



## **Mathematical modeling of the elasticity of some shell roofs: the Madrid Racecourse by E. Torroja**

**Jesús Idefonso Díaz**

Universidad Complutense de Madrid  
Facultad de CC Matemáticas  
Plaza de las Ciencias 3, 28040 Madrid, Spain

<http://www.mat.ucm.es/~jidiaz/>

### **ABSTRACT**

The experience shows that by endowing a thin surface with a small curvature in the direction transverse to the main length there is an extra rigidification which doesn't appear in the flat case. A good example of this is offered by the flexible steel meter.

In this conference (which presents several works in collaboration with E. Sánchez-Palencia) will obtain an asymptotic model of such kind of fine structures. We will also consider more sophisticated structures formed by two, or more, basic elements that are coupled by means of an edge with a slight folding. A very illustrative example of these couplings is the roof of the of the shell roofs of the Madrid Racecourse): The Hipódromo de la Zarzuela, due to E. Torroja in 1935. It offers a brilliant result of reinforced concrete forms consisting of a system of frames, separated in 5m intervals and connected longitudinally by surfaces with a small transverse curvature.

In his book ("The Structures of Eduardo Torroja ", F. W. Dodge Corporation, New York, 1958) Torroja indicates the lack of a mathematical theory capable of model such delicate structures. Our results provide a study rigorous mathematician of this type of structure, responding, in a certain sense, to that open question raised by Torroja.

