING OUR DESERT CITY

text **Nan Ellin, Jeffrey Cook, Dan Hoffman, Harvey Bryan, Darren Petrucci, Vidar Lerum and Ron McCoy**
Images **Dan Hoffman**

Not much about the urban form of Phoenix betrays its desert setting. This is because 90% of the metropolitan area has been constructed since the Second World War when local topography, climate, culture, and history played little role in shaping cities. This last half century has also privileged moving cars over moving people. Phoenix is paying for its youth, then, by lacking the built-in strategies of older and wiser desert cities that protect pedestrians from the blazing sun, such as compact urban cores with a range of passive cooling devices. Instead, we have a sprawling metropolis that virtually prohibits walking while it also contributes to social isolation and environmental degradation. The highly publicized "heat-island effect," the result of substituting asphalt for the natural landscape, intensifies the magnitude of this problem as well as the need for remedying it.

The pendulum of city-building logic has been swinging back over the last decade to favor human comfort and well-being along with the creation of pedestrian-friendly environments. But we inherit the heavy urban legacy of misdirected decades prior. How can we now



"A KEYSTONE OF BOTH THE IMAGERY AND EFFICIENCY OF THIS TRANSFORMATION WAS A BUILT DEMONSTRATION OF SUCH AN URBAN OASIS IN DOWNTOWN PHOENIX."

retrofit our desert city so that it joyfully accommodates people as well as cars? The answer is found in the integration of uses to create denser urban pockets as well as the incorporation of design elements that offer comfort throughout the year.

The School of Architecture at Arizona State University has become a leading research center in cooling strategies for desert cities. Primary among these is an investigation into shade structures undertaken by various members of the faculty in their classrooms and private practices. These range in scale from the very small to the very large as well as in the materials applied and the costs incurred. Some are still in the conceptual stage, others ready to be implemented, others passed over, and others still scheduled to break ground.

Effectively designed and realized, shade structures have the potential to provide a comfortable walking environment even in the hottest months, to create linkages—or "sutures"—between currently isolated places, to serve as a catalyst for urban infill, and to provide the sense of place and character that are sorely lacking in our city.

PHOENIX SOLAR OASIS 1988

Phoenix in the mid-1980s saw the emergence of a new sense of civic identity. Amid the mission statements crafted at the time was the goal of making Phoenix the premier desert city in the world. Civic leadership included members of the political, educational, arts, technical, ethical, and business communities, among them Terry Goddard, then Mayor of Phoenix and Karl Hodges, then Director of the Environmental Research Lab at the University of Arizona. In an effort to convert the existing sprawling suburban anonymity into a cooler and more comfortable shaded city of unique character, an oasis concept of desert vegetation and architectural infrastructures was proposed for the public realm.

A keystone of both the imagery and efficiency of this transformation was a built demonstration of such an urban oasis in downtown Phoenix. The design for the Phoenix Solar Oasis was presented by a large model which formed the centerpiece exhibit of a small, full-sized demonstration, "A Summer Imitation," mounted on the Civic Plaza from June 21 to September 21, 1988 by the Environmental Research Lab that included operating cool towers.

The Phoenix Solar Oasis model was based on bioclimatic design principles featuring trees, shading canopies, and cool towers that not only reject solar-produced heat but also produce coolness. The importance of vegetation for a desert oasis is ageless knowledge. But the development of economic plasticized fabrics that resist ultraviolet degradation was only a recently available asset. The resulting tensile shade structures are capable of controlling solar as well as thermal absorptivity and emissivity. Even more recent and especially appropriate to this proposal was the invention of the "cool tower" by William A. Cunningham and T. Lewis Thompson in Tucson. Essentially, a "cool tower" is a down-draft chimney passively driven by evaporatively-cooled air. When combined with the shading characteristics and air flow potentials of the new fabrics, here was a new design vocabulary for outdoor spaces. Conceived in 1976, this concept proved operationally successful in a 1984 demonstration.

In retrospect, neither costs nor performance explain why the Phoenix Solar Oasis was not built. Rather, there were questions of civic priorities. Nonetheless, this new vocabulary of bioclimatic design was of international interest and the project was published widely throughout the world. It informed the design the Expo 92, the World's Fair held in Sevilla, Spain. Potentially, the most memorable image of that world fair was the urban shaded coolness of the outdoor spaces, a direct descendent of the unbuilt Phoenix Solar Oasis of 1988.

COOL CONNECTORS

Cool Connectors builds upon the assumption that the quality of the environment and the quality of public life in the city can be mutually supportive with nature and urbanity woven together in new and exciting ways. The site for this study is a piece of empty land bordered by the Grand Canal and the 202 Freeway north of Sky Harbor Airport. The location of the airport in the middle of the city is a mixed blessing making it convenient for travelers while limiting the options for expansion because of the proximity of built-up areas. The vast amount of runway paving also contributes to the "heat island effect," raising summer temperatures in the city beyond the comfort level. Despite these apparent limitations, the airport is considering

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an additional runway to the north, which would necessitate the removal of many buildings and facilities including a dog racing track and large parking lot. This parking lot is the location of *Park and Swap*, a large flea market where people buy and sell personal goods from the trunks of their cars. It is also the most active outdoor, pedestrian area in the city bringing together people of diverse cultural and economic backgrounds.

This study proposes relocating the *Park and Swap* to a new facility on the site to the north. Using a wide variety of passive cooling strategies, the new facility is designed to mitigate the heat build-up of the new runway while providing a comfortable environment for year-round use. The design expands on the flea market concept by providing a modular construction system that can accommodate a variety of changing commercial and recreational environments. The resulting *Parket (Park + Market)* is a new land use typology combining parks, parking, and market facilities. Its presence in this part of the city will enhance pedestrian activity and contribute to the development of a Cool Connector pedestrian network through the city.

Shading is one of the key passive-cooling strategies used in this project and is provided in an array of shapes and forms consistent with the various programmed uses of the facility. Like the delicate and variegated shading found under the mesquite and palo verde trees, the structures in this project are designed to bring color and year-round comfort to pedestrians.

LIGHT RAIL STATION CANOPIES 2001

At the bequest of Valley Connections, we have proposed standards for passenger stations of Phoenix's forthcoming Light Rail System. For reasons of economy, stations will not be enclosed and mechanically conditioned, but open-air shelters. In this report, entitled "Climate, Comfort, and Health," we recommend overhead canopies as well as vertical shading screens especially for the late afternoon rush periods when temperatures can be at their highest, but the sun is only half way to the horizon.

In addition to demonstrating the view factor technique of calculating mean radiant temperature, recommendations were also made concerning the choice of construction materials. Many existing shade structures for walkways, bus stops and car part canopies have not been appropriately designed for hot arid climates. Many of these structures use dark single-ply light gauge metal as the primary shading surface. Field measurements of a number of these structures have found that it is not uncommon for them to have surface temperatures approaching 160 degrees Fahrenheit on a summer day. Such temperatures on surfaces of a large radiative plane a few feet above a user creates significant thermal discomfort.

In shading device design, then, material selection and surface color are as important as getting the sun angles right. The technical specification of solar absorptivity and emissivity are key to avoiding the effect of metal canopies becoming solar-heated radiators while they are providing shade.

To complement canopy design, we also recommended extensive landscape planting as part of station design to provide additional shading, as well as evapo-transpiration generated cooling. Although vegetation was also an important element of citizen urban design recommendations, the ground area available at stations is extremely limited. Thus, as station design has emerged, there is an even stronger dependence on overhead architectural shading canopies as the primary source of cool comfort.

CONNECTIONS: PEDESTRIAN AMENITIES ALONG 7TH AVENUE

Connections is the result of a three-year research project to develop an urban revitalization strategy that forms a new multi-use pedestrian network linking together the disparate fragments of the commercial strip with the surrounding neighborhoods, parks, retail, restaurants, and schools. The demonstration site for this project is the one-mile commercial corridor of 7th Avenue between Indian School Road and Camelback Road.

This project will be the first demonstration of a new "Amenity Infrastructure" that combines shade, lighting, ground surfaces, landscape, and signage to transform conventional pedestrian and automobile infrastructures (such as sidewalks, street lighting, and parking spaces) into such amenities as shaded parking, display areas, outdoor seating, and recreation areas. Unlike conventional street infrastructure focused only on life-safety, these new amenities developed by the city are designed with the merchants and neighborhoods in mind. [s]