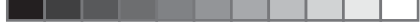




Hugh Byrd

# Celebrating Sundials





# Introduction

This booklet illustrates student projects that were specifically set up with the purpose of making the understanding of solar geometry an interesting topic that related to the conceptual design of buildings and which had a degree of accuracy. The act of making a physical model of a sundial is never forgotten.

'Celebrating Sundials' was a project that required students to design a sundial that would be ingenious, accurate and stylish. After all, a building is a sundial and should also have the same criteria.

'The Urban Sundial' project focussed on the projection of shadows of the existing built environment. Students used existing buildings as gnomons and projected shadow patterns from them.

## The History and Future of Solar Principles of Architecture

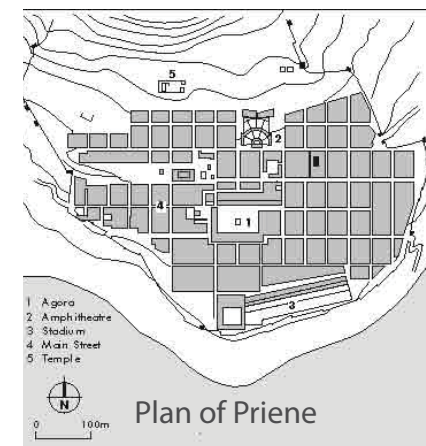
In the 4th century BC the adoption of passive solar design spread to many sections of the Greek world and interest in it remained unabated for several centuries to come. Entire cities, such as the city of Priene, were planned so that every citizen could receive solar heat. Aristotle advocated that, "the house must be sunny in winter and well sheltered from the north". The reason for this interest in passive solar design was that ancient Greece was running out of fuel for heating. The main source of fuel was wood and across Greece laws were adopted to protect the few remaining trees. Buildings designed with solar principles saved energy and trees.

By the 1st century AD the Romans were also facing the same problem. Iron and

bronze foundries as well as the newly invented glass manufacturing consumed huge amounts of wood. Their buildings were also heated by wood burning. The shortage of timber was the main reason for passive solar architectural principles to become adopted. In the words of Vitruvius, describing the orientation of rooms in a house, "the setting sun faces us with all its splendour giving off heat and rendering the area warmer in the evening". Like their Greek predecessors some 4000 years earlier, they were forced to consider passive solar design as a response to resource depletion.

In the 21st century AD we are again facing a similar problem; having consumed most of the timber we have now consumed most of the

accessible fossil fuels. Once again building design needs to consider solar energy as an alternative to burning fossil fuels that are both depleting and causing climate change. However, building design now not only needs to consider heating but also to reduce cooling by air-conditioning. Building designers need to consider how to exploit solar energy so that useful solar heat gains can be captured and stored while solar gain that causes over-heating can be eliminated.



## Teaching Solar Principles of Architecture

This requires an understanding of solar geometry by building designers. It is an art that the era of plentiful energy has made us forget. We build buildings that are excessively glazed and unprotected from the sun allowing useful heat to escape in cold weather and unwanted heat to accumulate in the summer. With about 40% of all energy used on the planet being consumed by buildings, architects have a moral obligation to implement solar principles.

The teaching of solar geometry has been done by using solar protractors, sunpath diagrams and environmental software that can be used to evaluate a design. These are useful tools but do not aid designers in the conceptual stages of design when important decisions

of orientation, proportion of glazing and shading are considered. To aid the conceptual stages, designers need an almost instinctive feel for solar geometry. Designing a sundial is an enlightening experience since it is a precision instrument that demands accuracy and an understanding of solar geometry. However, there are many ways in which to design a sundial so that it is both beautiful and imaginative while retaining the precision.

Buildings are sundials: both the shadows that buildings cast and the sunlight that penetrates rooms can be accurately predicted. The science involved in making a building a precision solar instrument is an integral part of the design process.

