

## 2016-2017 Schob Scholars LAUP Mini-Grant Program

### 1. Principal Investigator:

*Dr. Robert D. Brown, Professor, Landscape Architecture & Urban Planning*

### 2. Project Title:

*Measuring the microclimatic effect of an urban nature reserve on the thermal comfort of visitors*

### 3. Project Abstract (150 Words):

Global Climate Change (GCC) and Urban Heat Island (UHI) intensification are causing more frequent and more intense heat waves in cities, putting people's health and well-being at risk. Landscape architects have the potential to reduce these effects and create cooler urban environments, but they can only achieve this if they understand how design affects a microclimate, and how a microclimate affects the thermal comfort of a person. This study will measure the microclimate along a transect from an urban hot spot, through Schob Nature Preserve, and ending in another urban hot spot. Results will illustrate the relative effectiveness of different planning and design interventions.

### 4. Objectives of the Project:

This project will offer the opportunity for a Landscape Architecture PhD student to learn how to collect high quality microclimatic data as well as begin to understand how physical design affects the microclimate, and how the microclimate affects thermal comfort of people. The *goal* of the project is to compare microclimatic conditions at different times of the day in urban environments ranging from areas with hard, dry, dark surfaces to soft, green, well-watered areas. This will be accomplished through the following objectives:

1. Identify a transect that would be expected to provide a range of microclimatic conditions.
2. Set up, test, and calibrate microclimate instruments.
3. Mount instruments on a mobile vehicle and conduct a pretest.
4. Select test days.
5. Collect data during a range of weather conditions.
6. Analyze the data and illustrate the results.
7. Present the results at an academic conference and submit a paper to a refereed journal.

## **5. Work Plan (including task number, name and descriptions):**

The project will be done in three phases: *Site Inventory and Analysis*; *Data Collection*; and *Data Analysis and Communication*.

### ***Phase One: Site Inventory and Analysis***

**Task 1.** Conduct an inventory of the area within a mile of Schob Nature Reserve. Three maps will be produced: canopy cover; vegetated ground; and impervious surfaces. These maps will be used to identify a transect route that will pass through impervious, unshaded areas as well as vegetated, shaded areas.

### ***Phase Two: Data Collection***

**Task 2.** Microclimate instruments will be set up, tested, and calibrated in the Microclimatic Design Laboratory. Instruments will include (Vanos et al 2012): thermocouple (air temperature); hygrometer (air humidity); anemometer (wind speed); pyrgeometer (terrestrial radiation); and pyranometer (solar radiation).

**Task 3.** Instruments will be mounted onto a golf cart and a pretest will be conducted around the Architecture Quad of the Texas A&M campus.

**Task 4.** Four test days will be selected for study: a hot, sunny day after a prolonged dry spell; a hot, sunny day after a substantial rainfall; a hot overcast day after a prolonged dry spell; a hot overcast day after a substantial rainfall.

**Task 5.** The instrumented golf cart will be driven at a constant speed, equivalent to a walking person, both directions along the transect recording data every 5 seconds. Measurements will be taken at four times of each test day: just before sunrise; near noon; mid-afternoon; and just after sunset.

### ***Phase Three: Data Analysis and Communication***

**Task 6.** The data will be analyzed using descriptive statistics and then input to the human energy budget model COMFA. The results will compare the microclimates of the different landscapes traversed, and will illustrate the results in terms of human thermal comfort. Each component of the microclimate will be considered in isolation to illustrate to designers the most- and least-effective design interventions.

**Task 7.** An abstract will be written based on the results and submitted to an academic conference (possibly CELA or ECLAS). A paper will be prepared and submitted to a refereed journal (possibly Urban Forestry and Urban Greening, or Landscape and Urban Planning).

**6. Student Learning Outcomes:**

The Landscape Architecture PhD students will learn how to collect high quality microclimate data and how to write the results in an academic format. They will also learn what design interventions are most effective in producing cool urban microclimates.

The results of the study will be communicated in such a way that they could be used in a BLA or MLA design class for them to build the concept that they should take microclimate ecological benefits of urban green space into considered while designing.

**7. Schedule of Activities:**

Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Task1	Task1										
		Task2	Task2	Task2	Task2						
					Task3	Task3					
							Task4				
							Task5	Task5	Task5		
									Task6	Task6	
										Task7	Task7

**8. Anticipated Deliverables (including the format, media and timing of delivery):**

An illustrated report will be produced that explains the research and results in a professional format. In addition an abstract and journal article will be produced in an academic format.

**9. How Will the \$3,000 Be Used:**

The total amount will be used to pay LA PhD student Wenwen Cheng to undertake and complete the study.

In-kind contributions provided by the PI include faculty time and use of microclimate instruments.

**10. References:**

Vanos, J.K., Warland, J.S., Gillespie, T.J., Slater, G.A., Brown, R.D. and Kenny, N.A., 2012. Human energy budget modeling in urban parks in Toronto and applications to emergency heat stress preparedness. *Journal of Applied Meteorology and Climatology*, 51(9), pp.1639-1653.